DETERMINANTS INFLUENCING UPM STUDENTS' INTENTION TO USE SMARTPHOME-BASED ONLINE FOOD DELIVERY APPLICATION

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Abstract. The rapid rise of Online Food Delivery Applications (OFD Apps) has transformed meal access by connecting consumers with food providers through third-party platforms, often supported by gig workers. While offering speed and affordability, these platforms face challenges such as fluctuating demand and external disruptions. University students, known for their tech-savviness and convenience-driven habits, represent a crucial user segment for OFD services. This study explores the behavioral factors influencing Universiti Putra Malaysia (UPM) students' intention to use OFD Apps, using the Unified Theory of Acceptance and Use of Technology (UTAUT) as a framework. Key constructs examined include performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). A total of 375 students participated in an online survey, with data analyzed via Pearson correlation and Multiple Linear Regression (MLR) using IBM SPSS Version 27.0. Results revealed strong positive correlations between usage intention and PE (r=0.587), SI (r=0.504), and FC (r=0.503), while EE showed a moderate correlation (r=0.426). MLR analysis identified PE (B=0.351) as the most significant predictor. These findings offer practical insights for enhancing OFD adoption among youth and contribute to the theoretical application of UTAUT in the digital food delivery context.
Keywords: *Online Food Delivery (OFD), Universiti Putra Malaysia (UPM), university students, purchase intention, smartphone*

Introduction

Over the years, OFD have become an essential part of the food technology industry, shifting from food processing and manufacturing technology to the growing market of online food ordering and delivery services. With advancements in technology and changing lifestyles, online shopping has become one of the most popular online activities. OFD can be seen as a time-saving activity that parallels online shopping, both of which aim to attract and satisfy consumer needs. OFD services have progressively altered consumers' food purchasing behaviours. The OFD industry is now worth billions of dollars globally (Tan and Kim, 2021). In addition, OFD Apps are platforms that allow users to place food orders via smartphones. These web-based Apps assist in the management of order processes, track quantities, and handle payments, but they do not engage in food preparation (Pigatto et al., 2017). In Malaysia, OFD are categorized into two types including those provided by restaurant intermediaries and those offered directly by merchants. For example, fast-food chain restaurants such as Pizza Hut, McDonald's (MCD), and Kentucky Fried Chicken (KFC) typically charge extra from their customers for transportation when delivering food. On the other hand, OFD Apps, which are considered restaurant intermediaries, offer delivery services for a wide variety of restaurants instead of their own branding for example Grab Food and Foodpanda (Daud and Yoong, 2019). In 2021, the China Internet Network Information Center estimates the OFD industry in China to be worth RMB934 billion (US$138 billion),

making up a significant portion of the country's catering market. In Malaysia, the prediction where OFD market will generate US$2.77 billion in sales by 2024, with further growth expected, reaching US$4.67 billion by 2029 which refers to a huge amount of potential sales. OFD platforms function through logistics networks that involve "gig workers" or "riders," who use their vehicles such as motorcycles to deliver food to customers. These platforms rely on advanced AI-driven scheduling systems to efficiently plan, and route deliveries based on restaurant and customer locations. Factors such as order volume, delivery speed, and service quality can influence the compensation for delivery workers. Acting as intermediaries between restaurants and customers, OFD platforms have significantly contributed to the growth of the food service industry (Ji et al., 2024). Additionally, these Apps offer users the convenience of easily accessing and ordering food from a variety of restaurants, providing up-to-date and accurate information about restaurant menus. Customers can also track their orders in real-time (Algharabat et al., 2017).

Technological innovation, particularly smartphones and the internet, has dramatically transformed global society. Generation Alpha, born between 2011 and the mid-2020s, has grown up with smartphones and the internet as integral parts of daily life. The increasing digital connectivity among young people is influenced by their environment, including education and household income. Accordingly, Malaysia is expected to have 30 million smartphone users by the year 2025, with millennials and Generation Z owning the majority of smartphones. Given their high smartphone ownership, OFD Apps have become especially popular among young adults, particularly university students. A key feature of these apps is the function of push notifications, which alert users to new deals, transactions, and menu items (Anil and Francis, 2023). As a result, the popularity of OFD Apps is linked to the widespread use of smartphones and the potential influence they have on consumer intentions. OFD Apps have been innovated a lot by improving their overall systems and functions. Many food technology companies have started replacing traditional restaurants while OFD Apps offer cheaper prices and quicker delivery, they face problems like unpredictable demand, peak mealtimes, and outside factors like traffic, weather, and daily changes in customer needs. Due to aggressive competition and huge potential markets, the online food delivery industry needs to keep improving to make customers more satisfied, convenient, and loyal. Similar to e-commerce businesses, food technology companies rely entirely on technological platforms. Therefore, it is crucial to explore the adoption of OFD (Karulkar et al., 2021). According to Mei and Siok (2019), the majority of Malaysian students attending public colleges lack access to transportation, which prevents them from taking advantage of the chance to dine outside campus. Many public universities aren't supplied by a significant number of meal delivery systems currently on the market. In addition, certain meal delivery services only offer delivery for the minimum quantity ordered. This means that students without jobs or extra money cannot afford this type of food delivery service. Thus, students from UPM are selected to be the respondents of this study to evaluate the determinants of their intentions in using the OFD Apps.

Nowadays, OFD is gaining popularity, but there has been limited research on the factors that influence customers' willingness to use these Apps. Most previous studies have highlighted on mobile Apps in general, without exploring the specific area of OFD in detail. Furthermore, earlier research often had a broad scope, making it challenging to understand the attitudes and behaviours of distinct user groups without focusing on

specific demographics (Dung et al., 2024). Despite the increasing adoption of OFD apps among university students, limited research exists on their behavioural drivers, particularly within the context of UPM students known as a research knowledge gap. There is research related to UPM students and technology including research carried out by Jusoh and Jing (2019) that explores the factors that influence UPM students' intention to adopt e-payment. It examines perceived security, subjective norm, and self-efficacy as key variables, based on the Theory of Planned Behavior (TPB), and investigates their relationship with the intention to use e-payment. Moreover, there are also studies related to exploring the factors affecting UPM students' intention to adopt eWallet carried out by Osman and Yi (2021). A total of 200 UPM students took part in the research, selected using simple random and systematic sampling methods. Apart from that, there is also a past study (Osman and Leng, 2020) related to factors that influence the behavioural intention to adopt mobile banking among UPM students. However, there are absence of study related to UPM students and OFD thus this research gap will be able to be fill in this study. In addition, Allah Pitchay et al. (2022) conducted a study to explore customers' purchase intentions, including both those under and over the age of 25. The majority of respondents were employed, with only 32% being students. This highlights a research population gap, as there is limited information on the factors influencing university students' intention to use OFD Apps on smartphones. This study aims to address that gap by examining the factors that affect UPM students' intention to use OFD Apps. Several factors influence purchase intentions among university students. For example, in Quetta, Pakistan, university students' purchasing decisions in the fast-food sector are shaped by factors such as the physical environment and health consciousness (Bano et al., 2023). Allah Pitchay et al. (2022) identified key determinants impacting the purchase intention of OFD users, including performance expectancy, effort expectancy, social influence, information quality, price-saving orientation, and time-saving orientation.

In recent years, many university students prefer spending their leisure time at home browsing the internet. Cooking meals can be time-consuming for them, especially when balancing academic work. As a result, they often opt for vending machines, grab-and-go food, or OFD as alternatives (Hooi et al., 2021). Malaysian students attending public universities have expressed that they find the selection of affordable, high-quality, and healthy food options in OFD Apps to be limited (Eu and Sameeha, 2021). Among all OFD App users, university students, particularly from Generation Z, are frequent users due to their high internet connectivity. This generation is more active online compared to older generations, and the OFD Apps, being internet-based, are highly accessible to them. Consequently, university students make up a large portion of the global user base for OFD apps. The convenience, variety of meal options, and busy lifestyle of students contribute to the increasing adoption of these services. Research has shown that factors like delivery speed, cost, and the perceived quality and security of the service significantly impact students' satisfaction with OFD apps (Azman et al., 2021). At UPM, students face difficulties for example transportation issues as the majority of students do not possess their own transport to have meals in restaurants near UPM area. Thus, there is demand for OFD in UPM as students are only able to have food by using OFD service due to the inconvenience. On the other hand, there are several research gaps found in past studies including population gap and knowledge gap. According to recent research by Allah Pitchay et al. (2022), the study mainly focused on working adults in private and government sectors instead of university students although the

majority of the age of respondents in the study were less than 25 years old. However, for the knowledge gap, there are several research carried out related to UPM students and technology including e-payment, eWallet and mobile banking (Osman and Yi, 2021; Osman and Leng, 2020; Jusoh and Jing, 2019) and there is lack of studies of OFD in UPM. Hence, this study contributes to filling these research gaps. Additionally, Rasli et al. (2020) studied the impact of OFD apps on customer satisfaction among private university students in Pahang and found that factors such as information quality, effort expectancy, hedonic motivation, price value, and habit positively influenced behavioural intention. Several studies have been conducted to examine consumer preferences and their intention to use OFD Apps (Allah Pitchay et al., 2022; Lee et al., 2019). Key factors that influence the adoption of OFD Apps include habit, performance expectancy, and social influence, as these factors affect user satisfaction and the overall efficiency of these platforms (Lee et al., 2019). Moreover, Allah Pitchay et al. (2022) identified additional factors that impact customers' intentions, such as performance expectancy, effort expectancy, social influence, information quality, price-saving orientation, and time-saving orientation.

Review of literature

Food service digital transformation

Since the 20th century, technological advancements have significantly impacted the Food Industry, driving changes in both the sector and consumer behaviour. Various aspects of the industry have adapted to new technologies to better meet consumer expectations and fulfil their needs, leading to a transformation in business practices. According to Janaki and Abraham (2020), digitalization has sparked a new revolution in the era of thriving businesses, technological progress, and expanded market reach. It has not only impacted sectors like education, hospitality, healthcare, and transportation but has also been a key driver in the growth of the food service and fast-food industries. The number of fast-food establishments has grown significantly in recent years, and it is clear that digitalization has played a crucial role in transforming how consumers enjoy food, leading to an increase in food-related businesses. Nowadays, the food service industry is undergoing a significant digital transformation, with a widespread shift towards the adoption of digital technologies and data-driven strategies across its entire value chain. This transformation spans various areas, including supply chain management, production, distribution, marketing, and customer engagement. Technologies like artificial intelligence (AI), Internet of Things (IoT), blockchain, and data analytics are being utilized to improve operational efficiency, enhance product quality, ensure food safety, and provide personalized customer experiences. From smart farming practices and precision agriculture to advanced packaging and online ordering platforms, the industry is leveraging digital tools to stay competitive, adapt to changing consumer demands, and drive innovation. This digital shift is reshaping the industry, promoting greater sustainability, transparency, and the ability to quickly respond to new market trends and evolving customer preferences (Nugroho et al., 2023). Theoretical frameworks are typically developed through a comprehensive literature review that systematically synthesizes and integrates existing knowledge, theories, models, and concepts relevant to the research topic. According to Van Der Waldt (2024), as theoretical frameworks are based on a particular theoretical perspective or school of thought, the literature review assists researchers in selecting the most suitable

perspective that aligns with the research goals and existing knowledge. In general, theoretical frameworks act as the intellectual structure that supports research in the social sciences, offering an analytical lens for understanding complex social phenomena. Moreover, frameworks also provide unity to research projects by connecting research questions and offering a structured approach for data analysis and presenting findings (Lynch et al., 2020).

Convenience of the OFD applications

Convenience can be an important element on food delivery apps, however there is no agreement towards quality attributes that represent convenience on food delivery app. Besides, convenience showing ability to access and use a mobile app at any convenient time and place, whereby it given to control mobile app quality. According to previous study, convenience and accessibility created functional that been driving mobile user. Moreover, the fast acceptance of m-commerce has outstanding to risen convenience and efficiency that provided for the consumer. Moreover, the conceptualizes convenience orientation whereby a consumer is preferred to save time and effort using food delivery apps. Next, convenience also is defined as time and effort saved consumers meanwhile purchasing and using food delivery apps. Moreover, a part of the overall convenience construct identified on time and efforts saving especially on mobile application. Moreover, convenience on time and place had a strong impact towards mobile purchase intention. Previous research shows that convenience reflects the overall essential value which consumers obtain their time and effort on the purchase behavior.

Next, time saving aspects of convenience has been researched widely in the customer waiting time information which relate to perceived waiting time influence on behavior intention. Therefore, convenience can save a lot of time and energy and also will influence behavior intention to use on food delivery apps. Convenient access to product information that help and provide consumers making decision on online platform. Besides, the tools to measure convenience is through effort savings; for instance, easy to find products or menu and location. In virtual platform, the characteristics of conveniences value is that product or menu delivered on time, easy to make order and product or menu is displayed properly. In addition, empirical research shows that convenient of Internet is giving impact on consumer of willingness to buy or use online. Food delivery apps are available for consumers round the clock compared to store or restaurant as it is open 24 hours and 7 days a week. Besides, food delivery apps carry multiple advantages in terms of convenience; for instance, less time consuming, less physical effort and flexibility. Next, the main motivation for food delivery apps is assured in terms of shop or restaurant at any time and having package or wrap of food delivered at doorstep. Thus, convenience brings a lot of benefits especially in time saving and effort to consumers on using food delivery apps.

Research trends related to OFD adoption

Recent studies highlight significant trends in Internet technology, focusing on emerging innovations and their profound impact on society. Key developments include 5G, the Internet of Things (IoT), edge computing, and quantum internet. While these advancements offer transformative potential, they also present challenges such as high infrastructure costs and cybersecurity risks (Baffour et al., 2024). Additionally, Taherdoost (2022) notes that technology evolves rapidly, and those in the tech industry

must quickly adapt to these constant changes. With the rapid progression of information technology, organizations must identify and adopt appropriate technologies to stay competitive. Tools like cloud computing, IoT, artificial intelligence, blockchain, big data analytics, virtual and augmented reality, and 5G networks are essential in helping businesses achieve real-time efficiency. Staying updated on these trends is crucial to meeting consumers' increasing demand for technology-driven solutions. The IoT, for instance, has enabled the development of impactful applications for both consumers and industries, with notable advancements in integration with modern technologies (Debnath and Chettri, 2021). Moreover, mobile apps, particularly in health, have seen rapid growth in recent years, drawing significant research interest due to their potential in disease monitoring, treatment, and health promotion (Peng et al., 2020). According to Zein et al. (2023), current research in mobile app development focuses on areas like architectural design models, context-aware testing, and intelligent mobile applications. Over the past decade, smartphones have been the leading products. However, the smartphone industry is now facing a ceiling effect, as new models are very similar to the previous ones. Analyzing technology trends in the smartphone industry has become urgent to identify future development directions. Patent data from an emerging patent database was used, and technologytrends were studied using hierarchical clustering analysis. Time series analysis shows that low-power design in smartphones has gone through the stages of introduction, and rapid growth, and is currently in a sustainable growth phase. In the future, low-power design is expected to remain in this phase, making it an important focus for the smartphone industry (Zhang et al., 2020). Smartphone users look for features like high-quality cameras, large storage capacity, and long battery life in their devices. The market sells over 1.5 billion units annually, showing strong demand for each new model to offer better performance and better suit modern lifestyles (Lajoso et al., 2020). Marketing research on mobile apps has studied how they influence customer experiences and value throughout different stages of the customer journey, helping businesses gain a competitive advantage (Stocchi et al., 2021).

The rapid expansion of online food delivery apps has transformed dining habits and the food service industry. These apps have evolved, influencing consumer behaviour, the restaurant sector, and the overall dining experience (Tayal, 2023). A recent study by Rapariya (2023) highlights that online food delivery apps provide convenience by offering a wide variety of meals without the need for cooking. They help customers save time and explore different restaurants from the comfort of their homes. This service has become increasingly popular, benefiting both customers and small, especially new, restaurants by attracting customers and aiding them in recovering costs during their initial stages. On the other hand, the perception of risk associated with OFD Apps has emerged as a key research focus in Malaysia. A study by Poon and Tung (2022a) investigates how consumers' perceived risk such as performance, privacy, financial, physical, and COVID-19 risks affect their use of OFD using the goal-directed behaviour (MGB) model. Additionally, recent research has examined the moderating role of the perceived effectiveness of dispute resolution (PEDR) in influencing trust in OFD Apps and in restaurants, focusing on the transfer of trust from OFD Apps to restaurants (Raza et al., 2022). Consumer behaviour and preferences, along with the impact of this trend on different aspects of society, are central topics in the current research on online meal delivery. A study by Tarmazi et al. (2021) explored consumer purchase intentions for online food delivery services, focusing on factors such as

control, convenience, interaction demands, technology-related anxiety, and satisfaction. This research helps identify the demographic profiles and market segments for the service, as well as the most popular service providers among customers. Additionally, the study examines how consumers' attitudes toward OFD Apps have changed post-Covid-19. Regarding future usage intentions, it investigates the relationships between convenience motivation, perceived ease of use, time-saving orientation, and price-saving orientation (Tan et al., 2024). Various theoretical models, including the Technology Acceptance Model (TAM), UTAUT, and the Goal-Directed Behavior (MGB) model, are applied to understand consumer intentions towards OFD Apps (Zaheer et al., 2024; Hong et al., 2022; Poon and Tung, 2022b).

Generally, there are several theories applicable in the identification of behavioural intention for example Theory of Reasoned Action (TRA) (*Figure 1*), Theory of Planned Behaviour (TPB) (*Figure 2*), the Technology Acceptance Model (TAM) (*Figure 3*), and the Unified Theory of Acceptance and Use of Technology (UTAUT) (*Figure 4*). Madden et al. (1992) describe the Theory of Reasoned Action (TRA) as linking behaviour to intentions influenced by beliefs. Behavioural beliefs shape attitudes, while normative beliefs affect subjective norms. Together, they drive intentions, leading to behaviour. TRA highlights how expectations and social norms guide decision-making and behaviour outcomes in the process. On the other hand, Mathieson (1991) explained that the Theory of Planned Behavior (TPB) provides more detailed guidance for development compared to TRA, as it builds on the earlier model. TPB examines consumers' attitudes and behavioural intentions, focusing on their actions and interests. The Technology Acceptance Model (TAM) is a theory in information systems that explains how users adopt new technology. It also identifies factors influencing their decisions. TAM consists of two key dimensions: ease of use and usefulness. Usefulness refers to how a user's work becomes more effective, while ease of use focuses on how effortless the user believes the technology will make their tasks (Davis et al., 1989). UTAUT theory will serve as the foundational framework in this study. This model is a well-established and reliable tool for predicting technology usage, having been widely applied across various contexts. According to Handoko (2019), factors such as performance expectancy, effort expectancy, quality of service, and personal innovativeness significantly influence behavioural intentions in online learning. By integrating multiple technology adoption theories, UTAUT has become a frequently used and dependable model (Tamilmani et al., 2021). In this study, OFD Apps are categorised under part of technology, and this model has been found to account for up to 70% of the variation in people's intention to use technology and around 50% of the variation in actual technology usage (Karulkar et al., 2021). Thus, UTAUT is suitable to be applied as the model of theory in this study.

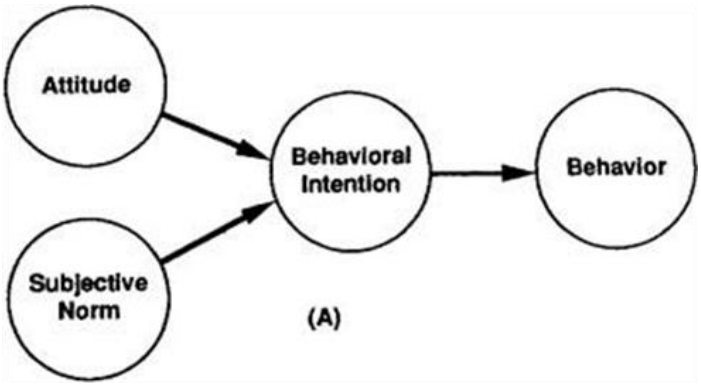

Figure 1. *Path model of Theory of Reasoned Action (TRA).*
Source: Madden et al. (1992)

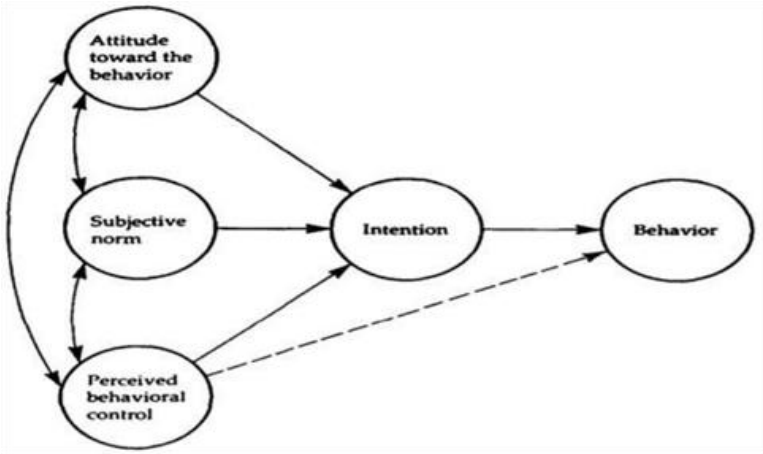

Figure 2. *Path model of Theory of Planned Behaviour (TPB).*
Source: Mathieson (1991)

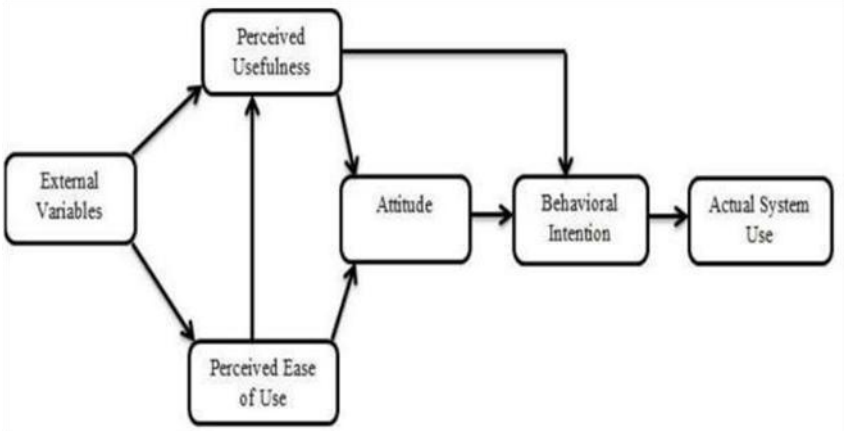

Figure 3. *Path model of Technology Acceptance Model (TAM).*
Source: Davis et al. (1989)

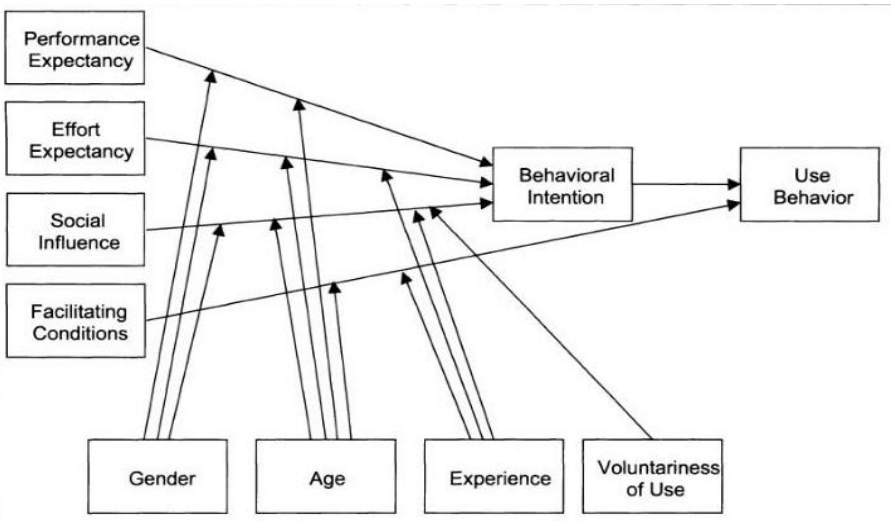

Figure 4. *Path model of Unified Theory of Acceptance and Use of Technology (UTAUT). Source: Venkatesh et al. (2003)*

Some research efforts focus on understanding why users adopt or reject technology, with the Unified Theory of Acceptance and Use of Technology (UTAUT) being one of the key frameworks used to explore technology acceptance and the intention behind its use. The primary aim of UTAUT is to model the process of assessing its effectiveness in explaining the use of information technologies (IT) in higher education contexts. The findings indicate that performance expectancy and behavioural intention are the most consistent predictors of technology use and acceptance within the UTAUT framework. The core variables in this model includig performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). All of the variables have been consistently significant in various studies, proving the reliability of UTAUT. Lee et al. (2019) noted that these four factors directly impact behavioural intention and usage. Therefore, this paper proposed the following research conceptual framework as in *Figure 5*.

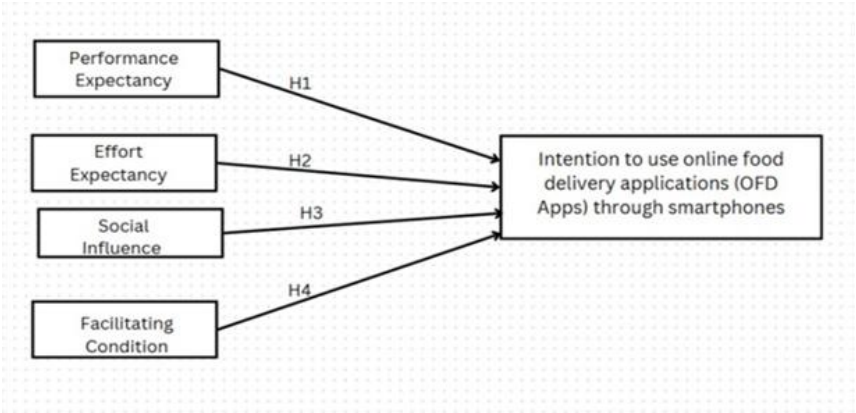

Figure 5. *Proposed Conceptual framework of this study.*

Research framework operational definitions

The OFD Apps platform is designed to enhance business opportunities and streamline food ordering and delivery services by reducing labor costs and offering an

online menu. Leveraging artificial intelligence (AI) technologies, including image recognition and recommendation engines, the app ensures a user-friendly experience (Trupthi et al., 2019). Through websites and mobile apps, customers can conveniently place food orders, a service facilitated by platforms such as Zomato, Foodpanda, and Swiggy (Rahman et al., 2022). Acting as intermediaries between customers and restaurants, these platforms generate revenue through commissions, helping restaurants reduce operational costs and attract customers (Rapariya, 2023). With continued advancements in food technology, these apps are significantly transforming the food industry. The role and identity of university students is a complex idea, as shown in various studies. Shugurova et al. (2022) talk about student-run universities, focusing on independence and a passion for learning, which challenges the usual way of teaching. Ikuta et al. (2021) discuss how college students, as unpaid volunteers, use advanced technology to improve teaching. Wong and Chiu (2019) explore the idea of the "perfect" student, highlighting the importance of clear expectations to help communication between students and teachers. Private university students are also often seen as more committed to sustainability, with better attitudes and behaviors in this area (Wang et al., 2020). These points show that the role and identity of university students is always changing.

The concept of intention to use is complex and influenced by individual creativity and computer self-efficacy (Thompson et al., 2006). In the context of assistance systems, where intentions can be inferred from observed behaviors or past experiences, this concept is particularlyimportant. Sheeran et al. (2005) define intentions as voluntary actions or goals that individuals aim to accomplish. These intentions are typically measured through statements like "I intend to do or achieve this." Once decisions are made, intentions reflect the outcome of behavioral discussions, capturing an individual's commitment, performance standards, and the effort and time they plan to invest in action. Smartphones, with their operating systems, processors, memory, and advanced cameras, are similar to laptops but more affordable and user-friendly. Their rise in popularity is driven by app development and continuous tech improvements. Smartphones enable features like real-time information sharing and detection capabilities through built-in cameras (Hernández and Marty, 2017). They function as personal computers, phones, cameras, and more (Thavalengal and Corcoran, 2016). Linked to online food delivery apps, smartphones serve as the primary interface, with their ease of use and quick access driving widespread adoption (Suk et al., 2020).

Performance Expectancy (PE)

Performance expectancy refers to the benefits and services, such as time and effort savings, efficiency, accessibility, customization, and ease, that can be gained from using a modern channel (Venkatesh et al., 2003). Dickhäuser et al. (2011) describe performance expectancy as the belief that an individual is capable of completing a specific task. Studies have shown that performance expectancy plays a significant role in influencing behavior and outcomes. Higher levels of certainty in expectations are linked to better performance and greater consistency (Schindler et al., 2015). According to Park et al. (2022), performance expectancy is one of the factors with a positive impact. For example, performance expectancy in mobile applications has been found to positively affect technology adoption. Furthermore, it has been shown to positively influence the acceptance of artificial intelligence-powered services and remote mobile payment systems. By enhancing efficiency and effectiveness in work processes, users'

willingness to adopt technology can be improved. Additionally, performance expectancy has been shown to significantly affect the intention to use technology (Salloum et al., 2018). Therefore:

Hypothesis 1 (H1): Performance expectancy is positively related UPM students' intention to use OFD apps through smartphones

Effort Expectancy (EE)

Effort expectancy, a key concept in expectancy theory, refers to the belief that a certain amount of effort will result in a specific level of performance. It is possible to predict an individual's behavior by assessing how much their actions contribute to achieving desired outcomes. Okumus et al. (2018) discovered that effort expectancy influenced users' intentions to use mobile applications. These factors can vary depending on the context and affect a person's motivation and effort to achieve their goals. Additionally, the relationship between effort expectancy and consumer attitude in mobile banking is well-established, with perceived ease of use of mobile banking services positively influencing consumers' attitudes towards them (Shaikh et al., 2018). However, Yapp and Kataraian (2022) found that effort expectancy does not have a positive effect on users' intentions to continue using mobile food delivery apps. Therefore:

Hypothesis 2 (H2): Effort expectancy is positively related to UPM students' intention to use OFD apps through smartphones

Social Influence (SI)

Social influence, as defined by Ewell et al. (2014), is the process by which individuals change their attitudes, beliefs, or behaviors in response to external pressures. This influence can occur through various channels, including online interactions, and can either align or cause differences in opinions within a group. People tend to behave in predictable and socially accepted ways toward one another. Chen et al. (2018) found a significant relationship in which social influence positively impacts attitudes. A key aspect of social interactions is the desire to be accepted within a group, with individuals often adjusting their thoughts and actions to maintain their inclusion (Wesselmann et al., 2017). According to Doan (2020), social influence was the primary factor affecting Vietnamese people's willingness to shop online. Wei et al. (2021) also found that social influence positively impacts the younger generation's intention to use mobile payment systems. Therefore:

Hypothesis (H3): Social influence is positively related to UPM students' intention to use OFD apps through smartphones

Facilitating Condition (FC)

Facilitating conditions refer to an individual's belief that adequate technical support is available for using a system (Venkatesh et al., 2003). This includes the perception that users will have access to assistance, guidance, and resources when learning how to use a technology. When users feel that the supporting conditions are adequate, their intention to adopt a new service increases (Lee et al., 2019). Zhang et al. (2023)

highlighted that facilitating conditions include factors such as the availability of support for using the system and access to necessary resources. According to Park et al. (2022), human behavior is influenced by habits, behavioral intentions, and facilitating conditions. These conditions are social factors that represent external requirements beyond an individual's control. Peñarroja et al. (2019) confirmed that facilitating conditions positively impact technology-assisted knowledge-sharing behaviors in today's world. Therefore:

Hypothesis (H4): Facilitating condition is positively related to UPM students' intention to use OFD apps through smartphones

Materials and Methods

This study adopted a quantitative research approach to investigate the factors influencing university students' intention to use Online Food Delivery (OFD) Applications, guided by the Unified Theory of Acceptance and Use of Technology (UTAUT). The methodology was designed to objectively measure the relationship between key UTAUT constructs: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC); and students' behavioral intention toward OFD app usage. The quantitative approach enabled the collection of measurable data through structured instruments, allowing for rigorous statistical analysis. This methodological framework ensured alignment with the research objectives, aiming to provide empirical insights into the technology adoption behavior of tech-savvy university consumers in the context of food delivery services. This section outlines the research design, target population, sampling techniques, instrumentation, data collection procedures, and analytical strategies employed to validate the proposed model and test the research hypotheses.

Research design

In this study, the relationship between dependent variables (intention to use OFD Apps through smartphones) and independent variables (PE, EE, SI, FC) will be investigated. Quantitative research which refers to a non-experimental design will be conducted to investigate the relationship between dependent and independent variables. According to Ahmad et al. (2019), utilizing the techniques of the natural sciences to generate specific information and numerical data is known as quantitative research. The aim is to apply statistical, computational, and mathematical methods to identify a cause-and-effect relationship between two variables. This type of research, known as empirical research, is valued for its accuracy and reliability in measurement. The data collected can be organized, ranked, or measured using different units of measurement. Quantitative research helps in creating graphs and tables from raw data, which makes it easier to analyze the results. This study aims to measure factors such as PE, EE, SI and FC which can be quantified and analyzed statistically. This approach allows for data collection from a large sample of UPM students, ensuring generalizability. Additionally, the non-experimental design suits this study as it examines existing relationships without manipulating variables. Overall, this approach is efficient for gathering data, analyzing trends, and predicting how various factors influence UPM students' intention to use OFD Apps.

Population and sampling

Sampling is a crucial process in research that involves selecting individuals from a larger population to gather relevant data. The choice of sample influences the validity and generalizability of the study's findings. According to Hooi et al. (2021), the sampling process includes identifying the target population, selecting an appropriate sampling frame, determining the sampling method, and calculating the required sample size. For this study, the target population comprises undergraduate students at Universiti Putra Malaysia (UPM), based on the rationale that youth, defined by Najmie et al. (2024) as individuals who are tech-savvy, adopt new technologies early, and actively use mobile services, represent a significant portion of Online Food Delivery (OFD) App users. Supporting this, approximately 19.8% of Malaysian OFD App users are aged 18 to 24. According to the 2024/2025 UPM academic calendar, the university hosts 11,981 undergraduate students, 795 Foundation students, and 9,321 postgraduate students. Due to accessibility constraints and the use of convenience sampling, only 10% (93 students) of the postgraduate population were included. The total population for this study was estimated at 12,869 students. Based on Krejcie and Morgan (1970) sampling table for populations of up to 15,000 and confirmed using Raosoft sample size calculator, a sample of 375 students was determined to be sufficient.

Research instrument

Data for this study were collected using a structured questionnaire as the primary research instrument. The questionnaire was distributed via Google Forms to ensure convenience and accessibility, allowing respondents to complete it using their electronic devices. This approach also contributed to environmental sustainability by minimizing paper usage. The questionnaire consisted of three main sections: (1) demographic information, (2) determinants influencing students' intentions, and (3) students' intention to use online food delivery (OFD) applications. The development of the questionnaire was guided by validated instruments from previous studies, including those by Jusoh and Mahalingam (2023), Naruetharadhol et al. (2023), Allah Pitchay et al. (2022), Hooi et al. (2021), Bae et al. (2020), and Lee et al. (2019). Section A focused on four key determinants influencing UPM students' intention to use OFD apps: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC). This section included: PE=5 items; EE=4 items; SI=5 items; FC=3 items. In total, Section A comprised 17 items. Section B examined students' intention to use OFD applications via smartphones. The items in this section were adapted from recent studies and measured using a five-point Likert scale, ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"), to gauge respondents' levels of agreement. Section C captured demographic information through closed-ended questions. It covered variables such as gender, age, ethnicity, faculty, current level of study, frequency of OFD app usage, the number of OFD apps installed on mobile devices, and the primary reason for using these apps. While the structure of the questions remained consistent with those in previous studies, some response options were modified. For instance, the age range was revised from 19–27 years to two categories: 19–24 years and 25 years or above, to better reflect the study population.

Pilot test

A pilot test which refers to a small-scale experimental method will be conducted before the process of obtaining respondents for this study to reduce the possibility of inaccuracy and propose a new conceptual model. To obtain reliable data and information, any issues can still be fixed before the questionnaire is formally sent to the eligible respondents (Hooi et al., 2021). According to Hertzog (2008), the sample size for carrying out a pilot test should be overall 10% of the sample size of the actual research. Thus, a sample size consisting of 38 respondents is identified. Students from public universities in Malaysia instead of UPM will be selected to participate in a pilot test of this study. Data collected during the pilot test will be measured and analysed using SPSS to identify the reliability. Cronbach's Alpha is within an acceptable range with a value of 0.6. A variable can be considered unacceptable or not desired if its value is less than 0.6 (Taber, 2017).

Results and Discussion

Overview of analytical approach

This section presents the findings derived from descriptive analysis, Pearson correlation, and multiple linear regression (MLR) to investigate the factors influencing Universiti Putra Malaysia (UPM) students' intention to use Online Food Delivery (OFD) applications via smartphones. The determinants examined are based on the Unified Theory of Acceptance and Use of Technology (UTAUT), including Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC).

Descriptive profile of respondents

A total of 375 valid responses were obtained. The demographic breakdown showed that 59.7% of respondents were female, and the majority (69.9%) were aged between 21 and 24. Ethnically, Chinese students constituted 49.9%, followed by Malays (41.1%) and Indians (6.7%). The highest proportion of respondents came from the Faculty of Economics and Management (25.6%), with most participants being undergraduate degree students (81.1%). The descriptive statistics suggest a diverse student representation and widespread OFD app usage, primarily among degree-level students from business and food-related faculties. *Figure 6* shows the main reason for OFD usage among UPM students and most of the respondents used OFD for the purpose were for meals (47.5%), followed by easier and quicker to have foods (33.1%) and getting delicious and tasty foods (10.1%) due to the reason of there are variety of restaurants options available at OFD Apps and UPM students with transportation issue are able to place an order for food with just a click at the Apps which is more convenience. Furthermore, 4.8% of UPM students used OFD Apps due to bad weather, 2.4% were due to other reasons instead of the 5 main reasons stated and only 2.1% used OFD Apps because of cheaper than home-cooking. This can be explained due to OFD Apps consisting of delivery fees thus overall expenses for using OFD Apps to get meals will be relatively higher and this may cause a burden to UPM students who lack personal income.

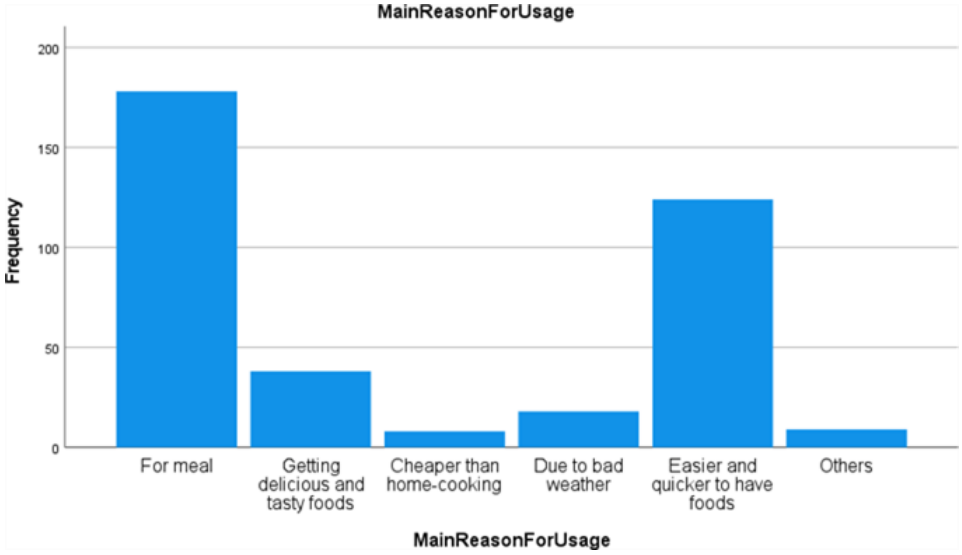

Figure 6. *Descriptive analysis on main reason for usage of respondents (N=375).*

Reliability of constructs

For the reliability test, a total of 38 respondents obtained from the public university of Malaysia instead of UPM including students from University Malaysia Kelantan (UMK), University Utara Malaysia (UUM), University Tun Hussein Onn Malaysia (UTHM), University Kebangsaan Malaysia (UKM), University of Malaya (UM), University Teknologi Malaysia (UTM), University Malaysia Sarawak (UNIMAS), University Sains Malaysia (USM) and University Teknologi Mara (UiTM). The pilot test based from various public universities indicated strong internal consistency across all constructs. *Table 1* shows that the Cronbach's Alpha values exceeded the minimum acceptable threshold of 0.70: PE (0.897), EE (0.868), SI (0.868), FC (0.741), and Intention (0.876), confirming the reliability of the measurement scales. Overall, Cronbach's Alpha of four determinants (PE, EE, SI and FC) and intention to use OFD Apps are above 0.6. Hence, the instruments developed in this study are validated and appropriate to be distributed for data collection for actual research purposes.

Table 1*. Reliability test for pilot test.*

Construct	Cronbach's Alpha	Number of Items	N
Performance Expectancy	0.897	5	38
Effort Expectancy	0.868	4	38
Social Influence	0.868	5	38
Facilitating Condition	0.741	3	38
Intention to use OFD Apps	0.876	4	38

Correlation analysis

The statistical metric known as the Pearson correlation coefficient, or r-value, measures the magnitude and direction of the linear link between two continuous variables. This correlation coefficient, which was created by Karl Pearson, is among the most used in statistics. For the purposes of hypotheses testing and predictive modelling, it can show how changes in one variable may be related to changes in another (Kenton, 2022). Therefore, this study adopted the analysis to determine the relationships between independent variables such as Performance Expectancy (PE), Effort Expectancy (EE),

Social Influence (SI) and Facilitating Condition (FC) with the dependent variable which refers to the intention of UPM students to use OFD Apps through smartphones. The Pearson correlation analysis in *Table 2*, revealed significant and positive relationships between all four independent variables and the dependent variable, intention to use OFD apps. PE ($r=0.529$, $p<0.001$), EE ($r=0.454$, $p<0.001$), SI ($r=0.504$, $p<0.001$), and FC ($r=0.503$, $p<0.001$) were all positively correlated with the intention to use OFD apps. These results support hypotheses H1 through H4 and align with prior studies, affirming the theoretical applicability of the UTAUT model to OFD adoption among university students. The summary of the above-mentioned relationships are shown in Table 3, in which all hypotheses in this study (H1, H2, H3 and H4) were supported due to the Pearson Coefficient value (r-value) being positive and p-value less than 0.05 that shows a positive and significant relationship towards the intention of UPM students to use OFD Apps through smartphones.

***Table 2**. Pearson Correlation Coefficient for all independent variables.*

Variable	Pearson Coefficient (r-value)	Sig. (2-tailed)	N
Performance Expectancy (PE)	0.587	<0.001	375
Effort Expectancy (EE)	0.426	<0.001	375
Social Influence (SI)	0.504	<0.001	375
Facilitating Condition (FC)	0.503	<0.001	375

*Note: *Correlation significant at the level of 0.05 (2-tailed).*

The hypothesis summary in *Table 3* reflects upon the following discussion on each of the independent variables. The dominant influence of Performance Expectancy underscores students' reliance on OFD apps for efficiency, convenience, and time-saving benefits, echoing findings from Allah Pitchay et al. (2022) and Tamilmani et al. (2019). OFD platforms that emphasize fast delivery, real-time tracking, and user personalization are more likely to meet users' performance expectations. Social Influence emerged as another strong predictor, suggesting peer reviews, social media exposure, and peer recommendations significantly shape students' intention. This corroborates past studies (Surya et al., 2021; Yaseen and Qirem, 2018), highlighting the social dimension of technology adoption. Facilitating Conditions were also significant, reflecting the importance of technological readiness, app functionality, stable internet access, and smartphone availability in supporting app usage. This is consistent with Kim and Lee (2020) as well as Jewer (2018), who emphasized that technical infrastructure could enable or inhibit user adoption. Interestingly, Effort Expectancy did not significantly affect intention. This may suggest that OFD apps have reached a level of usability where perceived ease of use is no longer a major concern for tech-savvy student populations, particularly those already accustomed to mobile app environments.

***Table 3**. Result of hypotheses testing.*

Hypotheses	Result
Performance expectancy is positively related to UPM students' intention to use OFD Apps through smartphones (H1)	Supported
Effort expectancy is positively related to UPM students' intention to use OFD Apps through smartphones (H2)	Supported
Social influence is positively related to UPM students' intention to use OFD Apps through smartphones (H3)	Supported
Facilitating conditions is positively related to UPM students' intention to use OFD Apps through smartphones (H4)	Supported

Multiple linear regression analysis

The MLR analysis in *Table 4* further identified the most influential predictors of behavioral intention. The regression model was statistically significant (F=71.132, p<0.001), with an R^2 of 0.435, indicating that approximately 43.5% of the variance in behavioral intention is explained by the four predictors. Among them, PE (β=0.351, p<0.001), SI (β=0.243, p<0.001), and FC (β=0.144, p=0.008) were statistically significant predictors. In contrast, EE (β=0.080, p=0.110) was not significant, indicating that while students perceive OFD apps as easy to use, this does not substantially impact their behavioral intention.

***Table 4**. Multiple Linear Regression (MLR) result for the study.*

Category	Unstandardized coefficients	Standard coefficient		t	Sig, (p)
	B	Std. Error	Beta		
Performance Expectancy	0.489	0.071	0.351	6.909	<0.001
Effort Expectancy	0.122	0.076	0.080	1.603	0.110
Social Influence	0.331	0.063	0.243	5.267	<0.001
Facilitating Condition	0.206	0.077	0.144	2.664	0.008
F=71.132; R=0.659; R^2=0.435; Sig. F=<0.001; Adjusted R^2=0.429					

Conclusion

This study investigated the determinants influencing Universiti Putra Malaysia (UPM) students' intention to use Online Food Delivery (OFD) applications through smartphones, using the Unified Theory of Acceptance and Use of Technology (UTAUT) as the theoretical framework. The findings revealed that Performance Expectancy (PE), Social Influence (SI), and Facilitating Conditions (FC) significantly influenced students' behavioural intention, while Effort Expectancy (EE) did not have a notable effect. Among these, PE emerged as the strongest predictor, emphasizing the importance of convenience, speed, and functional benefits in technology adoption among digitally native student populations. Theoretical implications: This research enriches the body of knowledge by applying the UTAUT model in the context of online food delivery services within a Malaysian public university setting, a context previously underexplored. By confirming that PE, SI, and FC are significant predictors of behavioural intention, the study validates the relevance of UTAUT in mobile service adoption among youth. The findings also contribute to narrowing the existing population and knowledge gaps in the literature, particularly on OFD app adoption among students in Malaysia. Furthermore, the insignificance of EE in the model suggests that, for tech-savvy demographics, ease of use may no longer be a decisive factor, signalling a shift in user expectations and baseline digital literacy that warrants deeper exploration in future studies. Practical implications: The results offer actionable insights for OFD platforms, app developers, and food service businesses targeting university student markets. First, enhancing the performance features of OFD apps, such as intuitive interfaces, faster delivery times, and order tracking, can directly increase adoption rates. Second, leveraging social influence strategies, including student influencers, peer recommendations, and referral rewards, may improve market penetration. Third, maintaining reliable infrastructure such as app stability, secure transactions, and accessible customer support aligns with users' expectations of facilitating conditions. These strategies can not only enhance user satisfaction but also build long-term loyalty among student consumers. Overall, the study informs more tailored marketing, design, and operational strategies that resonate with the evolving expectations of Generation Z consumers in Malaysia's higher education ecosystem.

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Conflict of interest

The authors confirm that there is no conflict of interest involve with any parties in this research study.

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