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Dissertation presented as the partial requirement for obtaining a Master's degree in Information Management, specialization in Information Systems and Technologies Management

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WHAT EXPLAINS INDIVIDUAL PERFORMANCE OF FOOD DELIVERY APPS DURING THE COVID-19 PANDEMIC?

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RESUMO

Ao longo dos anos, e-commerce tornou-se uma ferramenta poderosa para melhorar certos negócios e indústrias em diferentes países de todo o mundo e para estreitar a sua relação com clientes. O desenvolvimento da tecnologia e a possibilidade de descarregar aplicações de qualquer tipo de serviço para o smartphone, têm potencializado essa relação. As aplicações de entrega de alimentos (FDA) estão a ganhar popularidade entre os utilizadores de smartphones e o número dos restaurantes aderentes tende a aumentar. Com o aparecimento do vírus COVID-19, a indústria alimentar e o sector da restauração tiveram de mudar drasticamente os seus negócios devido às restrições de bloqueio impostas pelo governo para reduzir a transmissão do vírus. O objetivo desta pesquisa é compreender quais os fatores que têm influência no desempenho individual dos serviços de entrega de alimentos (FDA) durante a pandemia COVID-19. Para a falta de literatura sobre este desempenho individual, este estudo propõe um modelo que integra a teoria TTF com a teoria U&G. Foi utilizado o método dos mínimos quadrados parciais (PLS) para analisar as 372 respostas dos estudantes universitários dos países da UE que já encomendam alimentos da FDA, recolhidas através de um inquérito em linha. Os resultados estatísticos e a discussão mostram que o desempenho individual é mais influenciado pela utilização desta aplicação do que a variável TTF. Por outro lado, a utilização é afetada pela pressão social, experiência de entrega, experiência do cliente, preço e facilidade de utilização. Isto significa que os hábitos e costumes dos utilizadores desempenham um papel importante quando se utiliza esta aplicação do que a funcionalidade da mesma. Os resultados deste estudo oferecem várias implicações e recomendações para futuras investigações sobre os FDA.

PALAVRAS-CHAVE

E-commerce, Serviço de Entrega de Comidas, Desempenho individual, Task-technology fit, COVID-19

ABSTRACT

Over the years, e-commerce has become a powerful tool to improve certain businesses and industries in many countries around the world and to make their relationships with customers closer. The development of technology and the ability to download applications of any type of service has enhanced this relationship. Food delivery apps (FDA) are gaining popularity among smartphone users and the number of restaurants adherents has trended upward. With the appearance of the virus COVID-19, the food industry and restaurant sector had to dramatically modify their business due to the lockdown restrictions imposed by the government to reduce transmission of the virus. The aim of this research is to understand the factors influencing individual performance in FDA during the Covid-19 pandemic. To address the lack of literature about this individual performance this study proposes a model that joins the task-technology fit (TTF) theory with uses and gratification (U&G) theory. The 372 responses from EU countries' university students who already order food from FDA was analysed using the partial least squares (PLS) method. The results show that individual performance is more influenced by the use of this application than the TTF variable, and that the use is affected by social pressure, delivery experience, customer experience, price, and ease of use. The findings of this study offer implications and recommendations for future research on FDA.

KEYWORDS

E-commerce, Food delivery apps, Individual Performance, Task-technology fit, COVID-19

INDEX

LIST OF ABBREVIATIONS AND ACRONYMS

ATM Automated Teller machine

AVE Average variance extracted

CA Cronbach 'Alpha

EU European Union

FDA Food Delivery Application

HTMT Heterotrait - Monotrait ratio of correlations

IT Information Technology

PLS Partial Least Squares

TAM Technology acceptance model

TTF Task – Technology fit

U&G Uses and Gratification

VIF Variance factor

WHO World Health Organization

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1. INTRODUCTION

The evolution of technology over the years has had a massive impact on the lifestyles of people around the world. With the introduction of the Internet and e-commerce, some companies have improved their business models, making it possible for consumers to purchase any product or service online, using only a computer, tablet, or a simple smartphone (Hadi Mohamad et al., 2020). This triggered the emergence of applications that assist people's daily tasks, such as buying online from our favourite physical shops, obtaining weather forecasts, simulating an ATM, getting a ride, or ordering food. This study will address applications that allow ordering food via Internet, such as UberEats, Zomato, Glovo, and others. The use of food delivery apps (FDA) is growing around the world in comparison with visiting restaurants amongst consumers (Ray et al., 2019; Keeble et al., 2020). According to Ali et al. (2021), consumers prefer online shopping when considering factors such as convenience, competitive pricing, customized service, greater access to information, and fast delivery.

At the end of 2019 a new infectious disease named COVID-19 was reported in Wuhan, China, and quickly spread across the world. The World Health Organization (WHO) declared COVID-19 a global pandemic and all countries had to take measures to stop the propagation of this new virus (World Health Organization, 2020). The global economic activity has been negatively affected and the actual impact remains unknown. Song et al.(2021) examined the effect of COVID-19 in the restaurant context and concluded that the restaurant industry is one of those most damaged from the impact of this virus.

In Portugal the restaurant sector is also one of the most affected sectors. The government's measures to stop the appearance of new cases of infection of the disease, the imposition of the day and night curfew for all the citizens, a general lockdown, and decrease the service hours for restaurants are some of the factors causing restaurants to lose money and customers. In order to circumvent these factors, restaurants look for alternatives to generate revenue and to deliver their food to customers. Take-away or food delivery at home are the best options to solve the problem. According to Hussey (2020), FDA such as Uber Eats and Deliveroo have launched an option named "Leave at your door service" to help customers and drivers maintain a social distance to prevent the propagation of the disease. Some restaurants have published guidelines about the hygiene and food safety for employees and committed to temporarily withdraw from the service if there has been confirmation of any case of COVID-19 amongst their employees. According to Curvelo (2020) the effect of the pandemic generated a growth of e-commerce in Portugal. This growth is between 40% and 60% compared to 2019 in some categories such as food delivery and take away.

There are several studies about FDA or the sharing economy. For instance, Lin et al. (2020) study the effect of food-delivery workers, Chai and Yat (2019) investigate behavioural intention of online food delivery, and Yeo et al. (2017) explain the consumer experiences, attitude, and behavioural intention toward online food delivery services. Some studies indicate which factors affect FDA in Bangladesh (Saad, 2020), and which factors have an impact on consumers' intentions to use FDA in Bangkok (Elango et al., (2019). These studies show the growing interest in this topic. At the same time, however, there is no earlier research on FDA individual performance. We link the individual performance to well-being. According to Sonnentag and Frese (2005), individual performance and well-being are empirically related. Accomplishing task effectiveness and efficiency can be seen as a source of individual performance, bringing feeling of mastery and pride, and the opposite may bring dissatisfaction.

In order to evaluate the impact of individual performance on FDA, this study will apply the task-technology fit (TTF) proposed by Goodhue and Thompson (1995) coupled with the uses and gratifications theory (U&G) suggested by Katz et al., (1974). The TTF theory shows the fit between the task characteristics and technology characteristics and how it influences the usage and individual performance. U&G theory identifies the reasons behind a user's choice of a certain type of technology. This theory explains how the user satisfies her/his needs by searching a specific medium to do so. Note that with the impact of the COVID-19 pandemic, the use of technology became more urgent, with one of the most emblematic examples being the food delivery at home, which proved to be particularly useful for customers (to have food without leaving home) and the sustaining of companies that had been forced to close their doors. It is important to understand the antecedents of the use, value, and outcomes of home delivery apps – something scarcely addressed in the literature.

This study brings two contributions to the literature review related to individual performance in the FDA context. First, it combines the TTF and U&G theory to determine the individual performance. Although previous studies have investigated individual performance in different areas, none of them integrated these two theories to examine this variable in the FDA context during the COVID-19 pandemic. Secondly, this study establishes a conceptual model to identify the main determinant factors that influence individual performance. This research will fill this gap in the literature and will answer the following research question: What explains the individual performance on FDA during the COVID-19 pandemic?

The structure of this paper is as follows. In the next section we review the literature on FDA and the TTF and U&G theories. Thereafter we formulate the conceptual model and hypotheses, followed by the methodology section, which highlights data collection and analysis. Finally, the results are discussed including some managerial strategies and guidance for restaurants or other food industry companies, as the COVID-19 pandemic continues to evolve.

2. LITERATURE REVIEW

2.1. FOOD DELIVERY APPS (FDA)

In the restaurant industry FDA is an emerging wave. With the development of the internet and the increased use of smartphones among the world population has benefited the usage of FDA (Kats, 2020). The process of ordering food directly from local restaurants through mobile apps has become an easy and common task amongst consumers and is becoming especially popular amongst females and those aged in their 20s and 30s according to a study made in Korea (Lee et al., 2019). FDA such as FoodPanda, FikiFoo, EatEasy, UberEats, Glovo, and others have become helpful for restaurants to provide their products to a large number of customers over a range of locations such as customers' homes and offices. The number of people who subscribe to food delivery has increased due to the offer from technology in terms of space and time (Ali et al., 2021).

There are FDA services in geographical contexts as diverse as India (Ray et al., 2019; Gera et al., 2018; Swothi S.,2020; Shaikh and Yadav, 2020), Austrália (Bissell,2020), China (Lin et al., 2020; Zhao and Bacao, 2020), the USA (Cai and Leung, 2020), Korea (Lee et al., 2019), Italy (Fancello et al.,2017), and Brazil (Pigatto et al.,2017). This prior literature has addressed a variety of issues. Ray et al. (2019) identified different intentions and reasons to use the FDA such as, customer experience, search of restaurants, listings, and ease-of-use. Bissell (2020) considered that applications are "becoming the owners of infrastructures of society". This study investigated how consumption practices in a city can be changed by digital on-demand platforms, particularly through a food delivery platform, and the impact on the lifestyles of the citizens. Shaikh and Yadav (2020) noted these change in behaviour on customer's attitudes related to online food app. Saad (2020) evaluated consumers' choices and identified direct factors such as delivery time, service quality, price and condition of food delivered, and indirect factor including number of restaurants, menu, delivery tracking service, and attitude of the delivery person. A similar study proposed by Chai and Yat (2019) indicates that the emergence of online food delivery services could be attributed to the changing of urban consumers' lifestyles. The consumers choose to use the food delivery services to obtain fast and practical meals during or after a day of work. The prevalence of food delivery services uses and sociodemographic can also be explained by the growth in the use of smartphones in the last decade (Keeble et al., 2020).

Roh and Park (2019) considered the adoption of online to offline (O2O) food delivery services and attribute a moderating role of "moral obligation" in meal preparation. Their study indicates how people's value systems influence the decision to adopt FDA. Karulkar et al. (2019) adopt the Unified Theory of Use and Acceptance of Technology (UTAUT) developed by Venkatesh et al. (2003) to explore the consumer adoption of online food delivery services. This theory has also been used to analyse the customer behaviour in mobile food ordering application (Izzati,2020). The operations in food delivery can be used in business to optimize the cost and profit margin. According to Swothi (2020), a survey that was done in the city of Trivandrum indicates that the online FDA are very popular amongst the citizens and the Uber Eats app was the most used FDA followed by Swiggy and Zomato. Lin et al. (2020) investigated how the economy has redefined the term "work" in the food delivery sector in China, and Zhao and Bacao (2020) study the continuance intention of FDA in China during the COVID-19 pandemic, using three theories: Unified Theory of Use and Acceptance of Technology (UTAUT), Expectancy confirmation model (ECM – Bhattacherjee, 2001) and Task-Technology fit model (TTF), proposed by Goodhue and Thompson (1995).

The sudden spread of the COVID-19 has impacted socioeconomics and the world population's lifestyle. With the lockdown restrictions, food management and consumption changed dramatically, leading to food waste (Principato et al., 2020). Economic and financial consequences arose due to this pandemic, especially in the restaurant industry (Song et al., 2021). In U.S. many restaurants developed economic and financial strategies to combat this crisis and to be prepared for another in the future (Brizek et al., 2021).

Zhao and Bacao (2020) indicate some factors determining the continuance intention to use food delivery services, such as performance expectancy, effort expectancy, social influence, trust, confirmation, and satisfaction of the user during and after the utilization. For India, Mehrolia et al. (2020), investigated the response of the use of food delivery services during the COVID-19 pandemic, using a Binary Logistic Regression to differentiate the customers' characteristics of who did or did not order food through food delivery services. Their study points out the growth in the use of digital payments and that some of the FDA services use their platform to raise the awareness of their customers regarding this new disease. Chang and Meyerhoefer (2020) investigate how online food shopping responds to the number of customers' orders during the COVID-19 period in Taiwan. Their study indicates that the variety of products sold on e-commerce platforms increased during the pandemic and the use of online food shopping platforms can generate a positive health externality as the individuals stay at home and thereby do not infect each other. In Pakistan, Ali et al. (2021) indicate that some factors such as optimism, innovativeness, insecurity, and discomfort motivated consumers to adopt food delivery ordering services.

The current study will demonstrate how food delivery is a good option for restaurants to adjust to the impact of COVID-19 and which determinants of FDA are important to evaluate the individual performance.

2.2. TASK TECHNOLOGY FIT (TTF) THEORY

The Task-Technology fit theory was suggested by Goodhue and Thompson (1995) as a way to measure factors such as quality, locatability, authorization, compatibility, ease of use/training, production timeliness, systems reliability, and relationships with users. Howard and Rose (2019) sought to redefine and extend this theory regarding its conceptualizations, operationalizations, oversight of "misfit", and an overemphasis on their direct effects.

The theory has been applied in different contexts such as seeking to understand the consumer acceptance of wearable devices in the healthcare sector in China. Wang et al. (2020) joined the UTAUT and TTF theories and noticed that TTF was a positive influence in consumer's behaviours when they use the Healthcare wearable devices. It has also been used in the context of the factors that influence the adoption of mBanking. Oliveira et al. (2014) investigated the influence of end-customer attitude toward initial trust and technology characteristics.

Aljukhadar et al. (2014) used the TTF in online user context to identify the technology factors that users face when performing online tasks and how important these factors are. Fancello et al. (2017) investigated the effects of explanatory-based food safety training in Italy using the TTF theory and the model of domain learning theory. Larsen et al. (2009) combined the post-acceptance model (PAM) proposed by Bhattacherjee (2001) with some aspects of TTF theory. Lin and Huang (2008) combine a social cognitive theory and the TTF to study the factors that influence the knowledge management

systems in information technology (IT), organizational tasks, and personal cognition. Ronaghi and Forouharfar(2020) applied the UTAUT model to show what technological factors could affect the intention to use IoT technology amongst farmers in the Middle East region.

2.3. USES AND GRATIFICATION (U&G) THEORY

Uses and Gratification (U&G) theory was proposed by Katz et al., (1974) to understand the reasons of a user's choice for a certain type of media. This theory was formulated in 1944, but only in the 1980s became a popular theoretical framework to understand the use and gratification behind the use of different forms of media. Katz et al. (1974) point out some basic assumptions of this theory's approach. First, the goal audience must be active and use media frequently. The audience makes choices based on their previous experience in media, and these choices are to satisfy their needs and desires.

Ho and Syu (2010) note that mobile applications achieve users' expectations and become a practical learning tool to be developed in the future, in order to understand the requirements of different users and to response to the user's demand. Smartphones are one of the most innovative technology of mobile devices and can be modified to meet individual needs (Joo and Sang, 2013). Entertainment, information, and consumers' attitudes are some factors that influence the intention to use online shopping in Malaysia (Lim and Ting, 2012). Horta et al. (2021) use this theory to understand consumers' attitudes and intentions of using the Internet as a shopping channel from a media perspective. This theory was been applied in the FDA context in India (Ray et al., 2019) and has been used with other theories such as the technology acceptance model, which is another theory used to understand the adoption of Information communication technology (Joo and Sang, 2013).

To the best of our knowledge, there is no earlier published research that includes this theory in the FDA context. The current study will fill this gap and will be used with the TTF theory to evaluate the influence of individual performance in the FDA context.

3. RESEARCH MODEL AND HYPOTHESES

Goodhue and Thompson (1995) indicate that individual performance is the result of the use and the fit between the technology and task characteristics of an IT. These two dimensions can influence the individual performance of an IT. In this study the proposed research model includes the two well-established theories: TTF from Goodhue and Thompson (1995) and U&G from Ray et al. (2019) to measure the individual performance of the FDA. Figure 1 illustrate the research model.

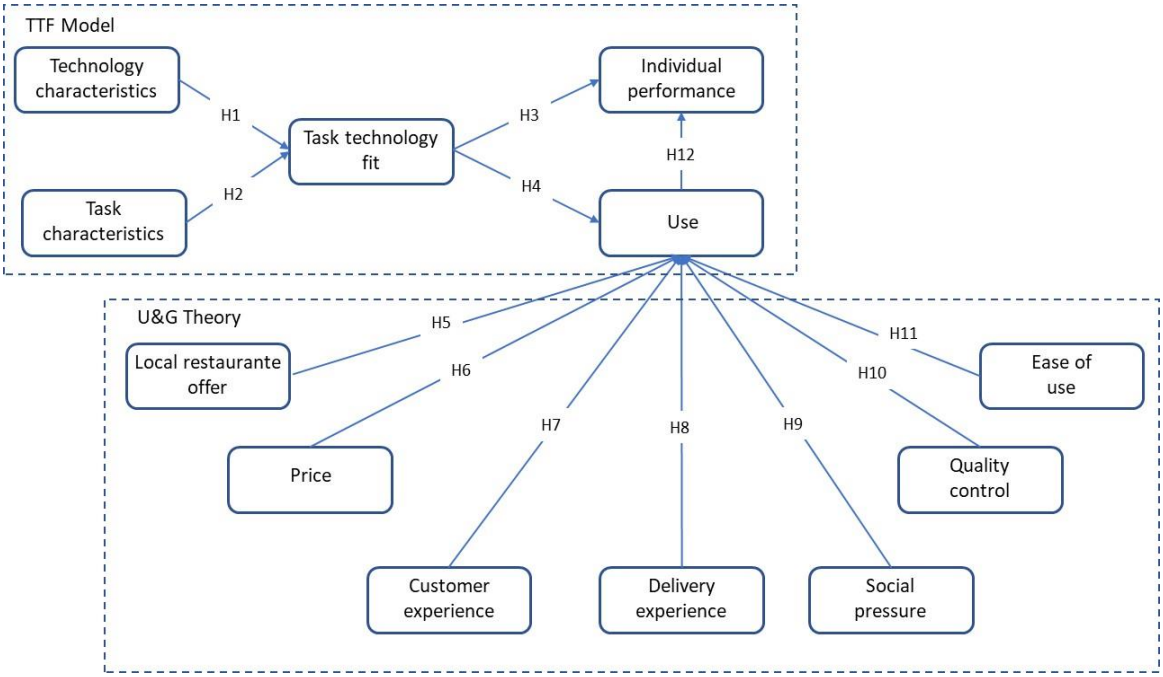

Figure 1 – Research Model

Based on TTF, the matches between tasks and technology can influence the individual performance. In the broad TTF perspective, Goodhue and Thompson (1995) define task as "*actions carried out by individuals in turning inputs into outputs*". Task characteristics can encourage an individual to use an IT. They can be classified in several dimensions, including non-routines (analyse search behaviour) and interdependence (with other organizational units). The definition of technology according to Goodhue & Thompson, (1995) is the "*tools used by individuals in carrying out their tasks*". In the context of IS, technology refers to computer systems (hardware, software, data) and to support services for the user (helplines, training, etc). In the COVID-19 pandemic context, TTF theory indicates the advantages of food delivery by which customers can order anytime of the day and at any self-isolation location. In a previous study on this theory, Zhao & Bacao (2020) conclude that TTF has a strong influence on users' technological and mental perceptions when they are using delivery food apps. In other areas, such as the medical sector, the use of wearable healthcare devices refers to the complexity and requirements for users to manage their health, and simultaneously the technology could refer to the functionality and interface designs of these devices (Wang et al., 2020). According to Aljukhadar et al. (2014), TTF not only helps to predict performance but also predicts current and future utilization. The technology characteristics of FDA make the application attractive to the user, allowing him/her to order food from the local restaurant they wish to, and the process flow is easy to understand. Thus, we propose the following hypotheses:

H1. Technology characteristics of FDA positively influence the TTF**.**

H2. Task characteristics of FDA positively influence the TTF**.**

Task technology fit is the perception of how the task and technology characteristics of an IT will influence the technology use and individual performance. If the user notices that the technology can support the tasks they need to perform, it will demonstrate a good individual performance in the result. In the COVID-19 pandemic context, TTF represents the advantages for the users who want to order food anytime at their self-isolation location.

H3. Task technology fit of FDA has a positive influence on individual performance.

H4. Task technology fit positively affects the use of FDA.

The U&G theory can be classified in four categories: social, process, content, and technology gratifications. In this study the "intention to use" variable of FDA depends of eight independent variables: local restaurant offer, price, customer experience, delivery experience, social pressure, quality control, ease of use, and user satisfaction. These eight variables can be divided into the four dimensions of the U&G theory: social (social pressure), process (price, customer experience, delivery experience, ease of use), content (local restaurant offer), and technology gratification (quality control, user satisfaction). The hypotheses for different dimension are presented below. Local restaurant offer refers to the listing of restaurants that are operational in FDA. Each restaurant has a list of the products that are on offers, and the user choose which product he/she wants to consume. This is associated with the use of this application because if the restaurant does not have the product that the customer wants to consume, there is no intention to use. FDA users appreciate when the app has many varieties of restaurants and many food options (Saad, 2020). The study proposes:

H5. Local restaurant offer is positively associated with use on FDA.

Price refers to the cost the FDA charge to the customer when ordering a product from one of the restaurants that are available in the application. The price can be the sum of the cost of the meal plus the delivery fee, which depends on the distance the customer is from the restaurant. Customer engagement mechanisms such as coupons, discounts, and advertisements are useful to bring more customers to use FDA (Ray et al., 2019). According to Saad (2020), price is a factor that should be taken into account when the user is choosing the FDA. Thus, the study proposes:

H6. Price is positively associated with use on FDA.

Customer experience refers to the experiences a user derives from a food service order. FDA offer exclusive discounts or promotions to the users of different restaurants to engage more customers in the application. We expect that the customer experience has an influence on the use of the FDA. Hence, this study proposes:

H7. Customer experience is positively associated with use on FDA.

Delivery experience refers to the user's experience related to the delivery of food when ordered via a FDA. It includes the time the meal takes to arrive to the customer, if it is the correct order, and if the meal arrives in a favourable condition. The delivery experience plays an important role in the FDA. It is the principal connection between the restaurants and the customers. According to Gera et al. (2018), delivery services have been improving over the years and many restaurants have already partnered with them. This has a considerable impact on a restaurant's revenue and food can be delivered directly to the consumer without any concern. The Delivery experience is a relevant factor in choosing the

online FDA (Saad, 2020). We expect that the delivery experience has a good influence on the use of FDA and, therefore, this study proposes:

H8. Delivery experience is positively associated with the use on FDA.

Social pressure refers to the influence the user receives from the environment. This influence may come from family, friends, colleagues, or society. In the context of FDA, this may come from social media or advertisements to promote the application. Karulkar et al. (2019) examined the relationship between social influence and behavioural intention on consumer adoption in online food delivery services, and concludes that people used those services because of the influence of the Internet (social media). Ray et al. (2019) suggest that social pressure has no association with the use of FDA, and the possible reasons can be that users order mostly individual meals or that people do not use FDA because of the recommendations from their family and friends. We suggest that social pressure has a good influence on the use of FDA and hypothesize that:

H9. Social pressure is positively associated with the use of FDA.

Quality control refers to the standards the FDA want to control. The user of FDA expected that this application indicates some indicators of the products that are offered, such as photos of the meal, reviews about the experience from other users, and ratings. This variable is important for FDA because the application must have restaurants with good ratings to attract more customers. Mehrolia et al. (2020) consider the service control of an online food delivery service in Bangladesh to be a relevant factor in choosing which food delivery company to order from. Ray et al.(2019) also indicate that if the FDA provide a quality indicator to their consumers, then it is likely that consumers will use that FDA. We expect that quality control has a good influence in this app and proposes:

H10. Quality control is positively associated with the use on FDA.

Ease of use refers to the ease of using the application when ordering food. In the context of FDA, this is related to the technology process pertaining to how a user can order a meal from the application and to how he/she wishes to make the payment. Ray et al. (2019) indicate that customers find value in the ease of use on the application's flow process, i.e. order-placement process and a feature to track order progress, amongst others. Roh and Park (2019) agree and conclude that a greater perceived ease of use leads to higher positive expectations for the outcomes of a certain technology and leads to its use. We suggest that this variable has a good influence on the use and propose:

H11. Ease of use is positively associated with the use of FDA.

The use of an application depends on the motives of the customer wanting to use the application. It is influenced by the eight variables mentioned above. In the context of COVID-19 pandemic, this variable is the most important. With the population in self-isolation and the restaurants and supermarkets closed, the users of FDA may order more meals than ever. In TTF theory this dimension is also the match between the TTF and the use, resulting in individual performance of an IT. We propose:

H12. The use of FDA influences individual performance.

4. METHODS

4.1. MEASUREMENT INSTRUMENTS

In order to measure the individual performance (IP) of FDA during COVID-19 pandemic, an online questionnaire survey was conducted through a survey website to collect data to validate the research model and examine the hypotheses. The questionnaire has two parts. The first comprised the items indicated in the research model, including the variables of the TTF model (Goodhue & Thompson, 1995), technology characteristics (TEC), task characteristics (TAC), use (U), and the variables constructed from based on the literature review, local restaurant offer (LRO), price (P), customer experience (CE), delivery experience (DE), social pressure (SP), quality control (QC), and ease of use (EU). The scale items and their references are listed in Appendix A. All the indicators corresponding to the constructs in the survey were measured on a seven-point scale ranging from strongly disagree (1) to strongly agree (7).

The second part concentrated on the demographic information of the participants using close-ended questions pertaining to information such as age, gender, education, and occupation. Respondents were also asked how many people live in the current household, their knowledge of FDA names available in the market, and how often they used FDA during the COVID-19 pandemic. The survey was developed in English, based on the literature (Appendix A), and translated into Portuguese, and then back into English by a different translator to ensure translation consistency (Brislin, 1970).

4.2. DATA COLLECTION

Data were collected using a personal hyperlink between May 2021 and June 2021 that could be used only once, to prevent repeated responses. This link was sent to university students of the European Union (EU) who already order food from FDA.

To test the research model for this study, a pilot survey was conducted among a group of 30 persons who used FDA during the COVID-19 pandemic. These responses were not included in the final survey. The results of the pilot survey showed that the scales were reliable and valid, with the exception of five items, P1, DE4, DE5, SP1, and SP3, which had loadings lower than 0.7. However, these items were not excluded from the main survey because they are important to measure the FDA context.

A total of 372 responses were gathered for this study but only 313 were valid (84%); 59 were removed (16%). As shown in Table 1, of the 313 valid responses, 70% are woman and more than half of the respondents are between 21 and 25 years old (56%). The major occupation of the participants of this survey is student (72%) and 55% of participants' level of education is bachelor's degree. The number of people currently living with the participant is mostly two persons (35%).

Table 1 – Sample characteristics (N=313)

Distribution (n=313)					
Gender			**Education**		
Male	95	30%	Less than High School degree	3	1%
Female	218	70%	High School degree or equivalent	34	11%
			Bachelor's degree	172	55%
			Postgraduate degree	14	4%
			Master's degree	81	26%
			Doctorate degree or higher	9	3%
Age					
<=20	18	6%			
21-25	175	56%	**Occupation**		
26-30	61	19%	Full time employee	56	18%
31-35	24	8%	Part time employee	12	4%
>35	35	11%	Self-employed	8	3%
			Student	224	72%
			Other	4	1%
			Unemployed	6	2%
Household People			Retired	3	1%
1	48	15%			
2	109	35%	**FDA using frequency during COVID-19 pandemic**		
3	55	18%	Everyday	5	2%
4	56	18%	1-3 times a week	74	24%
5	29	9%	3-5 times a month	108	35%
6	6	2%	Occasionally use	123	39%
>6	10	3%	Other	3	1%

5. RESULTS

For the analyses of the results of the main survey, we used the partial least square (PLS) method using SmartPLS 3.2.7 software (Ringle, Christian M., Wende, Sven, & Becker, 2015).

5.1. MEASUREMENT MODEL

For the results of the measurement model, we analyse internal consistency, convergent validity, and discriminant validity.

To assess internal consistency of the research model, we use the Cronbach's Alpha (CA) test for all the constructs of this study. This test was used to ensure that the measurements of the survey questions have internal consistency. The results in Appendix B demonstrate that the majority of CA values are above 0.7, which assures that all constructs fulfil requirements for reliable and internal consistency, except for the technology characteristics and price constructs, which are greater than 0.65 and therefore considered acceptable in exploratory research (Hair Jr., J. F., Hult, G. T. M., Ringle, C., & Sarstedt, 2016).

The average variance extracted (AVE) of each construct should be 0.5 or higher so that the latent variable explains more than half of the variance observed in indicators. In Appendix B we can see that all twelve constructs have an AVE higher than 0.5, meeting the convergent validity criterion.

To test the discriminant validity of the constructs, we used the Fornell-Larcker criterion and cross-loadings (Fornell,1981). The first criterion requires the square root of AVE for each construct to be greater than the correlations between constructs. In the second criterion, the loading of each indicator should be greater than all cross-loadings (Chin,1998). Appendix B demonstrates that the square roots of AVEs (diagonal elements in the table) are higher than the correlation between each pair of constructs (off-diagonal elements). As shown in Appendix C, all construct indicators have a loading greater than cross-loading. Having a low loading, P3 was excluded based on this criterion. We also used another criterion to assess discriminant validity, the Heterotrait-monotrait ratio of correlations (HTMT). Appendix D demonstrates that HTMT values are less than 0.9, thereby indicating no lack of discriminant validity in any construct.

The assessment of internal consistency, convergent validity, and discriminant validity of the constructs are satisfactory, and the constructs can thus be used to test the conceptual model for this study.

5.2. STRUCTURAL MODEL

The measurement model was thus assessed and established. We then assessed the structural relationship. To estimate the structural model, we examined the explained variance (R^2) and the level of significance of the path coefficients. Figure 2 shows the model path coefficients for the model with bootstrapping based on 5,000 samples and path significances, with a variance factor (VIF) lower than 5. The R^2 of the dependent variables are 53.5%, 58.6%, and 43% for task technology fit, individual performance and use, respectively.

In the full sample, 53.5% of the variation of TTF is explained by technology characteristics ($\hat{\beta}$=0.553, p<0.01) and task characteristics ($\hat{\beta}$=0.304, p<0.01). Therefore, hypotheses H1 and H2 are supported.

Individual Performance is explained through TTF ($\hat{\beta}$=0.242, p<0.01) and use ($\hat{\beta}$=0.614, p<0.01), which is statistically significant and explains 58.6% of the variation in this variable. Hypotheses H3 and H12 are supported.

Finally, 43.0% of the variation in use is influenced positively by price ($\hat{\beta}$=-0.119, p<0.05), customer experience ($\hat{\beta}$=0.320, p<0.01), delivery experience ($\hat{\beta}$ =0.125, p<0.10), social pressure ($\hat{\beta}$=0.102, p<0.10), and ease of use ($\hat{\beta}$ =0.225, p<0.05). This provides support for the hypotheses H6, H7, H8, H9, and H11. However, the variables TTF, local restaurant offer, and quality control are not statistically significant in explaining the use. Therefore, the hypotheses, H4, H5, and H10 are not supported.

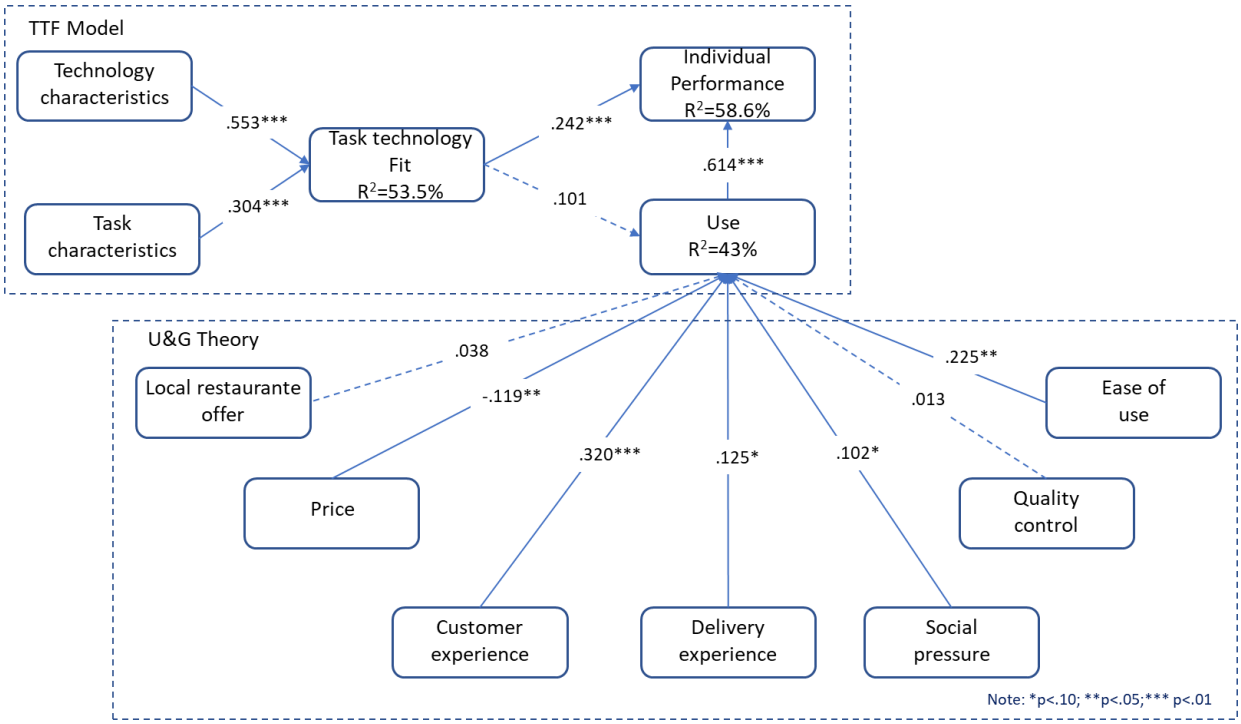

Figure 2 - Structural model results

6. DISCUSSION

6.1. THEORETICAL IMPLICATIONS

This study identifies which factors influence individual performance in the FDA context. TTF theory has been applied to explain individual performance of technology usage. However, in previous literature related to FDA it has never been integrated with the U&G theory. This study used U&G theory to identify and understand the factors behind the use of FDA. Of the twelve hypotheses tested in this study, nine were statistically supported. The findings of this study regarding the hypotheses are summarized in Table 2. These findings provide some interesting theoretical insights into the individual performance on FDA.

The results for technology characteristics (TEC) and task characteristics (TAC) were significant determinants of TTF theory, supporting previous studies (Oliveira et al., 2014; Wang et al., 2020; Zhao & Bacao, 2020). This can be explained by the participants of this study not being fully aware of all FDA tasks that can be conducted via these types of applications.

In the original model of TTF, Goodhue and Thompson (1995) highlight the importance of TTF to explain how technology leads to performance impacts. They also demonstrate that performance impact is a "*function of both task-technology fit and utilization, not utilization alone*". However, the TTF may not be determined by the utilization of the technology. The results of our study are inconsistent with prior literature (Goodhue & Thompson, 1995; Oliveira et al.,2014; Tam & Oliveira,2016a) revealing that TTF did not influence the usage of the FDA, but was statistically significant for individual performance. According to Goodhue and Thompson (1995), this may occur due to the influence of attitudes, habits, and behaviours of users when are using this type of technology or from the portfolio of tasks that the technology has available for users.

According to the conceptual model, the usage of the FDA during COVID-19 was influenced by five of the eight variables; 43.0% of variation of the usage was influenced by price, customer experience, delivery experience, social pressure, and ease of use, and customer experience was the most important factor. This study suggests that users appreciate that FDA take into consideration the users' appraisal from previous orders, suggesting new meals from new restaurants or indicate the previous order to be repeated. FDA allowing the meals or restaurants' ratings to be available for users may also be a strong influence in the use of this kind of service. The findings are in line with other studies (Ray et al., 2019).

Ease of use was the second most important determinant that affects the use of FDA. This finding is consistent with the prior literature (Ray et al. ,2019). This means that FDA users consider this type of applications' ease of use and they value some of the features of this application such as order progress, filter options (e.g., type of cuisine, promotions), and the possibility to track the order's progress from the moment the order leaves the restaurant until it reaches the place where the user is located.

Delivery experience also has an influence in the use of FDA. This finding contradicts those of previous studies (Ray et al., 2019; Saad, 2020; Agarwal & Sahu, 2021). It may suggest that FDA users consider free delivery, estimated time of delivery, the possibility to order food anytime of the day, and to track the courier in real time to be important factors when they are ordering food, allowing the users to appreciate their favourite meals of their favourite restaurants without leaving their houses, especially during the COVID-19 pandemic.

The other factor influencing the usage on FDA's during COVID-19 is social pressure. This study's findings suggest that family and friends have a strong influence on the user's habits and attitudes when choosing a restaurant or food on FDA. This also suggests that food choice is mostly made in group and, therefore, social pressure is associated with the use of FDA. However, this result is not in line with previous literature (Ray et al., 2019;Agarwal & Sahu, 2021).

Price has a negative impact on the use of FDA. Customer engagement mechanisms such as promotions, coupons, and advertisements, may be useful to emphasize the use of FDA, but some prices on these applications can be more expensive than the prices in the restaurants themselves. Therefore, the user doubts if is useful to order food from FDA or not. This issue warrants further investigation. The findings in this study are inconsistent with prior literature (Ray et al., 2019; Saad, 2020; Agarwal & Sahu, 2021).

Neither local restaurant offer nor quality control were statistically significant for the use of FDA. Local restaurant offer was not a statistically significant influence because this kind of application provides information on restaurants in the area where the user is located and allows the user to search by menu, which can lead to problems finding the intended restaurant. This result is consistent with the prior literature (Ray et al.2019; Agarwal & Sahu, 2021). Quality control was also not statistically significant. This study suggests that quality control in the form of photos, reviews, and ratings are not mainly directed to the usage of FDA, but to the selection process. This finding is consistent with the prior literature (Ray et al. 2019), however, Saad (2020) concludes that service quality is a relevant factor when the user is choosing an online food delivery company in Bangladesh.

According to the path analysis, the variation of 58.6% of individual performance was influenced by the TTF and the usage, with this last one being the most crucial indicator. This shows that FDA users are using this type of service not because of technology and task characteristics that are associated with this online service, but because of the factors that satisfy their needs and desires when they order food.

Table 2 – Results of hypothesis testing

Hypotheses	Path	β	t-value	Result
H1	TEC ->TTF	0.553	8.216***	Supported
H2	TAC -> TTF	0.304	4.710***	Supported
H3	TTF -> IP	0.242	5.050***	Supported
H4	TTF -> U	0.101	1.354^{NS}	Not supported
H5	LRO -> U	0.038	0.567^{NS}	Not supported
H6	P -> U	-0.119	1.971**	Supported
H7	CE -> U	0.320	5.429***	Supported
H8	DE -> U	0.125	1.651*	Supported
H9	SP -> U	0.102	1.789*	Supported
H10	QC -> U	0.013	0.221^{NS}	Not supported
H11	EU -> U	0.225	2.558**	Supported
H12	U -> IP	0.614	13.649***	Supported

Note: *p < 0.1; **p < 0.05; ***p < 0.01; NS. Statistically not significant

6.2. MANAGERIAL IMPLICATIONS

This study provides managerial implications for financial enterprises to measure the individual performance of FDA during the COVID-19 pandemic. Our research enhances the existing knowledge and factors that influence the usage on FDA, and therefore the individual performance. The results indicate that individual performance is explained by the matching between TTF and usage, but the

usage of FDA is not influenced by TTF. This demonstrates that users occasionally don't use FDA because of tasks and technology features, but to satisfy their desires and to delight their family or friends. It is very important that companies and food industry establishments take this into consideration when they develop and decide upon their marketing strategy to attract new users to these kinds of platforms.

The findings of this study are also important for restaurant owners and service providers, who should know that price, customer experience, delivery experience, and social pressure are the main factors for success in the individual performance of FDA, with social pressure being the most determinant. This means that a customer experience should be trustworthy when the FDA user experiences some problem with the app, receiving prompt response and a memorable service.

Before and during the COVID-19 pandemic FDA users show an interest in using this kind of application through social media platforms such as Facebook, Instagram, Twitter, and others (González-Padilla, Daniel A. & Tortolero-Blanco, 2020). This means that FDA should focus on promotional campaigns or marketing advertising via social media to convince people to use this type of application and to be aware of FDA brands available in the market. Consequently, they should focus on these aspects to achieve a good outcome from FDA and to devise strategies for customers' interaction to enhance the experience, and possibly increase the customer's intention to use FDA and obtain a good individual performance.

FDA have also become a survivor tool for restaurant owners and for the food service industry during this pandemic. These enable the customers to enjoy their food at home as well as have self-protection during the pandemic and help the food industry to build a better customer base not only in crisis situations, but also for future development (Zhao & Bacao, 2020). Therefore, availability of the information about food safety in the preparation, packaging, and logistic methods in FDA is important, not only to gain the users' trust in the app, but also to increase the intention to use the app or to intensify their use of it. During the COVID-19 pandemic FDA can also notify the user of the measures implemented in the country where the user is currently located, such as the use of mask, the social distancing, and/or the opening hours of establishments, so that the user can know until what time she/he can order food and to avoid exposure to the virus.

6.3. LIMITATIONS AND FUTURE RESEARCH

This study has several limitations that should be taken in consideration. First, the data were gathered in the EU, and the result of this study may not be generalizable to different cultures, countries, and food service industries (e.g., available restaurants and menus can differ across EU countries or regions). For future research it is recommended to collect cross-country data to explain individual performance in a specific country/region.

Second, although earlier research suggests that students represent typical consumers (Tam & Oliveira, 2016a; Zhao & Bacao, 2020), they may not fully represent the population of all potential FDA users, which might be a threat to the study's findings. To enhance generalization and external validity, future research could include non-students and other persons who work in the food industry including restaurant owners, employers, and couriers.

Third, this study was conducted during the COVID-19 pandemic. The results indicate only a short reflection of individual performance, not having the results prior to this period to predict the usage and individual performance of FDA over time. Future research can apply experimental methods to explore the research model of this study at different time periods and make comparisons. This will provide greater insight into the usage and individual performance of FDA.

7. CONCLUSION

FDA have gained attention recently, particularly because of their impact in the food industry during the COVID-19 pandemic. To the best of our knowledge, individual performance has not been previously studied in the FDA context. This study addresses this gap in the literature and contributes a model that combines the TTF and U&G theories. It also highlights which factors influence the individual performance on FDA and which strategies the companies might adopt during the COVID-19 pandemic.

This study concludes that individual performance is not determined only by task technology fit, but also influenced by the usage of FDA, with this having more impact than the other. This can signify that users often use FDA not because of the technology and task that are behind the functionality of these platforms, but to satisfy their needs and desires.

The factors that have an effect on the FDA usage are price, customer experience, delivery experience, social pressure, and ease of use, with customer experience being the dominant factor. Surprisingly, factors such as local restaurant offer and quality control do not have the impact expected.

The findings of this study are important to help the restaurant industry design strategies and innovate this kind of platform to meet the users' needs and expectations. It is important that service providers in this area be aware of this component as an important link between individual performance and the two theories, TTF and U&G.

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APPENDIX

Appendix A - Table of questionnaire questions, items and references

Dimension	Item	Reference
Technology Characteristics (TEC)	TEC1. FDA provide real time service during COVID-19 pandemic TEC2. FDA provide reliable service during COVID-19 pandemic TEC3. FDA provide a fast service during COVID-19 pandemic	Goodhue and Thompson (1995) ; Wang et al. (2020)
Task Characteristics (TAC)	TAC1. I can order anytime anywhere TAC2. I need to confirm my order before the payment TAC3. I need to have a real time control on my order	Goodhue and Thompson (1995) ; Wang et al. (2020)
Task-Technology Fit (TTF)	TTF1. The functions of FDA are enough to order and receive food during COVID-19 pandemic TTF2. The functions of FDA maintain my personal safety during COVID-19 pandemic TTF3. The functions of FDA fully meet my requirements of ordering and receiving food during COVID-19 pandemic	Goodhue and Thompson (1995); Zhao and Bacao (2020); Wang et al. (2020)
Local Restaurant Offer (LRO)	LRO1. FDA help me to search for restaurants during the COVID-19 pandemic LRO2. FDA help me to find my favourite local restaurants during the COVID-19 pandemic LRO3. FDA help me to discover nearby restaurants during the COVID-19 pandemic	Ray et al. (2019); Agarwal & Sahu (2021)
Price(P)	P1. FDA allowed me to compare food prices from different restaurants P2. FDA provide promotions and discounts for their users P3. The Prices charged in FDA are more expensive than in the participating restaurants	Ray et al. (2019); Agarwal & Sahu (2021);Lee et al.(2019)
Customer Experience (CE)	CE1. I refer the FDA to my family/friends to earn a promotion CE2. I enjoy the offers on the FDA CE3. I like the suggestions/ recommendations based on my preferences on FDA	Ray et al., (2019)
Delivery Experience (DE)	DE1. I like that the FDA provide the estimated time of my delivery DE2. I like that the FDA allow tracking the delivery person in real time DE3. I like that the FDA allow me to communicate with the delivery person DE4. I like that the FDA provide free delivery for specific orders DE5. I like that the FDA allow ordering food anytime of the day	Ray et al. (2019); Agarwal & Sahu (2021)
Social Pressure (SP)	SP1. I often see advertisements of FDA on social media SP2. I often see my friends/family order from FDA SP3. I find FDA trendy	Oliveira et al. (2014); Agarwal & Sahu (2021); Lee et al.(2019)

Quality Control (QC)	QC1. FDA provide photos, reviews and ratings of restaurant meals QC2. FAD provide photos, reviews and ratings of participating restaurants QC3. FDA provide photos, reviews and ratings of food items, which help me to finalize my order	Ray et al. (2019)
Ease of Use (EU)	EU1. FDA are easy to use EU2. The process of ordering food through FDA is easy for me EU3. The filter options (e.g., type of cuisine, promotions, estimated delivery time) are helpful to me EU4. I like the feature to track order progress (order accepted/prepared/picked up) via an FDA	Ray et al. (2019)
Use (U)	U1. If I have the opportunity, I order food through FDA U2. I intend to continue ordering food through FDA U3. I often use FDA during the COVID-19 pandemic	Ray et al. (2019); Tam and Oliveira(2019)
Individual performance (IP)	IP1. The FDA make it easier to order food during the COVID-19 pandemic IP2. The FDA are useful for my everyday tasks during the COVID-19 pandemic IP3. The FDA enable me to order food more quickly during the COVID-19 pandemic	Tam and Oliveira (2016)

Appendix B – Means, standard deviations, correlations and reliability and validity measures (CR, CA and AVE) of latent variables

Constructs	Mean	STDEV	CA	CR	1	2	3	4	5	6	7	8	9	10	11	12
(1) Technology Charact.	5.291	1.145	.697	.832	**.789**											
(2) Task Characteristics	5.317	1.206	.905	.940	.408	**.917**										
(3) Task-technology fit	5.396	1.156	.846	.907	.530	.677	**.875**									
(4) Local Restaurant Offer	5.181	1.349	.894	.934	.390	.504	.552	**.908**								
(5) Price	4.762	1.304	.669	.858	.322	.290	.343	.453	**.867**							
(6) Customer Experience	4.349	1.268	.765	.863	.349	.315	.411	.425	.550	**.824**						
(7) Delivery Experience	5.675	1.129	.884	.915	.447	.609	.662	.478	.360	.388	**.826**					
(8) Social Pressure	4.587	1.380	.723	.830	.366	.351	.441	.441	.340	.460	.325	**.789**				
(9) Quality Control	4.770	1.347	.877	.924	.343	.354	.397	.383	.370	.417	.354	.392	**.896**			
(10) Ease of Use	5.792	1.145	.903	.932	.491	.598	.711	.558	.397	.447	.757	.400	.468	**.880**		
(11) Use	5.056	1.343	.855	.912	.375	.394	.505	.411	.283	.513	.499	.406	.346	.555	**.880**	
(12) Individual Perform.	5.231	1.312	.854	.911	.411	.471	.552	.477	.331	.474	.568	.417	.369	.616	.736	**.880**

Note: Diagonal elements, which are printed in bold, are the square root of the AVE

Appendix C - PLS loadings and cross-loading

Constructs		1	2	3	4	5	6	7	8	9	10	11	12
(1) Technology Characteristics	TAC1	**.784**	.339	.448	.315	.259	.268	.344	.282	.253	.388	.309	.274
	TAC2	**.809**	.290	.420	.334	.240	.199	.345	.250	.329	.396	.261	.327
	TAC3	**.773**	.338	.381	.269	.264	.369	.372	.341	.228	.376	.321	.381
(2) Task Characteristics	TEC1	.378	**.903**	.609	.470	.250	.284	.582	.321	.284	.552	.349	.404
	TEC2	.382	**.931**	.638	.480	.295	.276	.575	.307	.337	.565	.350	.440
	TEC3	.362	**.916**	.614	.434	.249	.309	.518	.338	.351	.528	.386	.451
(3) Task-technology fit	TTF1	.481	.624	**.865**	.512	.288	.294	.635	.344	.344	.676	.420	.478
	TTF2	.457	.544	**.858**	.415	.286	.363	.520	.412	.341	.551	.457	.483
	TTF3	.451	.607	**.901**	.519	.325	.422	.581	.402	.356	.635	.448	.488
(4) Local Restaurant Offer	LRO1	.372	.512	.558	**.919**	.390	.349	.494	.427	.311	.553	.417	.479
	LRO2	.343	.394	.440	**.893**	.451	.409	.317	.369	.373	.421	.330	.369
	LRO3	.344	.453	.494	**.912**	.402	.409	.474	.400	.368	.533	.362	.440
(5) Price	P1	.253	.239	.309	.421	**.865**	.425	.271	.239	.333	.327	.243	.302
	P2	.304	.263	.285	.366	**.869**	.527	.352	.350	.309	.361	.247	.272
(6) Customer Experience	CE1	.157	.148	.163	.219	.341	**.718**	.102	.371	.278	.113	.304	.266
	CE2	.368	.333	.452	.448	.544	**.871**	.456	.413	.355	.522	.494	.485
	CE3	.299	.264	.345	.343	.445	**.873**	.328	.358	.387	.385	.439	.383
(7) Delivery Experience	DE1	.352	.597	.621	.428	.278	.268	**.814**	.262	.287	.688	.405	.487
	DE2	.365	.524	.558	.430	.323	.326	**.873**	.297	.313	.692	.447	.487
	DE3	.383	.418	.487	.346	.328	.377	**.784**	.274	.240	.505	.376	.460
	DE4	.382	.485	.517	.361	.288	.336	**.841**	.210	.328	.607	.340	.413
	DE5	.370	.485	.544	.398	.271	.305	**.816**	.286	.296	.617	.467	.489
(8) Social Pressure	SP1	.236	.245	.228	.227	.302	.287	.243	**.640**	.230	.260	.128	.220
	SP2	.282	.301	.334	.303	.287	.395	.249	**.837**	.309	.303	.325	.305
	SP3	.338	.293	.429	.455	.268	.394	.291	**.870**	.364	.372	.406	.414
(9) Quality Control	QC1	.307	.308	.375	.352	.356	.370	.307	.380	**.920**	.420	.315	.319
	QC2	.283	.335	.352	.370	.337	.354	.320	.366	**.908**	.427	.340	.363
	QC3	.342	.307	.340	.300	.299	.405	.328	.302	**.859**	.412	.268	.304
(10) Ease of Use	EU1	.454	.577	.675	.519	.319	.380	.689	.405	.457	**.919**	.531	.587
	EU2	.427	.548	.642	.506	.387	.399	.692	.349	.412	**.921**	.538	.587
	EU3	.427	.448	.567	.468	.371	.426	.539	.311	.403	**.799**	.409	.456
	EU4	.426	.525	.612	.472	.330	.382	.734	.336	.376	**.876**	.460	.524
(11) Use	U1	.306	.296	.377	.342	.216	.471	.362	.319	.320	.447	**.883**	.638
	U2	.391	.457	.563	.460	.289	.454	.584	.406	.339	.613	**.897**	.662
	U3	.287	.273	.378	.268	.237	.431	.352	.339	.249	.387	**.860**	.644
(12) Individual Performance	IP1	.375	.504	.574	.523	.322	.413	.618	.372	.336	.693	.673	**.873**
	IP2	.358	.281	.386	.309	.255	.436	.402	.362	.268	.405	.627	**.857**
	IP3	.351	.443	.483	.412	.291	.403	.464	.368	.365	.507	.640	**.909**

Appendix D - Heterotrait-Monotrait Ratio of correlations (HTMT)

Constructs	1	2	3	4	5	6	7	8	9	10	11	12
(1) Technology Characteristics												
(2) Task Characteristics	.514											
(3) Task-technology fit	.686	.773										
(4) Local Restaurant Offer	.490	.554	.628									
(5) Price	.471	.372	.455	.590								
(6) Customer Experience	.461	.362	.482	.497	.750							
(7) Delivery Experience	.573	.679	.763	.527	.468	.438						
(8) Social Pressure	.504	.431	.527	.506	.511	.601	.403					
(9) Quality Control	.441	.396	.460	.433	.482	.507	.404	.469				
(10) Ease of Use	.621	.659	.811	.616	.514	.500	.841	.479	.526			
(11) Use	.483	.442	.587	.459	.371	.619	.558	.451	.394	.620		
(12) Individual Performance	.537	.529	.644	.534	.435	.568	.644	.495	.422	.689	.860