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Article

# Continuous Intention to Use E-Wallet in the Context of the COVID-19 Pandemic: Integrating the Health Belief Model (HBM) and Technology Continuous Theory (TCT)

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**Abstract:** Personal safety has had a renewed focus throughout the COVID-19 pandemic, which has led to behavioral change. The adoption of E-wallets facilitates social distancing and thereby helps prevent the spread of the COVID-19 virus. This paper aims to investigate the potential for consumers' continued usage of an E-wallet service through an integrated framework based on two established models: the Health Belief Model (HBM) and Technology Continuous Theory (TCT). An electronic survey was distributed to a sample of 1080 individuals from academic society in three different Hungarian universities who had used an electronic wallet during the pandemic COVID-19. Structural equation modelling (SEM) was applied in the study and explained the 55.9% variance in consumers' continuous intention towards E-wallet usage. This study found that while the COVID-19 pandemic strongly influenced the current use of e-wallets; the pivotal factor affecting their continued use is based on consumer self-efficacy. The study has both short and long-term implications; in the short-term, decisionmakers should utilize health threat constructs (as an element of the protective behaviors taken during the COVID-19 pandemic) to motivate consumers to use E-wallets; in the longer-term, banks should develop further strategies that encourage consumer loyalty regarding E-wallets by reassuring customers that these financial services achieve the value and benefits that they expect, resulting in self-efficacy.

**Keywords:** e-wallet; COVID-19; technology continuous theory; health belief model; post-adoption



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## 1. Introduction

The COVID-19 pandemic affected almost every aspect of human life. People had to adopt new behaviors in their daily activities to meet the constraints of the pandemic, and such changes in human behavior may persist even after the pandemic is over. In the meantime, governments were forced to adopt non-pharmaceutical interventions to slow the spread of SARS-CoV-2 [1]. These interventions led to significant imbalances in countries' economies, and a slowing down of global economic development [2]. Fortunately, this pandemic has emerged at a time when our planet is more interconnected than ever, thanks to information and communication technologies, particularly the Internet. The digitization of banking and financial services has played an important role in implementing safety and preventive measures to minimize the spread of COVID-19 and save people's lives. In the same context, the pandemic led to a shift in consumer preferences towards digital payment methods, such as e-wallets, instead of traditional payment methods [3]. Therefore, financial institutions need to monitor the new orientations in consumer behavior and accelerate innovation in the payments sector to meet consumer demands. The e-wallet, also known as digital wallet or m-wallet, uses electronic means such as a computer or smartphone to

perform an online financial transaction [4]. The e-wallet eliminates the need for a physical wallet and allows users to store and carry their financial cards (debit card, credit card, prepaid money card, gift card, etc.) in a virtual medium. The current coronavirus pandemic has demonstrated the critical importance of digital financial services. Consumers can benefit significantly from advances in electronic wallets, financial technology services, and online banking. The World Health Organization (WHO) recommended that consumers avoid cash and contact-based payments as a potential source of infection and suggested that digital payment systems be used instead [5]. The recommendations were based on health experts' reports who confirmed that the SARS-CoV-2 virus could survive on surfaces such as cash and banknotes for two to four days [6]. Thus, e-wallets can be considered as a form of protective behavior during the pandemic. Some went further, suggesting that moving consumers to digital financial services, including electronic wallets, could help reduce the spread of the virus and its severity [7]. From this perspective, policy makers realized that efforts and decisions should be made to promote digital payments and avoid contact-based payments. For example, the Hungarian government tripled the minimum amount of mandatory pin code entry for card purchases [8].

As the pandemic continues to unfold, its influence on the behavior and expectations of consumers and businesses alike becomes more apparent. For example, as people strive to avoid face-to-face contact as much as possible, the use of e-wallets has increased. Given that it is unclear not only when the pandemic will end, but also whether previous behaviors will ever return, it is worthwhile examining which factors influence consumers' intentions to continue using electronic wallets. Meanwhile, literature relating to the pandemic COVID-19 has dominated scientific research publications. Not surprisingly, the health sciences dominate, accounting for 88.23% of publications COVID-19. However, research in technology and social sciences has also shown a significant increase [9]. Several studies have focused on understanding the factors that influence the adoption of information systems in the context of education [10], health [11], commerce [12,13], banking, [14] and others [15,16]. In studies that looked at adoption of FinTech systems during the pandemic [17,18], the health threat of COVID-19 was considered a critical factor. Al Nawayseh [17] argued that the fear that consumers developed due to the health risk of COVID-19 exceeded their fear of technology-associated risks and was the reason for the insignificant effect of technology-associated risk on FinTech adoption in Jordan. He also found that perceived usefulness had a significant effect on consumer intentions. Moreover, Aji et al. [19] confirmed that perceived COVID-19 risk had a significant effect on consumer intention to use e-wallets during the pandemic in addition to perceived usefulness and government support. As previous studies confirmed the role of self-efficacy in perceiving the utility and ease of a particular information systems [20], it is also viewed as an important predictor of health-related behaviors [21].

To our knowledge, research focusing on the continued use of electronic wallets is very limited and has not been fully explored by academics and researchers, especially during COVID-19. Puriwat and Tripopsakul [18] created an integrated model between Health Belief Model (HBM) and Expectation Confirmation Model (ECM) to explain consumers' intention to continue using contactless payment technologies during the COVID-19 pandemic in Thailand. However, although the model had good explanatory power in determining continuation intention, it did not include critical cognitive factors such as self-efficacy, perceived ease of use, and attitude that significantly affect FinTech systems adoption [22,23]. The attitudes that emerge from users' cognitive experiences can influence their behavior and decisions [24]. A study by Zhao and Bacao found that direct and indirect contact restrictions imposed by the pandemic influenced consumers' attitudes toward using contactless payment systems regarding the benefits of using this payment method during the pandemic [25]. To address this theoretical research gap, this study aims to introduce an integrated framework model based on established theories such as the Health Belief Model (HBM) and Technology Continuous Theory (TCT) to investigate consumers' continued usage behavior of electronic wallets. According to researchers, TCT has high explanatory power in interpreting post-adoption behavior [26]. Moreover, due to its solid foundation,

TCT is superior to other acceptance technology models in understanding users' behaviors at different points of time [22]. Therefore, by using this integrated model, our study can contribute to understanding users' motivational factors, attitudes, and behaviors regarding the continued use of e-wallet services. In practice, this research will be useful for e-wallet providers who want to understand consumers' motivations for using e-wallet during and after the COVID-19 pandemic. Hence, developing strategies that may help them achieve their goals of replacing physical payment systems with e-wallet systems. After a brief introduction to our work in Section 1, our study's theoretical background and conceptual model are explained in Section 2. The research methodology is described in Section 3. The results and discussion of this research are presented in Sections 4 and 5. Section 6 addresses the implications of the study. The conclusion of the study is presented in Section 7. The final section discusses the limitations and future research.

## 2. Conceptual Framework and Hypothesis Development

### 2.1. Technology Continuous Theory (TCT)

TCT was developed by Liao et al. [26] as a theory to predict and explain information system acceptance and users' continuous usage intention. TCT was developed by integrating three popular I.S. models: Technology Acceptance Model (TAM), Expectation Confirmation Model (ECM), and Cognitive Model (COG) into one integrated model [27–29]. While TAM proposed perceived usefulness and perceived ease of use as the main parameters to study the user acceptance of a technology [30], ECM relied on satisfaction as the main parameter to determine the user's continuous intention to use technology [22]. COG states that continuous behavioral intention is determined by satisfaction and attitudes [29]. According to Liao et al. [26], TCT provides a solid foundation for assessing the user's continuous intention. The theory includes six constructs from the previously mentioned models, namely: confirmation (CF), perceived usefulness (PU), perceived ease of use (PEU), satisfaction (SF), attitude (ATT), and continuous intention (CIN).

The significant contribution of TCT was the combination of satisfaction and attitude in one model, which increased the explanatory power of the dependent variable (continuous intention). In addition to the functional value of using a system, the inclusion of attitudes in the model adds meaning to the symbolic/emotional value of the user [31]. TCT represents a fundamental improvement over ECM, TAM, and COM. The model also shows superiority over the previously mentioned models due to its applicability in different life cycles (initial, short term, and long term) adoption [26]. Several researchers have used TCT to determine the continuous intention to use banking and payment systems [22,23,31]. Foroughi and Iranmanesh (2019) have confirmed the high exploratory power of TCT in explaining users' perceived usefulness of variables that influence users' continuous intentions to use m-banking [22]. Khayer and Bao [31] developed an integrated model between Context Awareness Theory and Technology Continuance Theory to investigate users' continuous intentions on the Alipay payment platform. The study found that all TCT constructs except perceived ease of use significantly influence users' continuous choice. According to Rahi and Khan [23], decision makers in the banking sector should focus on expectation confirmation, perceived usefulness, and satisfaction to ensure users' continuous intention to use e-banking services. Therefore, TCT was used in this study due to the high explanatory power that the model exhibits in determining the post-adoption phase.

### 2.2. Health Belief Model (HBM)

The HBM is a well-recognized, widely used model in health behavior studies [32]. A group of social psychologists developed the model in the early 1950s in the United States; they aimed to understand the reasons that prevent people from taking prophylactic health measures [33,34]. HBM focuses on the psychosocial characteristics that determine a particular health-related behavior [35]. The model offers insights into how people are brought up to respond to health risks and interprets their actions to control a health condition [36]. Theoretically, HBM focuses on cognitive elements. From a cognitive perspective, behaviors

are made based on rational expectations [37]. The HBM considers a perceived threat, perceived benefits, perceived barriers, self-efficacy (SE), and cues to action as determinants of willingness to act based on health circumstances. The model assumes that people who anticipate a health threat are more willing to engage in a particular health behavior [38]. Perceived health threat consists of perceived susceptibility (P-SUS) and perceived severity (P-SEV). Glanz et al. [39] argued that people are more likely to perform a particular action if they expect that such an action will reduce a severe illness.

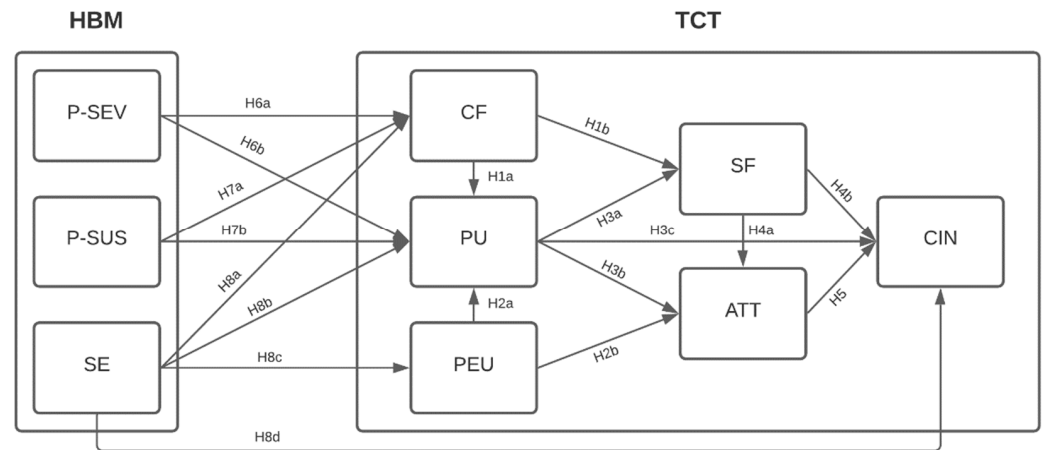
HBM has been widely used in the technology adoption literature [40–42]. However, HBM alone cannot explain behavioral adoption related to technology. Alaiad et al. [42] argued that the HBM only explains the factors that influence the use of health-related technology from a health perspective. Sari et al. [43] applied an integrated framework between the Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) and the HBM to examine the factors influencing mobile health technologies' adoption Malaysian employees. The study suggests the consideration of health-related behavioral factors in the study of mobile health technology adoption. Sreelakshmi et al. [44] developed an integrated framework between HBM and the expectation-confirmation model (ECM) to investigate the continuous intention to use mobile payment technologies during the COVID-19 pandemic. ECM assumes that actual performance/adoption is explained by confirmation. In the context of our study, mobile wallet adoption during the COVID-19 pandemic can be considered a protective health behavior. Consumers expect mobile wallets to suppress the risk of contracting the SARS-2 virus. They would be more likely to adopt a mobile wallet if their expectations were confirmed. Since the use of remote payments has become inevitable during the pandemic, the study considers the perceived threat of COVID-19 which includes perceived susceptibility and perceived severity as antecedents to confirm the expectation of mobile payment adoption. The study also considers perceived efficacy a critical factor to determine the continuous intention to adopt mobile wallets in the future as well.

### 2.3. Integrating HBM and TCT

Each of the theories related to IT system adoption can make a unique contribution to understanding technology acceptance behavior [30]. However, scholars claim that it is necessary to modify, combine, or extend different theories to understand initial and post-adoption behavior of technologies [45,46]. Al-Rahmi et al. [47] proposed an integrated TAM and Innovation Diffusion Theory (IDT) model to investigate the factors that influence the adoption of e-learning systems. Humbani and Wiese [48] developed an integrated theory framework of ECM and Technology Readiness Index (TRI) to investigate the initial and ongoing intention to use mobile payment apps. Moreover, Chiu et al. [49] argued that the integrated ECM and investment model (IM) model helps to better understand the decision-making process of fitness and health app users.

Similarly, the integrated model of TCT and Task Technology Fit (TTF) had significant explanatory power in predicting the continuance intention of internet banking users [23]. Regarding the adoption of systems for health purposes, Ahadzadeh et al. [50] argue that HBM and TAM are independently unable to explain the cognition and related factors that affect individuals' use of Internet health systems. In the context of the present study, COVID-19 is considered a threat to the overall health of consumers. To the extent that consumers become aware of the severity of COVID-19 and the possibility of becoming infected, they are more likely to make preventative health decisions. Besides, efficacy and the ability to adopt health-related behaviors are considered factors that influence the adoption of one set of protective payment behaviors and the avoidance of another. In a related context, the WHO has recommended that consumers use contactless payment methods to manage their purchasing behavior. Contact-based payment methods such as cash and banknotes could be carriers of the virus [51]. As mentioned earlier, it is still uncertain when this pandemic will end, and the HBM alone is insufficient in determining the user's continued intent to use e-wallet. This is because continued adoption is influenced by the extent of utility, satisfaction,

and attitude toward using such payment methods. Therefore, this article integrates the HBM, which focuses on preemptive behavior, with the TCT, which showed superiority over other technology acceptance models in understanding continued behavior toward a particular system to determine the user’s continued intention to use mobile wallets in the context of COVID-19. The proposed research model is shown in Figure 1.



**Figure 1.** Research proposed model. Note: P-SEV = perceived severity, P-SUS = perceived susceptibility, SE = self-efficacy, CF = confirmation, PU = perceived usefulness, PEU = perceived ease of use, SF = satisfaction, ATT = attitude, CIN = continuous intention.

## 2.4. Hypotheses Development

### 2.4.1. TCT

This study uses HBM and TCT to examine the factors influencing consumers’ intention to continue using digital wallets. Based on TCT, attitudes, satisfaction, and perceived usefulness are the most important predictors of intention to continue using. Meanwhile, confirmation and perceived ease of use are the drivers of perceived usefulness.

Confirmation is defined as the user’s belief that actual performance when using a particular IT system meets expectations [28]. Previous studies confirmed the significant effect of expectation confirmation on satisfaction and perceived usefulness [21,23,52]. Consumers are satisfied when they perceive that their expectations of using e-wallet services have been met [53]. Moreover, the user’s perceived usefulness increases as a result of the confirmation. In other words: In the initial stages of technology adoption, perceived usefulness is likely to be insignificant. However, confirmation experiences can change this perception as users learn that their initial perceptions were unrealistically low [52]. Similar to C.C. and Prathap’s [21] study and supported by Humbani and Wiese’s [48] perspective, this study considers the terms confirmation and adoption interchangeably, conceptualizing the experience after the first use of a particular service. In the context of this study, confirmation/adoption of digital wallets represents protective health behaviors during the COVID-19 pandemic. We therefore hypothesize the following:

**Hypothesize 1 (H1a).** Adoption/confirmation has a positive impact on perceived usefulness of e-wallets.

**Hypothesize 1 (H1b).** Adoption/confirmation has a positive impact on e-wallets users’ satisfaction.

Based on TAM and UTAUT, which represent the base of TCT, perceived ease of use and perceived usefulness are the primary antecedents of behavioral intention in the context of IS adoption [27]. In the context of COVID-19, Velicia-Martin et al. [54] found that TAM had high explanatory power for respondents’ intention to adopt a mobile app that indicated whether they were in contact with people infected with COVID-19. In the same study, PU and PEU were found to significantly influence participants’ attitudes and intentions. Other studies also showed similar results [10,55]. In the context of this study, PEU represents

consumers' belief that using mobile wallets requires less effort [27,56]. PEU is considered a significant predictor of consumers' attitudes regarding online shopping [57]. Previous studies also showed the positive effect of perceived ease of use on attitudes towards using mobile banking services [23,58,59]. Likewise, several studies confirmed the positive effect of perceived ease of use on perceived usefulness related to mobile application usage [60–62]. Ashraf et al. (2014) claimed that individuals believe that it is more efficient to complete their tasks if the new technology is easy to use. According to their claim, a convenient and easy system is accessed more frequently, which would affect the perceived usefulness of such a system. We therefore hypothesize the following:

**Hypothesize 2 (H2a).** *Perceived ease of use has a positive impact on consumers' perceived usefulness of e-wallets.*

**Hypothesize 2 (H2b).** *Perceived ease of use has a positive impact on consumers' attitudes towards the continued use of e-wallets.*

Perceived usefulness is the users' belief about how useful a particular information system is for performing their job [27]. Perceived usefulness is considered to be the strongest predictor in determining continuous intention behavior [63]. Venkatesh et al. [64] argue that user behavior and intention to continue using may depend on the user's belief about the perceived usefulness of a particular system. Thus, consumers may show an intention to continue using mobile wallets if they perceive them to be useful. Previous studies confirmed the positive effect of perceived usefulness on consumers' intention to continue using mobile or internet banking [22,23,53]. Following TAM and prospect theory and mental accounting, Perceived usefulness has a significant positive effect on users' attitudes [27,65]. Foroughi and Iranmanesh [22] found that consumers' attitude to continue using mobile banking was predicted by perceived usefulness and satisfaction. Several studies have also confirmed the positive relationship between perceived usefulness and user satisfaction [21,22,60]. Moreover, Rahi [53] argued that perceived usefulness and expectation confirmation are the most important drivers to increase customer satisfaction with internet banking. Therefore, based on the previous literature, we hypothesize the following:

**Hypothesize 3 (H3a).** *Perceived usefulness has a positive impact on consumers' satisfaction to continue the use of e-wallets.*

**Hypothesize 3 (H3b).** *Perceived usefulness has a positive impact on consumers' attitudes to continue the use of e-wallets.*

**Hypothesize 3 (H3c).** *Perceived usefulness has a positive impact on consumers' intention towards the continued use of e-wallets.*

Oliver [29], who developed cognitive theory, argued that an individual's behavioral intention can be conceptualized by satisfaction and attitude. Satisfaction refers to "a psychological or affective state related to and resulting from a cognitive evaluation of the discrepancy between expectancy and performance" [28]. Previous studies have confirmed that satisfaction positively influences users' attitudes [22,23]. In predicting continuous intention to use a mobile wallet, satisfaction is a phase of post-use evaluation. In other words, when consumers confirm that using mobile wallets has met their expectations, consumer satisfaction is evident. Therefore, satisfied consumers are more likely to show the intention to use such a system continuously. The ECM suggests that user satisfaction can be considered the most important parameter in determining the user's intention to continue using a particular system [22]. A study by Singh et al. [66] indicated the relationship between satisfaction and usage rate of mobile wallets, which found an increase in usage rate when consumers exhibited a significant satisfaction level. We therefore hypothesize the following:

**Hypothesize 4 (H4a).** *Satisfaction has a positive impact on consumers' attitudes towards continued use of e-wallets.*

**Hypothesize 4 (H4b).** *Satisfaction has a positive impact on consumers' intention towards the continued use of e-wallets.*

According to TCT, attitude is the main driver of users' continuous intention, along with satisfaction and perceived usefulness. Attitude defines the favorable or unfavorable feelings that an individual develops to perform a particular behavior [67]. Davis [27] found that attitude has additional explanatory power in understanding the factors influencing users' intention toward a particular system. In the context of continuous use, researchers such as Rahi et al. [53] found that attitude positively influences consumers' intention to continue using Internet banking. Foroughi and Iranmanesh [22] explained similar results when examining predictors of intention to continuously use mobile banking. Accordingly, we hypothesize the following:

**Hypothesize 5 (H5).** *Consumer's Attitudes have a positive impact on consumers' intention to continue using e-wallets.*

#### 2.4.2. HBM

Perceived threat is one of the determinants of protective behavior related to health [68]. According to Paige et al. [68], an individual's protective health behavior changes only when, in addition to perceived threat, adopting such a protective behavior reduces disease risk. Perceived threat is a combination of two basic constructs, including perceived severity and perceived susceptibility. Such a combination causes people to take protective actions [69]. Perceived severity represents beliefs about the degree of harm that will result from a negative outcome of a particular behavior [70]. Perceived susceptibility, also referred to as perceived vulnerability or perceived likelihood, is a person's belief that they may acquire an adverse health outcome due to a particular behavior [70]. Several studies have confirmed the role of perceived severity and vulnerability on intention and actual adoption of mobile health technologies [41,71,72]. Alaiad et al. [42] have argued that patients who perceive mobile health apps as useful show positive attitudes towards using such technologies once they perceive health threats. The effect of perceived health constructs on perceived usefulness of technology use in relation to health has also been confirmed in other studies [41,72].

Moreover, the study by C.C. and Prathap [21] showed a high level of perceived severity and vulnerability among Indian consumers during the Covid-19 pandemic, as well as the direct effect of these constructs on adoption/confirmation and perceived usefulness of mobile payment. The study also found that both constructs indirectly influence consumers' continuous intention through confirmation, perceived usefulness, and satisfaction. In relation to the current study, consumers are expected to adopt mobile wallets as a protective behavior to avoid the common health hazards of using cash or contact-based payments. We therefore hypothesize the following:

**Hypothesize 6 (H6a).** *The perceived severity of COVID-19 has a significant positive effect on the adoption/confirmation of e-wallets.*

**Hypothesize 6 (H6b).** *The perceived severity of COVID-19 has a significant positive effect on the perceived usefulness of e-wallets.*

**Hypothesize 7 (H7a).** *The Perceived susceptibility to COVID-19 has a significant positive impact on the adoption/confirmation of e-wallets.*

**Hypothesize 7 (H7b).** *The Perceived susceptibility to COVID-19 has a significant positive impact on the perceived usefulness of e-wallets.*

Perceived self-efficacy is an individual's belief that he or she can successfully perform a particular behavior [73]. The concept indicates the individual's internal confidence in his or her ability to accomplish a particular task. Several studies have addressed the role of self-efficacy in the future use of information technology systems [74–76]. Higgins [74] found that self-efficacy positively influences individuals' computer use. It has also been demonstrated that self-efficacy is a significant determinant in predicting health behav-



iors [41,77]. C.C. and Prathap [21] confirmed that consumer self-efficacy influenced mobile payment adoption/affirmation during COVID-19. Self-efficacy has long been associated with perceived ease of use and perceived usefulness in the context of information technology adoption. A study by Gbongli et al. [20] showed a significant association of self-efficacy with perceived ease of use and perceived usefulness concerning the use of mobile money services. They interpreted the results to mean that self-efficacy makes users aware of their ability to master such services, which increases the perceived usefulness of mobile money services. Previous studies have shown the role of self-efficacy in predicting users' intention to continue using IS. According to Foroughi and Iranmanesh [22], consumers' intention to continue using mobile banking increases as long as their self-efficacy in using this technology is high. Therefore, since continued intention depends on the willingness and ability to use such a system, we hypothesize the following (the definitions of the constructs can be found in Table 1):

**Hypothesize 8 (H8a).** *Perceived self-efficacy is positively associated with adoption/confirmation of e-wallets.*

**Hypothesize 8 (H8b).** *Perceived self-efficacy is positively associated with the perceived usefulness of e-wallets.*

**Hypothesize 8 (H8c).** *Perceived self-efficacy is positively associated with perceived ease of use of e-wallets.*

**Hypothesize 8 (H8d).** *Perceived self-efficacy is positively associated with continuous intention towards e-wallets.*

**Table 1.** Constructs' definitions.

Construct	Definition	Sources
Confirmation/adoption (CF)	The user's belief that actual performance when using a particular IT system meets expectations.	[28]
Perceived ease of use (PEU)	The user's belief that using a particular IT system requires less effort.	[27,56]
Perceived usefulness (PU)	The users' belief about how useful a particular IT system is for performing their job.	[27]
Satisfaction (SF)	A psychological or affective state related to and resulting from a cognitive evaluation of the discrepancy between expectancy and performance.	[28]
Attitude (ATT)	The favorable or unfavorable feelings that an individual develops to perform a particular behavior.	[67]
Perceived severity (P-SEV)	Beliefs about the degree of harm that will result from a negative outcome of a particular behavior.	[70]
Perceived susceptibility (P-SUS)	A person's belief that they may acquire an adverse health outcome as a result of a particular behavior.	[70]
Self-efficacy (SE)	An individual's belief that he or she is capable of successfully performing a particular behavior.	[73]
Continuous intention (CI)	An individual's intention to use or reuse a particular system continuously.	[28]

### 3. Methodology

#### 3.1. Survey Development

To test the research hypotheses, a web-based questionnaire with two parts was developed. The first part focused on the demographic data of the participants. The second part consisted of 27 items that were used to measure the model constructs. The measures were rated using a five-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree". The measures of the constructs were taken from the literature and slightly modified to fit the context of this study. Confirmation, perceived ease of use, perceived usefulness, and continuous intention were measured using three measures adopted from studies [28,78]. Measures of consumer attitude and satisfaction were adapted from stud-

ies [23,79]. Perceived severity and susceptibility were adapted from study [80]. Finally, measures of self-efficacy were adapted from study [20].

### 3.2. Data Collection

The survey was distributed to students and staff in Hungarian universities. Electronic platforms such as (email, LinkedIn, Facebook, and Instagram) were used to collect the data from the participants. The researchers conducted a pilot test with 60 participants to measure the reliability and consistency of the instrument. The results showed an acceptable level of reliability where Cronbach' alpha measure was above (0.70) for all constructs. The results also supported the consistency of the constructs as they showed no intercorrelation among the items. A total of 1080 completed questionnaires were collected from the study population. The demographic data showed that 55.9% of the respondents were male and 44.1% were female. The majority of the respondents were students (71.1%) and less than 40 years old. The level of education varied among the respondents. Those at bachelor's and master's level represent 75% of the respondents, while those at the PhD level reach about 20%. In relation to the use of e-wallet during the pandemic, almost half of the respondents stated that they use e-wallet between 6 and 10 times per month, and 18.9% of them use it more than 10 times per month.

### 3.3. Data Analysis

The study used the statistical software IBM SPSS to analyze the descriptive data of the respondents. Similar to previous studies [22,30,31], the partial least square structural equation modeling (PLS-SEM) was carried out to analyze the research model. (PLS-SEM) is widely used in the fields of marketing and social sciences [81]. (PLS-SEM) is considered a suitable approach for models that contain many constructs, indicators, and relationships [82]. Moreover, PLS-SEM is a causal-predictive model. It is based on explaining the underlying cause and then predicting the future behavior [81]. For the above reasons, the study (PLS-SEM) predicted consumer behavior towards digital wallets during COVID-19.

## 4. Results

### 4.1. Common Method Bias (CMB)

Since the dependent and independent variables were collected from the same respondents using the same instrument (electronic survey), the CMB could occur [83]. The CMB occurs when the estimated relationship between the measures could be strengthened. Consequently, an excessively expected systematic variance is generated. As a result, this may lead to imbalances in assessing the reliability and convergent validity of the scale constructs [84]. We applied Harman's one-factor test to examine the potential of CMB [85]. The CMB threat occurs when a single factor accounts for 50% or more of the variance [83]. Our results showed that the first factor accounted for 34.13% of the variance, far below the minimum threshold. We also applied the PLS marker variable technique to diagnose CBM. We included a variable unrelated to the survey as a marker variable. The results showed that the correlation between the marker variable and all variables is positive and less than 0.30, which means that the marker variable is relatively uncorrelated with the dependent variable. Then, we included the marker as an endogenous variable in the research model to analyze the new results and compare them with the baseline results. The results showed insignificant changes in the beta coefficient and coefficient variance. We also checked the variance inflation factor (VIF) to test for multicollinearity between the constructs. According to Koch, bias exists when the VIF threshold is higher than 3.3 [86]. The results showed that the VIF is less than 3.3 among all constructs, indicating that the model is free from common method bias.

### 4.2. Measurement Model

The measurement model was evaluated based on reliability, convergent validity, and discriminant validity. To evaluate the loadings of the indicators, it was assumed that

indicators with a loading greater than 0.60 would be retained and those with a loading less than 0.40 would be eliminated [87]. Based on the results, no indicator is removed as all indicators are above the proposed value. Cronbach’s alpha and composite reliability were used to assess the reliability of the constructs. Table 2 shows that Cronbach’s  $\alpha$ -values and composite reliability are above the suggested minimum value of 0.70, suggesting the consistency and reliability of the measurement model [88].

**Table 2.** Correlations of Latent Variables.

	Cronbach’s Alpha	(CR)	(AVE)	ATT	CF	CIN	P-SEV	P-SUS	PEU	PU	SE	SF
ATT	0.713	0.840	0.636	0.797								
CF	0.709	0.838	0.633	0.427	0.796							
CIN	0.714	0.840	0.636	0.624	0.482	0.798						
P-SEV	0.763	0.863	0.678	0.543	0.492	0.594	0.823					
P-SUS	0.727	0.845	0.646	0.384	0.507	0.393	0.434	0.804				
PEU	0.734	0.847	0.648	0.321	0.497	0.342	0.336	0.402	0.805			
PU	0.734	0.848	0.650	0.551	0.624	0.609	0.579	0.545	0.536	0.806		
SE	0.754	0.859	0.670	0.593	0.529	0.670	0.603	0.478	0.375	0.660	0.819	
SF	0.810	0.888	0.725	0.481	0.449	0.537	0.454	0.361	0.293	0.534	0.599	0.852

Note: CR = convergent reliability, AVE = average variance extracted P-SEV = perceived severity, P-SUS = perceived susceptibility, SE = self-efficacy, CF = confirmation, PU = perceived usefulness, PEU = perceived ease of use, SF = satisfaction, ATT = attitude, CIN = continuous intention.

Similarly, the average variance extracted (AVE) was used to assess convergent validity. In this study, the AVE of the constructs is higher than the recommended value of 0.50 [89]. Discriminant validity refers to whether indicators that measure different things are not highly correlated with each other [90]. Fornell and Larcker [89] stated that discriminant validity is achieved when the square root of AVE is higher than the correlation coefficient between constructs. As shown in Table 2, the AVE values ranged from (0.633 to 0.725) and the values of inter-construct correlation coefficients ranged from (0.293 to 0.852). Nevertheless, Henseler et al. [91] argue that the Cross Loading and Fornell-Larcker approaches may not be sufficient for detecting the lack of discriminant validity due to their low sensitivity. Therefore, they recommend using the Heterotrait-Monotrait Ratio scale (HTMT) to assess discriminant validity in variance-based SEM [91]. The threshold would be acceptable if it is below 0.90 for the similar constructs and below 0.85 for the distinct constructs. As shown in Appendix C, all HTMT values are below the threshold. Hence, these results support the discriminant validity of our study.

### 4.3. Structural Model

Having confirmed the reliability and validity of the measurement model, the next step is to test the research hypotheses using the structural model. The adequacy (goodness) of the structural model is tested using the coefficient of determination ( $R^2$ ) and the t-value of the path coefficients. The value of  $R^2$  indicated that the model constructs explained 55.9% of the variance in continuous intention and (35.3%, 30.7%, 61.3%, 14.1% and 38.8%) of the variance in attitudes, satisfaction, perceived usefulness, perceived ease of use, and confirmation, respectively.

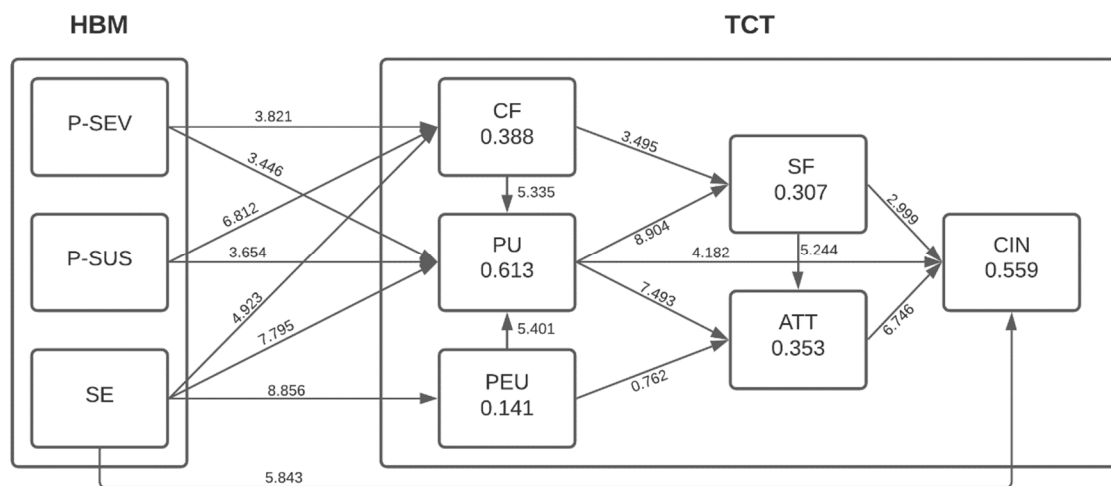
A full bootstrapping procedure with (5000 replicate samples) was used to assess the significance of the standardized path coefficients. The results of the hypotheses are presented in Table 3.

Table 3. Hypotheses testing.

	Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	p Values	Status
H1a	CF -> PU	0.243	0.242	0.035	5.335	0.000	Accepted
H1b	CF -> SF	0.190	0.187	0.057	3.495	0.001	Accepted
H2a	PEU -> PU	0.228	0.229	0.035	6.401	0.000	Accepted
H2b	PEU -> ATT	0.034	0.033	0.042	0.762	0.425	Rejected
H3a	PU -> SF	0.416	0.417	0.046	8.904	0.000	Accepted
H3b	PU -> ATT	0.394	0.395	0.050	7.493	0.000	Accepted
H3c	PU -> CIN	0.187	0.186	0.044	4.182	0.000	Accepted
H4a	SF -> ATT	0.260	0.260	0.048	5.244	0.000	Accepted
H4b	SF -> CIN	0.115	0.115	0.037	2.999	0.002	Accepted
H5	ATT -> CIN	0.281	0.285	0.041	6.746	0.000	Accepted
H6a	P-SEV -> CF	0.206	0.207	0.053	3.821	0.000	Accepted
H6b	P-SEV -> PU	0.178	0.180	0.046	3.446	0.000	Accepted
H7a	P-SUS -> CF	0.290	0.293	0.044	6.812	0.000	Accepted
H7b	P-SUS -> PU	0.139	0.140	0.038	3.654	0.000	Accepted
H8a	SE -> CF	0.266	0.262	0.054	4.923	0.000	Accepted
H8b	SE -> PU	0.339	0.338	0.041	7.795	0.000	Accepted
H8c	SE -> PEU	0.375	0.376	0.046	8.856	0.000	Accepted
H8d	SE -> CIN	0.310	0.308	0.048	5.843	0.000	Accepted

Note: P-SEV = perceived severity, P-SUS = perceived susceptibility, SE = self-efficacy, CF = confirmation, PU = perceived usefulness, PEU = perceived ease of use, SF = satisfaction, ATT = attitude, CIN = continuous intention.

The results showed that adoption/confirmation has a significant effect on perceived usefulness and satisfaction ( $\beta$  0.243,  $t$ -value 5.335,  $p < 0.01$  and  $\beta$  0.190,  $t$ -value 3.495,  $p < 0.01$ , respectively). Therefore, H1a and H1b were confirmed. Similarly, the results showed that perceived ease of use has a significant effect on perceived usefulness ( $\beta$  0.228,  $t$ -value 5.401,  $p < 0.01$ ). However, the effect of perceived ease of use on attitude was insignificant ( $\beta$  0.034,  $t$ -value 0.762,  $p > 0.05$ ). Thus, H2a was confirmed while H2b was not. H3a, H3b, and H3c are all confirmed as PU significantly influenced satisfaction, attitude, and continuous intention ( $\beta$  0.416,  $t$ -value 8.904,  $p < 0.01$ ;  $\beta$  0.394,  $t$ -value 7.493,  $p < 0.01$ ; and  $\beta$  0.187,  $t$ -value 4.182,  $p < 0.01$ , respectively). Satisfaction also has a significant effect on attitude and continuous intention ( $\beta$  0.260,  $t$ -value 5.244,  $p < 0.01$  and  $\beta$  0.115,  $t$ -value 2.999,  $p < 0.01$ , respectively). Thus, H4a and H4b were confirmed. The effect of attitude on continuous intention was also significant ( $\beta$  0.281,  $t$ -value 6.746,  $p < 0.01$ ). Thus, H5 was confirmed. On the other hand, HBM constructs were significantly related to TCT constructs. Perceived severity had a significant effect on confirmation and perceived usefulness ( $\beta$  0.206,  $t$ -value 3.821,  $p < 0.01$  and  $\beta$  0.178,  $t$ -value 3.446,  $p < 0.01$ , respectively). Moreover, perceived susceptibility had the same effect on confirmation and perceived usefulness ( $\beta$  0.290,  $t$ -value 6.812,  $p < 0.01$  and  $\beta$  0.139,  $t$ -value 3.654,  $p < 0.01$ , respectively). Thus, all H6a, H6b, H7a, and H7b are confirmed. Finally, self-efficacy has a direct significant effect on confirmation, perceived ease of use, perceived usefulness, and continuous intention ( $\beta$  0.266,  $t$ -value 4.923,  $p < 0.01$ ;  $\beta$  0.375,  $t$ -value 8.856,  $p < 0.01$ ;  $\beta$  0.339,  $t$ -value 7.795,  $p < 0.01$ ; and  $\beta$  0.310,  $t$ -value 5.843,  $p < 0.01$ ). Consequently, H8a, H8b, H8c, and H8d are confirmed. Figure 2 shows the results of the structural model analysis.



**Figure 2.** Hypotheses tests results. Note: P-SEV = perceived severity, P-SUS = perceived susceptibility, SE = self-efficacy, CF = confirmation, PU = perceived usefulness, PEU = perceived ease of use, SF = satisfaction, ATT = attitude, CIN = continuous intention.

Evaluating Predictive Relevance and Effect Sizes

Predictive relevance ( $Q^2$ ) is crucial for assessing predictive validity in complex models [92]. To assess  $Q^2$ , we used the blindfolding procedure. Blindfolding is a sample reuse procedure that omits data for a given block and then predicts the original values [93]. A value of  $Q^2$  greater than zero would be acceptable, indicating that the measure has predictive relevance [94]. However,  $Q^2$  values of 0.02, 0.15, and 0.35 represent low, medium, and high predictive relevance, respectively [95]. With respect to our study, as shown in Table 4, all  $Q^2$  values are positive and higher than 0.15, which represents a significant level of predictive relevance.

**Table 4.** Computing effect size analysis  $f^2$  and predictive relevance  $Q^2$ .

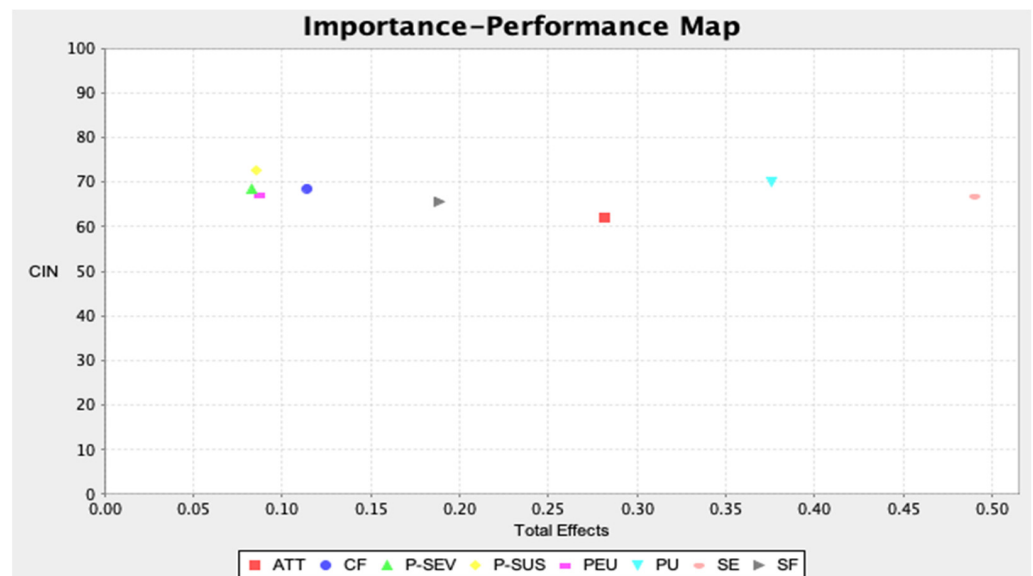
Construct	R <sup>2</sup>	Q <sup>2</sup>	f <sup>2</sup>	Decision
Continuous intention	0.559	0.351		
Attitude			0.106	Small
Satisfaction			0.040	Small
Perceived usefulness			0.018	Small
Self-efficacy			0.096	Small
Attitude	0.353	0.220		
Satisfaction			0.075	Small
Perceived usefulness			0.133	Small
Perceived ease of use			0.001	Small
Satisfaction	0.307	0.220		
Perceived usefulness			0.152	Medium
Confirmation			0.032	Small
Perceived usefulness	0.613	0.389		
Perceived ease of use			0.079	Small
Confirmation			0.062	Small
Self-efficacy			0.134	Small
Perceived severity	0.260	0.260	0.038	Small
Perceived Susceptibility	0.115	0.115	0.033	Small
Confirmation	0.388	0.240		
Self-efficacy			0.067	Small
Perceived severity			0.043	Small
Perceived Susceptibility			0.100	Small
Perceived ease of use	0.141	0.085		
Self-efficacy			0.164	Medium

Effect size ( $f^2$ ) is essential to determine the predictive power of exogenous constructs. In other words, to measure the strength of the relationship between constructs. In our

study, we used  $f^2$  to assess effect size. According to Cohen [95],  $f^2$  values of 0.35, 0.15, and 0.02 indicate high, medium, and low levels of effect size, respectively. As shown in Table 4, all of the exogenous constructs except the effect of (perceived ease of use on attitude and satisfaction on continuous intention) are positive and greater than 0.02. The preceding discussion indicates that most of the exogenous constructs have effects on the endogenous constructs.

#### 4.4. Importance-Performance Map Analysis

The importance of performance matrix analysis (IPMA) enables researchers to gain additional results to improve management activities [23]. IPMA helps researchers distinguish constructs that may have relatively high importance but somewhat low performance in shaping the dependent variable [96]. The importance of the independent variables is determined by its overall effects on the dependent variable. Simultaneously, the average values of the latent variables estimate the performance rescaled from the lowest 0 to the highest 100 [96]. According to the results of IPMA in Figure 3, consumer self-efficacy and perceived usefulness have the highest importance value (0.462 and 0.381, respectively), followed by attitude and satisfaction, which have intermediate importance levels (0.264 and 0.175, respectively). However, self-efficacy has a slightly low value (66.737) compared to the other constructs. In contrast, perceived susceptibility and perceived severity have relatively high performance (72.761 and 68.464, respectively). However, their overall effect lags behind all constructs, suggesting that the health threat construct is critical in determining consumers' continuance intention towards digital wallets.



**Figure 3.** IPMA results. Note: P-SEV = perceived severity, P-SUS = perceived susceptibility, SE = self-efficacy, CF = confirmation, PU = perceived usefulness, PEU = perceived ease of use, SF = satisfaction, ATT = attitude, CIN = continuous intention.

### 5. Discussion

The main objective of this study is to investigate consumers' intention to continue using e-wallet systems in the post COVID-19 era. Recent studies have focused on understanding the factors influencing the adoption of information systems during the COVID-19 pandemic, using a variety of technology acceptance models. Some have relied on TAM and UTAUT to examine the initial adoption of such systems during the pandemic [12,17]. Given the persistence of the pandemic and the uncertainty of its end date, and to achieve the desired goal of transitioning to digital financial services, several studies have used ECM to explain users' intention to continue using a particular information system [18,97,98]. Unlike previous studies, the presence of cognitive factors such as self-efficacy and attitude, besides

the uncontrolled health threat constructs in our model, was crucial to fill the gap in understanding post-adoption behavior and provide a better understanding in identifying factors that influence initial and continued adoption of e-wallets during the pandemic. Based on the findings, self-efficacy followed by perceived usefulness and attitude represented the most important factors influencing intention to continue use. In addition, uncontrolled external factors (perceived severity and susceptibility) showed relatively high performance in short-term adoption. The results of the study validate the integrated framework of TCT and HBM, where this combination had the power to explain the variance in consumers' continuation intention toward e-wallets ( $R^2 = 55.9\%$ ). The  $R^2$  results are similar to previous studies that used TCT as a basis for predicting consumer intention towards IS [18,23], but differ from others that used similar constructs with other models [99].

Consumer self-efficacy is essential for ensuring the ability to adopt digital wallets in the short and long term. The results showed that self-efficacy significantly influences the primary drivers of continuous intention, namely perceived usefulness and perceived ease of use. This may explain why consumers' self-efficacy led them to realize that they can easily use e-wallets, which also led them to perceive the usefulness of such a system during the pandemic. Furthermore, the significant direct effect of self-efficacy on current adoption and ongoing intentions to use e-wallets was confirmed. These findings are consistent with previous studies in the context of continuous use of mobile banking services [21]. Thus, we can argue that as consumers have demonstrated an ability to use e-wallets, their intentions to use them in the future are increasing. Similar to previous studies [21,72], our results also showed that perceived severity and perceived vulnerability significantly impacted adoption/confirmation and perceived usefulness of digital wallets. The continued rise in casualties due to the pandemic, reports confirming the possibility of the virus being transmitted through surfaces, including physical money, and what stood in the way of imposing social distancing and blocking measures, all make consumers aware of the seriousness of the disease and that their use of physical money can make them vulnerable to contracting the virus. Therefore, they believe that digital wallet use is viewed as a protective health behavior, leading them to feel that the perceived usefulness of a digital wallet as a financial tool reduces the risk of contracting the virus. However, the constructs of perceived threat alone were not sufficient to determine consumers' continuous intentions. Consumer self-efficacy is essential to ensure the ability to adopt digital wallets in the short and long term. The results showed that self-efficacy significantly influences the primary drivers of continuous intention, namely perceived usefulness and perceived ease of use. This may explain why consumers' self-efficacy led them to realize that they can easily use digital wallets, which also led them to perceive the usefulness of such a system during the pandemic. Furthermore, the significant direct effect of self-efficacy on current adoption and ongoing intentions to use digital wallets was confirmed. These findings are consistent with previous studies in the context of continuous use of mobile banking services [22,100]. Thus, we can argue that as consumers have demonstrated an ability to use digital wallets, their intentions to use them in the future are increasing.

According to TCT, the study showed that attitude and perceived usefulness had a significant impact on users' continuation intention, which is consistent with previous studies [22,23,31]. This implies that consumers intend to continue using digital wallets, influenced by consumers' perceived usefulness and attitude. Previous studies have confirmed that perceived ease of use and perceived usefulness are the most important antecedents to a user's attitude and intention to adopt a particular behavior [27,57]. Our results showed that perceived usefulness had a significant relationship with attitude. In contrast, perceived ease of use had an insignificant effect on consumer attitude. This result is not consistent with the study of Rahi et al. [23] who found a significant effect of perceived ease of use on users' attitude towards continued use of internet banking. However, Foroughi and Iranmanesh [22] explained the non-significant relationship between perceived ease of use and attitude. They argued that consumers became more experienced and familiar with using the mobile banking system in the post-adoption phase. Perceived usefulness is influenced

by perceived ease of use and confirmation. Users' assertion that the current adoption has met the expectations and the ease of using this type of financial services may be the direct reason for increasing the perceived usefulness of using digital wallets. Based on TCT, consumer satisfaction is driven by confirmation and perceived usefulness [53]. Our study found that consumer satisfaction with digital payments is driven by confirmation and perceived usefulness, which is consistent with previous studies [23,49,82,100]. These results suggest that if consumers' initial expectations are met and these consumers realize the functional and health benefits of using digital wallets during the pandemic, this will positively impact satisfaction levels. In addition, satisfaction significantly influenced consumers' attitudes and intentions to continue using digital wallets, consistent with previous studies [22,31].

The researcher conducted the effect size and IPMA analysis to gain a deeper insight into the factors influencing consumers' continuation intention of digital wallets. As shown in the effect size analysis, self-efficacy is the most significant construct in predicting consumers' continuance intentions toward digital wallets. Therefore, to improve consumers' attitudes, they should perceive the benefits of digital wallets and show satisfaction with previous experiences. Since this study integrated two different models with multiple constructs, IPMA analysis is essential to determine the importance and performance of the model constructs. In terms of importance, IPMA results showed that self-efficacy was the most important factor, with an index value of 49%, followed by perceived usefulness, attitude, with index values (37.6%, 28.1%, respectively). IPMA findings enable decision makers to identify key factors influencing consumers' ongoing e-wallet intentions and thus prioritize their actions and interventions. Due to the significant influence of customers' self-efficacy on their continuous intentions towards m-banking services, Foroughi and Iranmanesh [22] recommended banks to develop strategies to improve customers' self-efficacy towards m-banking, such as educating bank customers about the features of m-banking services and how to use them. Therefore, we concur that self-confidence and skills training are fundamental in developing e-wallet self-efficacy.

## 6. Theoretical and Managerial Implications

Understanding the conditions behind the intentions to continue adopting e-wallets during the coronavirus pandemic can lead to highlighting certain issues in the FinTech industry that are unique and can only occur under such exceptional circumstances. It can theoretically and practically add to the literature in related areas of technology adoption. This study has introduced several theoretical contributions to the continuum of digital wallet usage following COVID-19. To our knowledge, this empirical study was the first to combine HBM and TCT. As a result, this model contributes to knowledge by attempting to understand the factors that influence consumers' intentions to continue using digital wallets during and after the COVID-19 pandemic. The study confirmed the role of health threat constructs (perceived vulnerability and perceived severity) in driving consumers to use digital wallets during the pandemic. The study viewed adoption at this stage as a health-protective behavior that must be carried out. This view is consistent with the recommendations of previous studies that emphasize the role of information and communication technology applications, including financial technology, in building resilience during crises [101–103]. Moreover, our study highlights the crucial role of self-efficacy as one of the HBM constructs in determining the continuity of consumers' intentions. Consumers' confidence in their abilities to use digital wallets is considered to guarantee the continuity of such actions. This supports the validity of our model.

The study also confirmed TCT factors as triggers for intention to continue using digital wallets. Consequently, confirming consumers' expectations of digital wallet services can improve perceptions of performance. When performance meets or exceeds users' expectations, it would increase their satisfaction and attitude toward continued use of digital wallets. In addition, the results showed that the influence of perceived ease of use on consumers' attitude towards digital wallets was not significant. The reason may be that consumers' knowledge and experience will gradually increase in the post-adoption stage,



so the role of attitude in mediating the relationship between perceived ease of use and continuous intention will be small. This can also be supported by the omission of attitudes from the extended TAM, TAM2, and TAM3 [104].

The results of the study provide decision makers in Hungary with additional solutions to the social distancing measures imposed to control the spread of the virus. The introduction of e-wallets reduces the need for outdoor purchases, thus reducing the likelihood of direct contact with surfaces and people who may be infected. It also reduces the need to use physical money, which could be an intermediary for transmission of the virus. Therefore, policymakers should encourage and make consumers aware of how easy it is to use e-wallet as a healthy financial tool during the pandemic. The use of social media platforms would help launch awareness campaigns about the importance of using e-wallet services. On the other hand, the Hungarian government is suggested to support the development of the FinTech industry, including e-wallet projects, by encouraging the creation of these types of projects, facilitating their licensing procedures and reducing taxes. Current e-wallet users also suggested raising awareness among their peers about the use, importance, and benefits of e-wallet systems compared to traditional payment channels. In addition, IPMA addresses the key areas that management should focus on to improve. Therefore, this study should consider the significant effect of self-efficacy and perceived usefulness on initial and ongoing adoption. Service providers, including fintech companies and banks, are recommended to improve the design, content, and features of e-wallet applications to match the capabilities of current users and attract new potential users. Furthermore, e-wallet service providers are recommended to educate their current and potential customers about e-wallet usage mechanisms by publishing visual and written information about the benefits and mechanisms of using e-wallet systems.

## 7. Conclusions

The current study examines consumers' continuous intention to adopt e-wallet with the integration of HBM and TCT. After reviewing the literature, we found that most recent studies have focused on the initial adoption of contactless FinTech systems during the COVID-19 pandemic. Few have focused on the post-adoption phase. Therefore, this study applied the HBM, which provided significant results to explain the initial adoption of digital payment systems during the pandemic. We proposed the TCT, which showed high explanatory power for post-adoption behavior, to investigate continuous adoption. The results showed that attitude, satisfaction, perceived usefulness, and self-efficacy significantly influence consumers' intention to continue using e-wallets. In addition, our model was able to explain 55.9% of the variance in continuous intention.

In addition, the HBM constructs perceived severity, perceived susceptibility, and self-efficacy had a significant influence on the initial acceptance of the e-wallet. In addition, IPMA results showed that perceived susceptibility and self-efficacy were each in the introduction regarding the performance and importance of the design of the dependent variable (Continuous Intention). The study provides evidence of the importance of continued adoption of e-wallet during the pandemic, which can be considered a protective health behavior. Therefore, it is recommended that policy makers launch educational campaigns on the recommended behaviors that can help reduce the possibility of contracting the virus and correspond with social distancing measures. Such recommended behaviors include adopting the e-wallet service. On the other hand, e-wallet service providers are recommended to offer modern, renewable services that meet consumers' needs and match their financial and technical capabilities.

## 8. Limitations and Future Research

Despite the insightful practical and theoretical implications of our study, this study is not without some limitations. First, the current study develops a continuity technology model that is integrated with the HBM model and focuses on consumers' intentions regarding the continuous adoption of e-wallets. Therefore, the actual continuous adoption

of consumers should also be investigated. Second, the applicability of the HBM in this study is limited to the context of the pandemic COVID-19 or to situations that impose similar constraints and procedures as during the pandemic. Third, the sample represents the academic society (students, academics, and administrators) in three different universities in Budapest. Consequently, the views of the academic community in other cities and towns cannot be obtained. The majority of the sample (78.9%) focused on individuals under the age of 40. Hence, the results may not reflect the actual picture of user experiences with e-wallets across different user groups in Hungary. Thus, future research may add novelty to the study if it makes comparisons based on the age groups, gender, and students versus professionals. Considering that the R-squared is about 0.5, it is suspected that other factors exist to explain the dependent variable. Therefore, for future work, it is recommended to use the fuzzy set Qualitative Comparative Analysis (fsQCA), which can be used to investigate asymmetric relationships between the existing conditions as a means of determining which factors are necessary or sufficient to cause the adoption of e-wallet. Lastly, as health threat constructs' effect on the initial adoption is more obvious than continuous adoption, future research could involve factors like security and trust as crucial parameters that affect the consumers' intentions towards e-wallet continuous adoption.

**Author Contributions:** Conceptualization, A.D. and J.S.; methodology, A.D. and J.S.; software, A.D.; validation, A.D., J.S. and Z.Z.; formal analysis, A.D.; investigation, A.D.; resources, A.D.; data curation, A.D.; writing—original draft preparation, A.D.; writing—review and editing, J.S.; visualization, A.D.; supervision, J.S.; project administration, Z.Z.; funding acquisition, Z.Z. All authors have read and agreed to the published version of the manuscript.

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**Data Availability Statement:** The data presented in this study are available on request from the first author.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

**Table A1.** Respondent demographics.

	N	%
Sex		
Male	606	55.9
Female	474	44.1
Total	1080	100%
Age		
Less than 25	468	43.3
25 to 40	384	35.6
40 to 55	162	15
Above 55	66	6.1
Total	1080	100%
Education level		
Bachelor	514	47.6
Master	296	27.4
Ph.D.	214	19.8
Others	56	5.2
Total	1080	100%

**Table A1.** *Cont.*

	N	%
Occupation		
Student	768	71.1
Lecturer	172	15.9
Administrator	92	8.5
Others	48	4.5
Total	1080	100%
E-Wallet usage frequency during the COVID-19 pandemic		
Once a month	128	11.9
2 to 5 times a month	226	20.9
6 to 10 times a month	522	48.3
More than 10 times a month	204	18.9
Total	1080	100%

## Appendix B

**Table A2.** Results of item loading.

Constructs	Item Loading
Perceived Severity (P-SEV)	
P-SEV1: Thinking about getting infected by SARS-CoV-2 due to using cash or physical contact payment tools makes me nervous.	0.801
P-SEV2: I am afraid to think about the health problems of getting infected by SARS-CoV-2 if I use cash or physical contact payment tools.	0.827
P-SEV3: If I get infected by SARS-CoV-2 due to using cash or physical contact payment tools, my whole life would change.	0.842
Perceived Susceptibility (P-SUS)	
P-SUS1: There is a possibility to get infected by SARS-CoV-2 due to using cash or physical contact payment tools.	0.832
P-SUS2: My chances of infected by SARS-CoV-2 if I use cash or physical contact payment tools are high.	0.784
P-SUS3: I feel that SARS-CoV-2 will develop health problems to me in the future.	0.795
Self-Efficacy (SE)	
SE1: It would be easy for me to learn how to use e-wallet systems.	0.813
SE2: I could use e-wallet if someone showed me how to do it.	0.835
SE3: I can use e-wallet if there is no one around to tell me what to do.	0.807
Confirmation (CF)	
CF1: My experience with using e-wallet was better than what I expected.	0.769
CF2: The service level provided by e-wallet was better than what I expected.	0.826
CF3: Overall, most of my expectations from using e-wallet were confirmed.	0.791
Perceived Ease of Use (PEU)	
PEU1: e-wallet is easy to use.	0.809
PEU2: I feel comfortable while using e-wallets.	0.785
PEU3: it is easy to use e-wallet more frequently.	0.821
Perceived Usefulness (PU)	
PU1: using e-wallet improves my performance in managing personal payments.	0.798
PU2: e-wallet saves time in making payments.	0.817
PU3: overall, e-wallet is useful in managing payments.	0.803
Satisfaction (SF)	
SF1: I feel satisfied with e-wallet usage.	0.840
SF2: I feel contented with e-wallet usage.	0.869
SF3: I feel happy using e-wallet service.	0.845

Table A2. Cont.

Constructs	Item Loading
Attitude (ATT)	
ATT1: Using e-wallet for payment would be a wise idea.	0.794
ATT2: I like the idea of using e-wallet for payment.	0.763
ATT3: Using e-wallet would be a pleasant experience.	0.834
Continuous Intention (CIN)	
CIN1: I intend to continue using e-wallet rather than discontinue its use.	0.775
CIN2: My intentions are to continue using e-wallet than using any alternative means.	0.797
CIN3: if I could, I would like to continue my use of e-wallet as much as possible.	0.820

### Appendix C

Table A3. Heterotrait-Monotrait Ratio (HTMT).

	ATT	CF	CIN	P-SEV	P-SUS	PEU	PU	SE	SF
<b>ATT</b>									
<b>CF</b>	0.599								
<b>CIN</b>	0.837	0.676							
<b>P-SEV</b>	0.734	0.663	0.797						
<b>P-SUS</b>	0.531	0.700	0.547	0.580					
<b>PEU</b>	0.430	0.675	0.457	0.428	0.537				
<b>PU</b>	0.744	0.834	0.827	0.756	0.749	0.726			
<b>SE</b>	0.807	0.722	0.846	0.790	0.645	0.489	0.841		
<b>SF</b>	0.632	0.592	0.705	0.570	0.470	0.373	0.678	0.766	

Note: P-SEV = perceived severity, P-SUS = perceived susceptibility, SE = self-efficacy, CF = confirmation, PU = perceived usefulness, PEU = perceived ease of use, SF = satisfaction, ATT = attitude, CIN = continuous intention.

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