

**Hungarian University of Agriculture and Life Sciences**



**Doctoral School of Economic and Regional Sciences**

**Understanding Digital Immigrants' Sustained Use of Mobile Payment  
in Post COVID- 19 Era**

**Ph.D. Thesis**

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## Table of Contents

<b>1</b>	<b>INTRODUCTION</b> .....	<b>4</b>
1.1	RESEARCH BACKGROUND.....	4
1.2	RESEARCH PROBLEM .....	9
1.3	RESEARCH CONTRIBUTION AND SIGNIFICANCE.....	12
1.4	RESEARCH OBJECTIVES .....	16
1.5	RESEARCH QUESTIONS .....	17
<b>2</b>	<b>METHODOLOGY AND MATERIALS</b> .....	<b>17</b>
2.1	RESEARCH DESIGN .....	18
2.2	HYPOTHESES AND CONCEPTUAL FRAMEWORK .....	19
2.3	SCALE DEVELOPMENT .....	22
2.4	DATA COLLECTION.....	23
2.5	DATA ANALYSIS MECHANISMS .....	25
<b>3</b>	<b>RESULTS OF ANALYSIS</b> .....	<b>26</b>
3.1	DEMOGRAPHIC INFORMATION .....	26
3.2	EVALUATION OF THE STRUCTURAL MODEL IN PLS-SEM .....	29
3.2.1	<i>Model validity: Path coefficients</i> .....	30
3.2.2	<i>Importance-performance map analysis</i> .....	32
<b>4</b>	<b>DISCUSSION OF RESULTS AND CONCLUSIONS</b> .....	<b>34</b>
4.1	STUDY FINDINGS .....	34
4.2	NOVEL FINDINGS .....	42
4.3	STUDY IMPLICATIONS AND RECOMMENDATIONS .....	45
4.3.1	<i>Theoretical implications</i> .....	45
4.3.2	<i>Managerial implications and Recommendations</i> .....	46
4.4	STUDY LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH..	48
<b>5</b>	<b>CONCLUSION AND THESIS SUMMARY</b> .....	<b>49</b>
<b>6</b>	<b>REFERENCE</b> .....	<b>51</b>

# 1 INTRODUCTION

## 1.1 Research background

This study delves into the sustained use of mobile payment (M-Payment) among digital immigrants in Hungary in the post-COVID-19 era, with a particular emphasis on viewing M-Payment as a preventive health tool. Recognizing the potential of M-Payment to mitigate the risk of COVID-19 and other contact-based diseases, the research investigates the patterns and motivations behind the adoption and continuation of M-Payment practices. The study, conducted in 2022, surveyed 415 respondents who fall under the category of digital immigrants in Hungary. It specifically explores the impact of the COVID-19 pandemic on their decision to adopt M-Payment methods and seeks to comprehend their intentions to persist in using M-Payment in the post-COVID-19 landscape. By shedding light on these aspects, the research aims to contribute valuable insights into the evolving dynamics of M-Payment behaviour, especially among populations more accustomed to traditional forms of transaction.

Before COVID-19, the Information and Communications Technology (ICT) industry multiplied and became a milestone for countries' economic development (Kang, 2018). The ICT sector's development was accompanied by widespread mobile phones and significant growth in the electronic market, changes in customer expectations, and availability of funding and support from regulators and governments (Horner and Cunnane, 2017). In light of that, the ICT paved the way for a paradigm shift in the financial sector (Gai *et al.*, 2018).

Financial Technology (FinTech) industry has boomed during the last few years; it came to enable easy, safe, and high-quality online banking services (Kang, 2018). The Financial Stability Board (FSB) and The Basel Committee

on Banking Supervision (BCBS) have agreed on the accurate and comprehensive definition of Fintech. They defined it as technological, financial innovation that offers new products, applications, and business models that could impact delivering the financial services and developing the financial industry (Thakor, 2020). Fintech innovation has changed the traditional banking services offered by banks and financial institutions (Abu Daqar *et al.*, 2020). Fintech concentrates on understanding clients' needs and expectations and providing them with advanced financial services, including innovation in online payment, Blockchain, cryptocurrency, and other digitalized banking services.

M-Payment service, also known as a Mobile wallet (M-Wallet) or Mobile money (M-Money), is a payment service that directly links to financial institutions and Fintech payment service (Kang, 2018). M-Payment is an electronic payment instrument, which uses a mobile device to transfer the fund between the payer and payee (Karthikeyan, 2012). M-Payments have changed the way people viewed mobile use. It is no longer limited to communication, entertainment, and internet searching. Direct contact and cash are no longer necessary to conduct transactions and exchange value. M-Payment reshaped the way customers and merchants do transactions. It made transactions simple, easy, and fast. Nonetheless, it allowed people to do transactions anywhere and at any time.

Although some scholars argue that Digital natives (Millennials, people born between 1980 and 2000, and Generation Z, people born after 2000) are the main drivers of the FinTech industry and have the greatest propensity to adopt technology in their daily activities (Abu Daqar *et al.*, 2020). Others, however, refute the claim that Digital immigrants (Generation X, i.e., those born

between 1965 and 1980, and baby boomers born before 1980) are not capable of adopting technology (Rondan-Cataluña *et al.*, 2015; Walker Mark, 2019).

Meanwhile, the Global Web Index Report has found a significant increase in smartphone usage among Generation X. They are a highly engaged audience for digital services. According to the report, the reason for this adaptation is that most members of Generation X are busy professionals with families and large purchasing power. In addition, Generation X's rigorous lifestyle and limited free time make the use of digital services a practical and efficient tool for their daily professional and business activities. Among baby boomers, the pandemic has increased technology adoption among older generations, but adoption was already on the rise before COVID- 19 forced many businesses to go online. According to 2019 data from the Pew research centre, 68 percent of baby boomers now own a smartphone, and 11 percent of them use their phone as their primary online access method (EMILY A. VOGELS, 2019).

COVID- 19 has negatively affected almost every aspect of human life because of its rapid spread worldwide. In response to that pandemic, people have adopted new ways of living their daily lives, and such radical changes and behaviours in daily life are expected to continue after the pandemic ends. COVID- 19 pandemic forced most countries to take drastic measures to ensure social distancing among people. Some countries even imposed full lockdowns to prevent the rapid spread of the virus. United Nations Development Programme (UNDP) mentioned that the pandemic's socio-economic impact is not less significant than the health aspect, calling decision-makers to move beyond forecasts and take response actions (UNDP, 2020). While the global real Gross Domestic Product (GDP) grew by 2.9 percent in 2019, a decrease of 4.5 percent is predicted in 2020 due to the impact of COVID- 19 (Statista, 2020). In the meantime, governments have

adopted nonpharmaceutical interventions to slow the rapid spread of COVID-19 (Seale *et al.*, 2020). These interventions are causing major imbalances in countries' economies and slowing global economic development (Carracedo *et al.*, 2021).

The World Health Organization (WHO) announced that the COVID-19 virus could be transmitted mainly through saliva droplets or contact with people and surfaces that carry the infection. The virus attacks people's respiratory system and may cause death for some people who suffer from health problems; also, its level of risk increases as the affected person is advanced in age (World Health Organization [WHO], 2020). Whereby cash, banknotes, and contacted payment tools could increase the disease's spread, the WHO encouraged consumers to use the digital contactless payment methods in their financial activities (Ather *et al.*, 2020), (Auer *et al.*, 2020). Fortunately, thanks to advances in information and communications technology, particularly the Internet. People around the world became more connected than ever during this pandemic. With the digitization of financial services and banking, it is now easier than ever to take security and preventive measures to contain the spread of COVID-19 and save people's lives. During the pandemic, consumer preferences have shifted from traditional payment methods to digital M-Payment methods (Aji *et al.*, 2020). Therefore, currently financial institutions are paying closer attention to new trends in consumer behaviour and focusing on novel M-Payment services to meet the changeable consumer needs.

Undoubtedly, the pandemic has prompted governments, including the Hungarian government, to issue measures and laws to ensure social distancing. On the other hand, Health experts said that the Coronavirus could live on surfaces like cash and banknotes for 2 to 4 days, which increased the

fear of people getting infected with the virus (Pal and Bhadada, 2020a). The Perceived risk of getting infected with the virus has impacted consumers' behaviour and views towards payment systems, banking, and daily tasks that require direct contact transactions (Deloitte, 2020). Additionally, medical studies have shown that older adults are more prone to develop worse disease outcomes and higher mortality rates if infected with the SARS-2 virus. Therefore, this generation segment is more likely to take precautionary measures to avoid infection (World Health Organization [WHO], 2020).

Recent studies have focused on the negative impact of COVID- 19 on the Tourism industry (Uğur and Akbıyık, 2020), Services industry (Javed, 2020), Supply chain (Baker McKenzie, 2020), and Insurance sector (Babuna *et al.*, 2020). However, others indicated that the Fintech industry in general and digital payments specifically had shown remarkable growth during the pandemic (Belgavi, 2020; World Bank and CCAF, 2020). Moreover, the International Monetary Fund (IMF) considered the Digital Financial Inclusion (DFI) a crucial factor in mitigating the socio-economic impact of the crisis (Sahay, R., von Allmen, U. E., Lahreche, A., Khera, P., Ogawa, S., Bazarbash, M., & Beaton, 2020). Nevertheless, there is still a need for more research that focuses on the relationships between diseases like COVID- 19 and the type of payment systems used by consumers. To the best of my knowledge, there is lack of research on digital immigrant' continuous intention to use M-Payment, especially after the pandemic COVID- 19.

Therefore, the significance of this study that it introduce a comprehensive integrated framework of three theories (Technology Continuous Theory (TCT), Theory of Planned Behaviour (TPB), and Protection Motivation Theory (PMT)) to understand the factors affect Digital Immigrants continued use of M-Payment systems in post COVID- 19 Pandemic.



## 1.2 Research problem

World health organization expected an increase in the frequency and coverage of the pandemics in the future, cause more damage to the global economy and lead to greater global morbidity and mortality (World Health Organization, 2022). Therefore, a global environment that facilitates preparedness and response to infectious threats must be created. Being better prepared for the next infectious threat requires a mindset shift and the adoption of approaches different to what we are used to. As the pandemics continue to unfold, its impact on the behaviour and expectations of consumers as well as businesses will become more apparent. For example, as people strive to avoid direct contact as much as possible, the use of M-Payment has increased as this has advantages over traditional payment methods from an infection prevention perspective. Given that it is unclear not only when the pandemic will end, but also whether previous behaviours will ever return, it is valuable to understand what factors influence consumers' intentions to continue using M-Payment. Not surprisingly, studies in the health sciences account for a large proportion of COVID- 19 publications (e.g., 88.23%) (Daragmeh *et al.*, 2021). Many studies have been conducted in the fields of education (Rizun and Strzelecki, 2020), health environment (Rahi *et al.*, 2021), Banking (Shahabi *et al.*, 2020), and others have emphasized the importance of identifying the factors that influence the adoption of information systems (Al-Marroof *et al.*, 2020).

The health threat posed by COVID- 19 has been considered in studies that examined the adoption of FinTech in the context of a pandemic (Nawayseh and K, 2020), (Puriwat and Tripopsakul, 2021). According to study of (Nawayseh and K, 2020), people's fear of the health risk of COVID- 19 was greater than their fear of technology-related risks, making technology-related risks a lower trigger for FinTech adoption in Jordan. In addition, medical studies have shown that older adults are more likely to have a worse disease

course and higher mortality rate when infected with the SARS-2 virus. Therefore, Digital Natives, such as Generation X and baby boomers, are more likely to take precautions against infection. Consequently, it is critical to understand how COVID- 19 has led Digital Immigrants to continue using M-Payment as a means of health care.

Numerous studies have examined users' initial adoption of M-Payments during the COVID- 19 pandemic (e.g., (Flavian *et al.*, 2020); (Naeem, 2020) (Laato *et al.*, 2020); (Hanif and Lallie, 2021). Adoption is typically defined as a user's initial decision to use a new information technology (Hertel and Menrad, 2016). It is an important indicator of the success of M-Payment systems, but initial adoption can only determine the desired business outcome if it is followed by continuous usage (Bhattacharjee, 2001). The ultimate success of M-Payment systems depends on continuous usage by users, also known as user persistence (Bhattacharjee, 2001). This is currently under-researched. Several researchers have focused to have better understanding of factors affect users' adoption and continuation intentions of information systems (e.g., Bennett and Corrin, 2018; Yang *et al.*, 2021; ;Zhou *et al.*, 2021). Continuance intention is usually defined as a user's decision to continue using an information technology innovation after its initial adoption (Bhattacharjee, 2001). In context of this study, continuance intention is defined as the intention of M-Payment system users to continue using previously used payment system.

Each of the theories related to IT system adoption can make a unique contribution to understanding technology acceptance behaviour (Hubert *et al.*, 2019). However, scholars claim that it is necessary to modify, combine, or extend different theories to understand initial and post-adoption behaviour of technologies (Veeramootoo *et al.*, 2018) (Awa *et al.*, 2017). (Puriwat and

Tripopsakul, 2021) created a framework that includes the Health Belief Model (HBM) and the Expectation Confirmation Model (ECM) to represent users' intentions to continue using contactless payment technologies in Thailand during the COVID- 19 pandemic. They included two additional variables at COVID- 19 representing perceived health risks, namely perceived severity (P-SEV) and perceived vulnerability (P- SUS). Although the framework is useful for understanding continuation intention (CI), it does not account for other variables such as perceived ease of use (PEU), subjective norms (SN), and attitude (ATT).

In the context of the present study, COVID- 19 is considered a threat to the overall health of consumers in general and older adults in specific. In 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. In addition, efficacy and the ability to adopt health-related behaviours are considered factors that influence the adoption of one set of protective payment behaviours and the avoidance of another. In a related context, the WHO has recommended that consumers use contactless payment methods to manage their purchasing behaviour. On the grounds that contact-based payment methods such as cash and banknotes could be carriers of the virus (World Health Organization [WHO], 2020). Although it is still uncertain when this pandemic will end, and other contact based diseases might appear in the future. For the sake of the sustained use of M-Payment as a health preventive tool, Protection Motivation Theory (PMT) alone is not enough to determine the Digital Immigrants' continuous intention to use M-Payment. And since the continued adoption is influenced by the extent of utility, Satisfaction and Attitude towards the use of such payment methods. Therefore, this article integrates the PMT, which focuses on pre-emptive

behaviour, with TPB and TCT to determine the Digital Immigrants' continuous intention to use M-Payment in post COVID- 19 era.

### **1.3 Research contribution and significance**

One of the main goals of information systems researchers (IS) is to understand the adoption and retention of IS innovations by individual users (e.g., (Hubert *et al.*, 2019) (Khayer and Bao, 2019) (Rahi *et al.*, 2020)).

Adoption is broadly defined as a user's initial decision to use a new information technology innovation (Liao *et al.*, 2009). Continuous intention to use an IS innovation is generally defined as a user's decision to continue using it after he/she use it for the first time (Bhattacharjee, 2001). M-Payment eliminate the need for cash and connect to the bank accounts through virtual platforms.

The study is beneficial mainly for multiple reasons. First, M-Payment systems became popular in developing countries such as Hungary, it uses electronic devices such as computers or smartphones to conduct online financial transactions (Kang, 2018). By 2020, 43% of Hungarians will use M-Payment for regular online purchases. At the same time, 26% of respondents use M-Payment solutions to transfer money to others on a regular basis. And by 2022, more than half of Hungarians have made M-Payment. Almost 20% of them use this payment method several times a day, and another 19% make transactions with smart devices once a day. Thus, as M-Payment adoption has increased in Hungary during the pandemic, continued usage and encouraging existing users to adopt new mobile features may be the primary focus of service providers at this time (Medve, 2022a).

Second, The significant increase of deaths caused by COVID- 19 makes it important to adopt new contactless behaviours. Table 1 shows the number of

deaths, as well as in the COVID- 19 disease in Hungary. The death rate caused by COVID- 19 constitutes 6.4% of total deaths in Hungary at the end of 2020, and reached 16% of total deaths by the end of 2021. Thus, this research work sheds the light on the role of M-Payment as one of the contactless behaviours that should be adopted to reduce the risk of COVID- 19 pandemic (Daragmeh *et al.*, 2021). During the pandemic, the World Health Organization (WHO) declared that consumers should avoid cash and contact-based payments as a source of infection and use M-Payments instead (Auer *et al.*, 2020). Health experts said that the COVID- 19 virus can survive on the surface of cash and banknotes for four days (Pal and Bhadada, 2020b). According to (Daqar *et al.*, 2021), the introduction of digital financial services such as contactless/M-Payment could help prevent the spread and severity of COVID- 19 . This view allows policy makers to focus their efforts and decisions on promoting M-Payment rather than relying on contact-based payment methods (Daragmeh *et al.*, 2021).

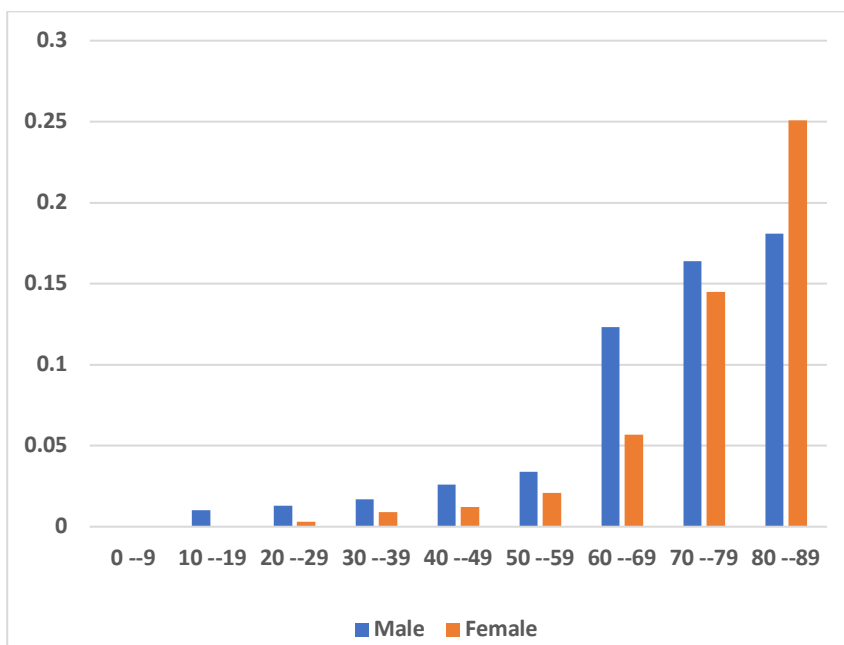
*Table 1. The number of deaths, as well as in the COVID- 19 disease in Hungary*

Sex	Total Deaths in 2019	Total Deaths in 2020	Deaths caused by COVID- 19 in 2020	% COVID- 19 / Total deaths in 2020	Deaths in 2021	Deaths caused by COVID- 19 in 2021	% COVID- 19/ Total deaths in 2021
Male	62843	68661	4615	<b>9.3%</b>	77099	12839	<b>16.7%</b>
Female	66760	72341	4369	<b>6%</b>	78522	11999	<b>15.3%</b>
Total	129603	141002	8984	<b>6.4%</b>	155621	24838	<b>16%</b>

Source: (KSH Demográfiai Táblázó (Demo), 2021)

Third, medical studies have shown that older adults are more likely to have a worse disease course and higher mortality rate after infection with the SARS- 2 virus. Figure 1 shows the deaths rate by age segments in Hungary in 2022, the death rate among Hungarians is increasing by age, and it significantly high

among Digital Immigrants compared to Digital Natives. Digital Natives, individuals born before 1980, was selected in this study due to the fact First the average age of the population in Hungary was 43.3 years in 2020, and it is expected to reach 45.1 years by 2025, suggesting that Digital Immigrants may represent the age of Hungarian society (O’Neill, 2023, pp. 1950–2100). Therefore, this generation is more likely to take preventive measures to avoid infection (World Health Organization [WHO], 2020). Thus, M-Payment could be an alternative protective measure in the event of a pandemic. The current study examined M-Payment as means of reducing COVID- 19 and other contact based diseases risk among Digital Immigrants in Hungary.



*Figure 1. Deaths rate by age segments in Hungary in 2022*

*Source: (PANDEMIA.HU, 2022)*

Fourth, The scope of this study is limited to an empirical investigation of the factors influencing the initial adoption of M-Payment and the intention to continue using them among Digital Immigrants in Hungary. In Hungary, M-

Payment adoption has increased since the beginning of the pandemic, but it is not clear if this is also true for Hungarian Digital Immigrants. but many users do not remain active. It is also important to know whether these users will remain active and continue to use M-Payment after the pandemic. So the increasing prevalence of M-Payment in Hungary fits well with this study to examine post-pandemic usage, and so M-Payment in Hungary became the research context.

Lastly, The model proposed for this study is a mixture of the TCT, TPB, and MPT constructs and addresses both continuous intention and initial adoption. The integration of constructs from these three models is beneficial for three reasons. First, the TCT model focuses on ongoing use IS, which can help explain user behaviours that cannot be explained by initial acceptance theories such as the TAM. It also includes confirmation of expectations, i.e., initial acceptance IS. The TCT model has been validated as a reliable model to explain continuance intention of IS (Liao *et al.*, 2009). The constructs of this model were used in this study because it is a post-adoption study of M-Payment system users' continuance intention. However, the ECM model includes five predictors to explain continuation intention, namely confirmation, perceived ease of use, perceived usefulness, satisfaction, and attitude (Bhattacharjee, 2001). However, the intention of users of IS may also be influenced by other factors. Second, TPB is a well-known theory that explains human behaviour and technology intentions. This theory is also well explained and applied to study the acceptance and impact of new information systems such as M-Payment and banking. TPB added perceived behavioural control (self-efficacy) to the other predictors, attitude and subjective norms, in the TRA. The greater a person's perceived behavioural control, the more motivated he or she is to engage in a particular behaviour. Third, PMT is widely used in the technology acceptance literature (Fischer-Preßler *et al.*,

2022) (Nguyen and Tang, 2022), and was also used to predict prevention behaviour during the COVID- 19 pandemic (Liébana-Cabanillas *et al.*, 2020); (Ezati Rad *et al.*, 2021). Because the use of M-Payments has become inevitable during the pandemic, the study considers the perceived threat of COVID- 19 , including perceived susceptibility and perceived severity, as antecedents to confirm the expectation of M-Payment adoption. The study also considers perceived self-efficacy as a critical factor in determining future intent to use M-Payments.

Therefore, we believe that the proposed integrated model significantly interprets Digital Immigrants' continuous intention to use M-Payment systems in the post- COVID- 19 era. In addition, the model showed high validity in understanding the continuous intention to use a particular information system in times of crisis related to public health and lockdowns.

#### **1.4 Research objectives**

The purpose of this study is to examine the factors that influence Digital Immigrants' intention to continue use M-Payment in post- COVID- 19 era. We define the continuous intention in this research as the intention to continue using M-Payment systems that users have previously used. To achieve this goal, the following specific research objectives are developed:

1. Determine the impact of COVID- 19 on M-Payment adoption among Digital Immigrants.
2. Determine the level of M-Payment adoption among Digital Immigrants during the pandemic and identify their willing to continue use it.
3. Identify hypotheses about factors that influence users' intention to continue using M-Payment.



4. Validate hypotheses and identify interactions between factors influencing users' intention to continue using and their behaviour.
5. Create an appropriate model for continued M-Payment use in the context of COVID- 19 and other direct contact diseases that may emerge in the future.

### **1.5 Research questions**

The COVID- 19 has led consumers to increasingly conduct their financial activities, including payments, through online channels. And due to the fact that older adults are the segment most affected by the health risk of COVID- 19 . and the less studied continuity and behavioural intent of this service, the following research questions were developed to be answered in the following parts of the study:

1. What is the impact of COVID- 19 on M-Payment adoption among DI?
2. What is the level of M-Payment adoption among Digital Immigrants during the pandemic, and identify their willing to continue use it?
3. What are the factors that influence Digital Immigrants' intention to continue using M-Payment systems?
4. What are the interactions between the factors influencing Digital Immigrants' intention to continue using and their behaviour.
5. Can the proposed model reliably measure the factors influencing Digital Immigrants' continued use of M-Payment systems in the context of the COVID- 19 pandemic or similar diseases that may occur in the future through direct contact?

## **2 METHODOLOGY AND MATERIALS**

## 2.1 Research design

A research design specifies the methods and procedures by which research data will be collected, processed, and analysed (Akhtar, 2016). For this research, an empirical study will be conducted using a survey. (Glasow, 2013) define survey research as an investigation that aims to determine the occurrence, frequency, and distribution of certain characteristics within a study population. In this study, a survey is used to gather information about respondents' characteristics and experiences with M-Payment systems during the pandemic.

According to (Kabir, 2016), researchers can collect either qualitative or quantitative data. Quantitative research is characterized by the collection of data from large samples that are usually analysed statistically. In contrast, qualitative research uses very small samples for methods such as interviews, observation, and focus groups. In this study, a self-administered online questionnaire is used to collect data from respondents. Appendix 3 shows the survey used in this study. The study uses a cross-sectional design because respondents were asked to complete the questionnaire only once at a specific time. The cross-sectional design was chosen because the goal of the study was not to detect changes in respondents' behaviour over time, as is the case with longitudinal studies.

Because a quantitative methodology was used in this study, a positivist research paradigm is used to evaluate the hypotheses. Positivism focuses on the hypothetico-deductive method of testing a priori hypotheses, often formulated quantitatively, from which functional relationships between causative and explanatory factors/ independent variables and outcomes/ dependent variables can be inferred (Park *et al.*, 2020). Consequently, a

positivist paradigm is used to attempt to achieve the objective of the study by assessing the predictors of adoption and intention to continue using M-Payment systems in post COVID- 19 pandemic.

## **2.2 Hypotheses and conceptual framework**

The study includes the following hypotheses to investigate the relationship between the constructs and the effect of the constructs on the dependent factors, including the effect of the variables on Digital immigrants' continuous intention to use M-Payments.

### **Hypothesis 1 -**

**H1a:** Adoption/Confirmation has a positive impact on Digital immigrants' perceived usefulness of M-Payment systems.

**H1b:** Adoption/ Confirmation has a positive impact on M-Payment systems Digital immigrants' satisfaction.

### **Hypothesis 2 -**

**H2a:** Perceived ease of use has a positive impact on Digital immigrants' perceived usefulness of M-Payment systems.

**H2b:** Perceived ease of use has a positive impact on Digital immigrants' attitudes towards the continued use of M-Payment systems.

### **Hypothesis 3 -**

**H3a:** Perceived usefulness has a positive impact on Digital immigrants' satisfaction to continue the use of M-Payment systems.

**H3b:** Perceived usefulness has a positive impact on Digital immigrants' attitudes to continue the use of M-Payment systems.

**H3c:** Perceived usefulness has a positive impact on Digital immigrants' intention towards the continued use M-Payment systems.

**Hypothesis 4 -**

**H4a:** Satisfaction has a positive impact on Digital immigrants' attitudes towards continued use of M-Payment systems.

**H4b:** Satisfaction has a positive impact on Digital immigrants' intention towards the continued use of M-Payment systems.

**Hypothesis 5 -**

**H5:** Consumer's attitudes have a positive impact on Digital immigrants' intention to continue using M-Payment systems.

**Hypothesis 6 -**

**H6a:** Perceived self-efficacy is positively associated with Perceived ease of use of Digital immigrants' to use M-Payment systems.

**H6b:** Perceived self-efficacy is positively associated with continuous intention of Digital immigrants' to use M-Payment systems.

**Hypothesis 7 -**

**H7a:** The health risk of COVID- 19 has a significant positive effect on the Conformation/adoption of Digital immigrants to use M-Payment systems.

**H7b:** The health risk of COVID- 19 has a significant positive effect on the perceived usefulness of Digital immigrants to use M-Payment systems.

## Hypothesis 8 -

**H8a:** Subjective norms have positive effect on perceived health risk of Digital immigrants towards using M-Payment systems.

**H8b:** Subjective norms have positive effect on self-efficacy of Digital immigrants to use M-Payment systems.

**H8c:** Subjective norms have positive effect on continuous intention of Digital immigrants to use M-Payment systems.

Figure 2 shows the proposed conceptual research framework based on the proposed hypotheses.

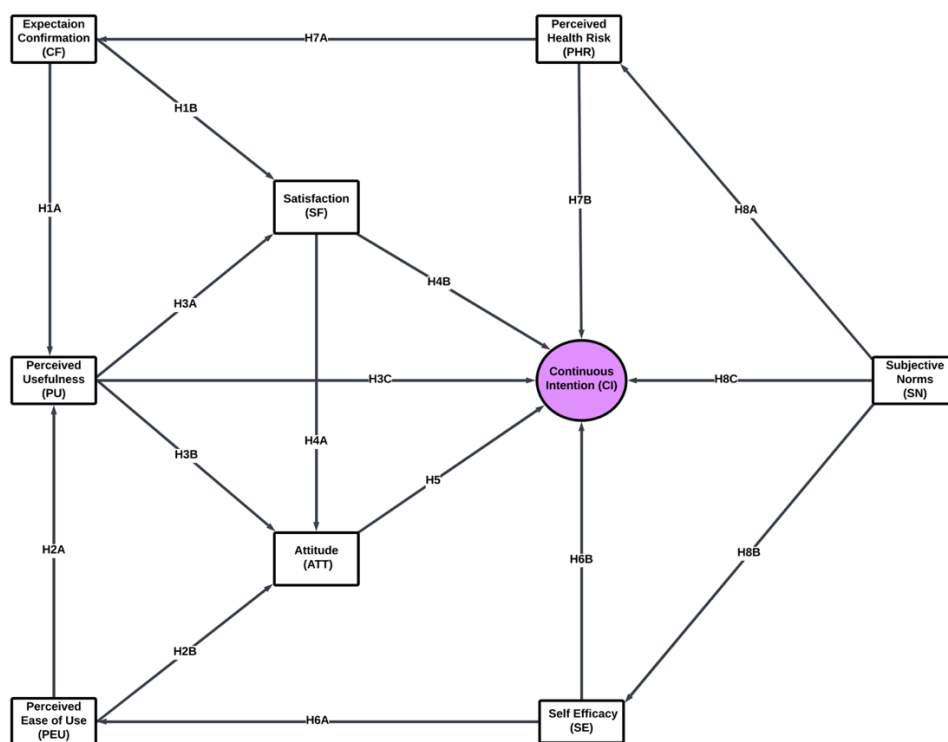


Figure 2. The proposed theoretical framework

Source: Author's own construction

### 2.3 Scale development

The study questionnaire began with an explanation of the purpose and objectives of the study. At the beginning, a description of the term "M-Payment service" and examples of M-Payment applications were given for explanation.

The questionnaire was divided into three sections. First section focused on participants demographic background. The second section participants were asked about their knowledge of M-Payment and current use of M-Payment during the pandemic COVID- 19 . This section aims to find out the extent to which respondents know about M-Payment and whether the pandemic has changed their level of use. Therefore, this section asks questions about respondents' preferred payment methods during the pandemic, the availability of M-Payment on their devices, the frequency of their use, and the types of products or services they have purchased using these apps to date. The third section provides statements measuring the predictors of consumers' intention to continue using M-Payment systems after the COVID- 19 pandemic. This section 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 (Bhattacharjee, 2001). Measures of consumer attitude and satisfaction were adapted from studies (Rahi *et al.*, 2020) (Kumar *et al.*, 2018). perceived health risk were adapted from study (Saleeby, 2000). While subjective norms items were adapted from studies (Fishbein and I. Ajzen, 1991; Hill *et al.*, 1977). Finally, measures of self-efficacy were adapted from study (Gbongli *et al.*,

2019). Section C captures the demographic profile of respondents in terms of age, gender, education level, respondent residence by province, and household income.

## **2.4 Data collection**

Data was collected using a web-based survey or questionnaire. This approach depends on collecting information from participants who respond to the study link using Internet-based communication technology (e.g., email, social media apps, or online survey platform). Researchers are showing increasing interest in Online-based data collection methods, as evidenced by the growing number of studies using online surveys to collect data during the COVID- 19 pandemic (Akintunde *et al.*, 2021, p. 1). Compared to other remote data collection methods (e.g., interviews), it also provides a cheaper and faster way to collect data (no interview is needed and data are entered automatically) (Hlatshwako *et al.*, 2021).

Regarding the language, the questionnaire was written in two languages: English and Hungarian. Both versions were reviewed by professors in Hungary who are fluent in both languages. The questionnaire was distributed among bachelor students at the Faculty of Finance and Accountancy in Budapest Business University, through the internal system of the university. The students were asked to share the survey with their parents and relatives in social media. The participation in this survey was voluntary, and we did not give any benefits to them in order to fill it.

A total of 580 responses were received, of which 415 were used for further analysis. 165 responses were excluded because respondents indicated that they had no experience with M-Payment transactions. The sample size was determined using Slovin's formula. In terms of precision, a confidence level

of 95%, as recommended by (Kothari *et al.*, 2005), indicates a 95 out of 100 probability that the sample results accurately reflect the true state of the population within a specified precision range. Conversely, there is a 5 out of 100 chance that the sample results do not accurately represent the population (Adhikari, 2021). Based on the Slovin's formula below sample size of 380 to 400 can significantly represent a population from 10000 to 10000000 person. Therefore, The sample size well represents the study's population (Digital immigrants in Hungary) .

Slovin's formula is  $(n = N/1+Ne^2)$ . Where:

N = The sample size.

N = The population of the study.

E = Margin of error (5%).

The researchers conducted a pilot test with 60 participants to measure the reliability and consistency of the instrument. Pilot studies are critical because they can predict where the main research project might fail, whether research protocols are not being followed, or whether the methods proposed or the instruments used are inadequate or too complex (Van Teijlingen and Hundley, 2002). The pilot test we conducted aimed to assess the reliability and validity of our survey instrument and model. We selected a subset of 60 participants from the overall pool of 415 study respondents. Participants were chosen to represent the demographic diversity of the larger sample. The results of the pilot test indicated promising levels of reliability and validity. Cronbach's alpha measure exceeded the threshold of (0.70) for all constructs. The results also supported the consistency of the constructs as they showed no intercorrelation among the items. Hence, The findings provided a promising indication that gathering data from the entire participant pool would offer valuable insights into the factors affecting the willingness of



digital immigrants to embrace mobile payment technologies in the post-pandemic environment. which provided confidence in the robustness of our research tools.

## **2.5 Data analysis mechanisms**

In the study, three statistical programmes were used to analyse the data, namely (Excel, IBM SPSS and PLS-SEM). The next step after creating and administering a questionnaire would be to enter the raw data into a data management application such as Microsoft Excel. Microsoft Excel is a spreadsheet program for organizing numbers and data using formulas and functions (Gipson, 2020). Excel analyses are widely used all over the world and are used by companies of all kinds for financial analysis. Using Excel, we were able to create a codebook for our data that would allow us to import the data into another program where the data analysis would be performed (e.g., SPSS and PLS-SEM).

Statistical Product and Service Solutions (SPSS) was used to analyse the respondents' descriptive data. IBM acquired the software package in 2009 and it is now known as IBM SPSS (Frey, 2017). The original manual for SPSS, written by the developers of the software, is considered one of the most important books in sociology of all time because it focuses on making statistical analysis user-friendly for ordinary academics (Jatnika, 2015). Other important functions of SPSS are data management and data documentation (Rahman and Muktadir, 2021). Students and researchers in business, sociology, psychology, and other disciplines use this application most often. SPSS is an excellent option for marketing and survey companies to analyse and predict consumer behaviour (Mesquita and Kosteljik, 2021).

Finally, similar to previous studies (Hubert *et al.*, 2019) (Foroughi *et al.*, 2019) (Khayer and Bao, 2019), the partial least square structural equation modelling (PLS-SEM) was carried to analyse the research model. (PLS-SEM) is widely used in the fields of marketing and social sciences (Shmueli *et al.*, 2019). (PLS-SEM) is considered a suitable approach for models that contain many constructs, indicators, and relationships (Shiau *et al.*, 2020). Moreover, PLS-SEM is a causal-predictive model. It is based on explaining the underlying cause and then predicting the future behaviour (Shmueli *et al.*, 2019). For the above reasons, the study (PLS-SEM) predicted consumer behaviour towards digital wallets in the contribution of COVID- 19.

### 3 RESULTS OF ANALYSIS

#### 3.1 Demographic information

The analysis of respondents' demographic information plays a pivotal role in understanding the composition of the surveyed population and provides valuable insights into the context of the data collected. By incorporating demographic factors such as sex, age, education, and occupation, researchers gain a comprehensive understanding of the diverse characteristics within their sample.

**Gender:** The results show that (59.42%) of the respondents were male, and 40.58% were female. Thus, our results show a higher frequency level of male participants compared to the female participants.

**Age:** The results show that the majority of the respondents were from generation X (40- 55 years) with 48%, followed by those between 56 and 70 years of age (39%). While around 13% of participants were older than 70.

**Education:** The level of education varied among the respondents. The results show that around 42% of the participants have a bachelor's degree. Followed

by those who hold a PhD degree with 25.5% of participant. Master's level represent 22% of the respondents. While those at PhD level reach about 10.3% of the participants.

**Occupation:** The majority pf participant were among the lecturers (Schools teachers and universities professors/assistants with 87% of the whole participants. 18.6% of the participants work at administrative levels in the targeted educational institutions. Finally, only 3.2% of the participants were workers or external supervisors in the educational institutions.

Furthermore, surveyed people were asked six other questions related to M-Payment usage behaviour of respondents during the pandemic. The following questions are:

1. When you began using M-Payment systems?
2. What types of transactions do you primarily use M-Payment for?
3. How frequently do you use M-Payment now compared to before the pandemic?
4. I believe that using M-Payment is a health protective tool from COVID- 19 infection?
5. How important is the health preventive role of M-Payment in your decision to continue using them after the pandemic?
6. In your opinion, do you believe that M-Payment will continue to play a significant role in health preventive measures post-pandemic?
7. Will you continue using M-Payment?
8. How likely are you to recommend M-Payment to your friends or family members for their health safety and convenience?

The results of the first question give a clear sign that adoption of M-Payment systems among Digital Immigrants was influenced by the effect of COVID-19 pandemic. 36% of the participants declared that they began started using M-Payment systems during the COVID- 19 pandemic. On the other side, almost 64% of the participants said that were users of M-Payment systems before the pandemic. The second question shows that Digital Immigrants used M-Payment transactions for different purposes. The results show they are most likely to use this payment method for In-store purchase, online shopping, and bills payment (39%, 31%, 18%, and 12% respectively). The third question focused to the frequency of the M-Payment usage among Digital Immigrants before and after the pandemic. The results show a significant increase of M-Payment usage among Digital Immigrants after the pandemic (65%). While, around 26% of respondents declared that were no changes of their usage, and only 9% said that their M-Payment usage tend to be less frequent compared to before the pandemic. Moreover, results of the fourth and fifth questions support the belief about the effect of COVID- 19 pandemic on consumers usage behaviour in terms of thoughts/beliefs and the actual behaviour. Around 62% of the participants believe that using M-Payment systems during the COVID- 19 pandemic could be a health protective tool from the infection risk of the virus. Meanwhile, 54% of the participants that the protective health role of M-Payment affect their decision to continue using M-Payments after the COVID- 19 pandemic. Based on the results of the sixth question, almost half of the participants believe that M-Payments will continue to play a significant role in health preventive measures post-pandemic. Finally the last two questions in this section focus on the core of this research work. Participants were asked clearly if they have the intention to continue using M-Payment systems in the future, and recommend it to their friends and family members. The results of those question demonstrates a clear idea that Digital Immigrants have a strong

intention to continue using M-Payment in the future with 68% announced in their positive intention. While 56% declared that they will recommend their peers and friends to use it.

### **3.2 Evaluation of the structural model in PLS-SEM**

Having confirmed the reliability and validity of the measurement model, the next step is to test the research hypotheses using the structural model. When evaluating a structural model, the path coefficients between the latent variables of the structural model must be evaluated (Henseler *et al.*, 2009). The significance level for significant path coefficients must be at least 0.05. The bootstrap method can be used to determine the significance of path coefficients. PLS-SEM provides only standard values, not the standard error. To obtain an accurate estimate of the standard error, a repeated sample was used, which can be achieved by bootstrapping. For path coefficients to be considered significant, the significance level must be at least 0.05. With a total of 5,000 repeated iterations, the bootstrapping method can be used to calculate the significance level of the paths. The results are shown in figure 3.

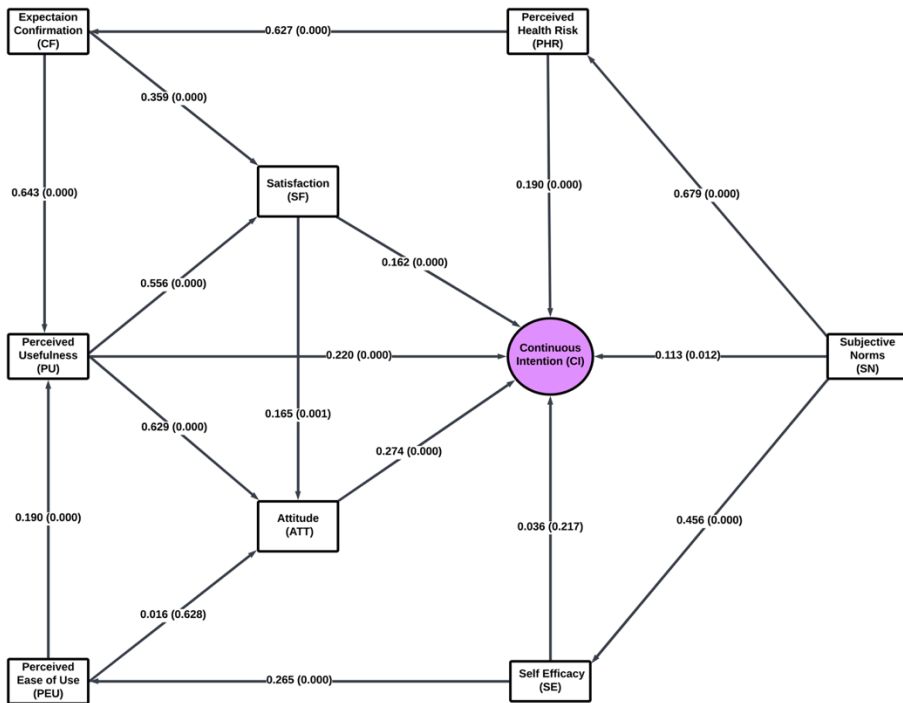


Figure 3. Results of the proposed model

**Note 1:** ATT= Attitude; CF = Conformation; CN = Continuous intention; SN = Subjective norms; PEU = Perceived ease of use; PHR = Perceived health risk; PU = Perceived usefulness; SE = Self-efficacy; SF = Satisfaction.

**Note 2:** P-value < 0.05 is significant; P-value > 0.05 is insignificant

### 3.2.1 Model validity: Path coefficients

A full bootstrapping procedure with (5000 replicate samples) was used to assess the significance of the standardized path coefficients. According to (Jr *et al.*, 2011). 1.96 (significance level = 5%), 2.85 (significance level = 1%), and 3.29 (significance level = 0.1%) are the respective critical t values for a two-sided test. Non-significant or opposite paths do not support a prior hypothesis, but significant paths pointing in the hypothesized direction provide empirical support for the suspected causal relationship (Jr *et al.*, 2011). Therefore, t-values of 1.96 or greater are considered significant and

support the proposed hypotheses in this study, while t-values of less than 1.96 indicate no significant effects and do not support the predetermined hypotheses in this study. The results of the hypotheses are presented in Table 4.

The results showed that adoption/confirmation has a significant effect on perceived usefulness and satisfaction ( $\beta$  0.346, t-value 8.089,  $p < 0.05$  and  $\beta$  0.123, t-value 2.927,  $p < 0.05$ , respectively). Therefore, H1A and H1B were confirmed. Similarly, the results showed that perceived ease of use has a significant effect on PU ( $\beta$  0.190, t-value 5.713,  $p < 0.05$ ). However, the effect of perceived ease of use on attitude was insignificant ( $\beta$  0.010, t-value 0.344,  $p > 0.05$ ). Thus, H2A was confirmed while H2B was not. H3A, H3B and H3C are all confirmed as perceived usefulness significantly influenced satisfaction, attitude and continuous intention ( $\beta$  0.526, t-value 12.009,  $p < 0.05$ ;  $\beta$  0.575, t-value 10.693,  $p < 0.05$ ; and  $\beta$  0.219, t-value 3.717,  $p < 0.05$ , respectively). Satisfaction also has a significant effect on attitude and continuous intention ( $\beta$  0.146, t-value 2.738,  $p < 0.05$  and  $\beta$  0.160, t-value 3.818,  $p < 0.05$ , respectively). Thus, H4a and H4b were confirmed. The effect of attitude on continuous intention was also significant ( $\beta$  0.270, t-value 4.666,  $p < 0.05$ ). Thus, H5 was confirmed. On the other hand, PMT constructs were not fully significantly related to TCT constructs. Although, self-efficacy had a significant effect on PEU ( $\beta$  0.265, t-value 5.797,  $p < 0.05$ ), however it had insignificant relationship with attitude and continuous intention ( $\beta$  0.096, t-value 1.794,  $p < 0.05$  and  $\beta$  0.035, t-value 1.290,  $p < 0.05$ , respectively). Thus, H6A were confirmed, while H6B and H6C were rejected. Moreover, perceived health risk had the significant effect on confirmation, satisfaction and continuous intention ( $\beta$  0.627, t-value 20.419,  $p < 0.05$ ;  $\beta$  0.053, t-value 1.396,  $p < 0.05$ ; and  $\beta$  0.190, t-value 3.638,  $p < 0.05$ , respectively). Based on that, H7A and H7C were confirmed, while H7B were rejected. Finally,

subjective norms had a direct significant effect on continuous intention ( $\beta$  0.123, t-value 2.972,  $p < 0.05$ ). Consequently, H8 were confirmed.

*Table 4. Hypotheses testing*

No.	Hypothesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV  )	P Values	Status
H1A	CF -> PU	0.346	0.348	0.043	8.089	<b>0.000</b>	<b>Supported</b>
H1B	CF -> SF	0.123	0.123	0.042	2.927	<b>0.004</b>	<b>Supported</b>
H2A	PEU -> PU	0.190	0.191	0.033	5.713	<b>0.000</b>	<b>Supported</b>
H2B	PEU -> ATT	0.010	0.011	0.029	0.344	<b>0.731</b>	<b>Not supported</b>
H3A	PU -> SF	0.526	0.524	0.044	12.009	<b>0.000</b>	<b>Supported</b>
H3B	PU -> ATT	0.575	0.570	0.054	10.693	<b>0.000</b>	<b>Supported</b>
H3C	PU -> CN	0.219	0.220	0.059	3.717	<b>0.020</b>	<b>Supported</b>
H4A	SF -> ATT	0.146	0.151	0.053	2.738	<b>0.009</b>	<b>Supported</b>
H4B	SF -> CN	0.160	0.166	0.042	3.818	<b>0.007</b>	<b>Supported</b>
H5	ATT -> CN	0.270	0.268	0.058	4.666	<b>0.003</b>	<b>Supported</b>
H6A	SE -> PEU	0.265	0.268	0.046	5.797	<b>0.002</b>	<b>Supported</b>
H6B	SE -> CN	0.035	0.034	0.027	1.290	<b>0.198</b>	<b>Not supported</b>
H7A	PHR -> CF	0.627	0.627	0.031	20.419	<b>0.000</b>	<b>Supported</b>
H7B	PHR -> CN	0.190	0.186	0.052	3.638	<b>0.010</b>	<b>Supported</b>
H8A	SN -> PHR	0.679	0.671	0.026	25.826	<b>0.000</b>	<b>Supported</b>
H8B	SN -> SE	0.456	0.458	0.040	11.492	<b>0.000</b>	<b>Supported</b>
H8C	SN-> CN	0.123	0.123	0.042	2.927	<b>0.004</b>	<b>Supported</b>

**Note 1:** ATT= Attitude; CF = Conformation; CN = Continuous intention; SN = Subjective norms; PEU = Perceived ease of use; PHR = Perceived health risk; PU = Perceived usefulness; SE = Self-efficacy; SF = Satisfaction.

### 3.2.2 Importance-performance map analysis

The importance of performance matrix analysis (IPMA) seems to enable researchers to gain additional results to improve management activities (Rahi *et al.*, 2020). IPMA helps researchers to distinguish constructs that may have relatively high importance but somewhat low performance in shaping the



dependent variable (Hair *et al.*, 2017). The importance of the independent variables is determined by their overall effects on the dependent variable. At the same time, the average values of the latent variables estimate the performance rescaled from the lowest 0 to the highest 100 (Hair *et al.*, 2017). According to the results of IPMA in Table 9, consumer's perceived health risk and perceived usefulness have the highest importance value (0.449 and 0.466, respectively), followed by confirmation and attitude, which have intermediate importance levels (0.366 and 0.254, respectively). However, self-efficacy and perceived ease of use have a slightly low effect on continuous intention compared to the other constructs with (0.086 and 0.074, respectively). In term of the constructs performance for continuous intention, consumer's perceived health risk and perceived usefulness also have the highest performance (71.586 and 71.285, respectively). Suggesting that the health threat construct is critical in determining consumers' continuance intention towards M-Payment adoption in the future. On the other side, self-efficacy and perceived ease of use also have the lowest performance for continuous intention (59.762 and 58.364, respectively).

**Table 5.** Importance of performance matrix analysis

	<i>Construct Performances for [CN]</i>	<i>Construct Total Effects for [CN]</i>
<b>ATT</b>	68.8474	0.2579
<b>CF</b>	65.6746	0.3892
<b>SN</b>	68.5856	0.5068
<b>PEU</b>	58.3643	0.0794
<b>PHR</b>	71.5332	0.4832
<b>PU</b>	71.2854	0.4937
<b>SE</b>	59.7511	0.0561
<b>SF</b>	69.7362	0.1920

**Note:** ATT= Attitude; CF = Conformation; CN = Continuous intention; SN = Subjective norms; PEU = Perceived ease of use; PHR = Perceived health risk; PU = Perceived usefulness; SE = Self-efficacy; SF = Satisfaction.

## **4 DISCUSSION OF RESULTS AND CONCLUSIONS**

The previous chapter explained the results of the data analysis and explored the potential predictors of intention to continue using M-Payment systems and intention among DI in Hungary. The Partial Least Squares Structural Equation Modelling approach (PLS-SEM) was used to examine the effect of the constructs on the dependent variables. This chapter discusses the main results presented in Chapter 5, Novel results, theoretical and managerial implications, limitations of the study, and finally an overall conclusion about the study.

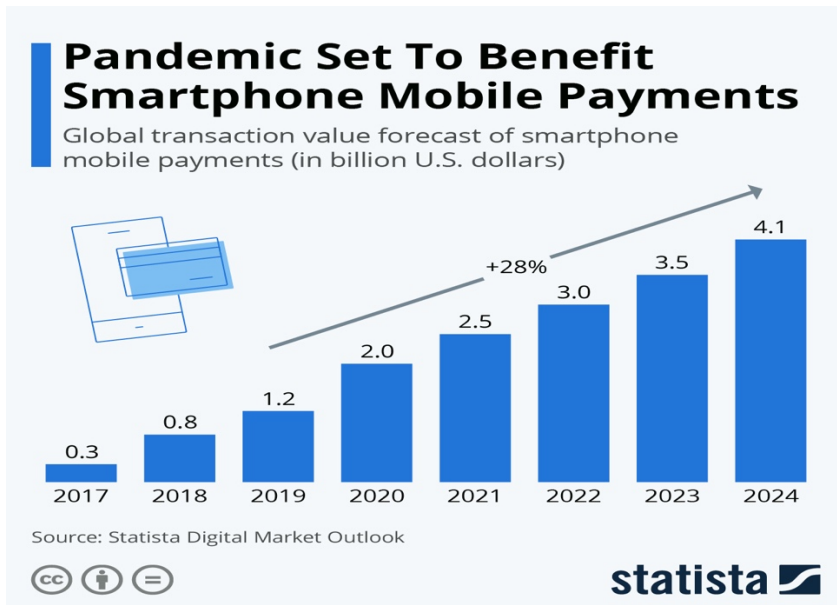
### **4.1 Study findings**

Due to the unique nature of this study, the major goal is to help describe the wide issue of M-Payment implementation during and after the COVID- 1919 pandemic among Digital Immigrants in Hungary. This study drawing on known models and theories to reach these results. The research issues were addressed through data collection and analysis using model created based on three well known theories namely; TPB, TCT, and PMT, with asking participants some behavioural questions assuming a phenomenological approach to support the qualitative aspect of the research. The empirical research findings, including the results of each research question, are addressed further below.

The second section of the questionnaire has been designed to answer and interpret the first two question:

1. What is the impact of COVID- 19 on M-Payment adoption among Digital Immigrants?
2. What is the level of M-Payment adoption among Digital Immigrants during the pandemic, and identify their willing to continue use it?

The results show that more than one third of the Hungarians Digital Immigrants participants in this survey declared that they used M-Payment for the first time after the pandemic began. The results consistent with The Statista Digital Market Outlook that forecasted that the value of M-Payment is set to continue increasing in the years ahead, with 28 percent growth predicted between 2019 and 2024 (McCarthy, 2020). Figure 4 shows the global transaction value forecast of M-Payments. Besides, almost two third of participants mentioned that they use M-Payment more frequently since the COVID- 19 pandemic began. The results is totally consistent with Statista Research Department study which found that 65 percent of French people stated that they would use M-Payment applications at least as much as during lockdown (Medve, 2021). Moreover, the results also supported by a survey conducted by (Medve, 2022b) in 2022, nearly 80% of Hungarians were mobile banking users. And 15% of respondents used a mobile banking application at least once a day.



*Figure 4. Global transaction value forecast of M-Payments*

Source: (McCarthy, 2020)

Based on our results, 62% of the participants declared that they consider M-Payments as a preventive health tool from the COVID- 19, and 54% confirmed that the preventive health tool of the COVID- 19 influenced their decision to use M-Payments. The results correspond with (C.C and Prathap, 2020) study, which shed lights on the impact of COVID- 19 perceived health risk on M-Payment adoption in India. In meantime, participants also showed an strong intention to continue use M-Payment in the future, and 56% of them said that will recommend using it to friends and family members due to health safety and convenience considerations.

In this context, we can argue that COVID- 19 pushed and expanded M-Payments usage and frequency among Hungarian Digital Immigrants majorly for four reasons. Firstly, such transactions are considered to be instrumental in adhering to social distancing and health preventive norms (Hanif and Lallie, 2021). Where Hungarians Digital Immigrants could conveniently

execute digital payment transactions. Secondly, the fear that face Digital Immigrants as they are among the high risky segment of death possibility if they get infected by the virus pushed them to look at contactless M-Payment as a preventive health tool. Thirdly, many retailers and delivery services began accepting digital payments, and customers were left with no choice but to adopt digital payment services (Horák, 2020). For instance, at the fourth quarter of 2020 alone, the number of POS terminals at merchant acceptance points increased by 7% as consumers increasingly make contactless payments (Bakonyi, 2021). Fourthly, The Hungarian government actions to promote cashless payments and reduce physical contact at the point of sale (Bakonyi, 2021).

The third section of the questionnaire has been designed to validate the integrated framework of TCT, TPB and PMT, and to answer the following questions:

1. What are the factors that influence Digital Immigrants' intention to continue using M-Payment systems?
2. What are the interactions between the factors influencing Digital Immigrants' intention to continue using and their behaviour.
3. Can the proposed model reliably measure the factors influencing Digital Immigrants' continued use of M-Payment systems in the context of the COVID- 19 pandemic or similar diseases that may occur in the future through direct contact?

The integrated model had the power to explain 75.4% of the variance in consumers' continuation intention toward M-Payment systems. In comparison to other studies (Wei *et al.*, 2020) (C.C and Prathap, 2020)

(Puriwat and Tripopsakul, 2021) that focused on understanding the contactless payment adoption behaviour during the pandemic, our model showed significant acceptance level of interpreting the continuous intention to use M-Payment in the context of the COVID- 19 pandemic (Hair *et al.*, 2019). This give a proof that our model were reliable to measure the factors influencing Digital Immigrants' continued use of M-Payment systems.

In term of answering the third and fourth questions, the following discussion focuses on the influence level of the constructs on continuous intention to use M-Payments, and the interactions among the constructs.

The results of this study showed that perceived health risk had a significant impact on adoption/confirmation and perceived usefulness of M-Payments. Similar to the results of (C.C and Prathap, 2020) study that applied ECM to understand the continuous adoption of M-Payment among the Indian society. 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 these reasons 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 M-Payment use is viewed as a protective health behaviour, leading them to feel that the perceived usefulness of M-Payment as a financial tool reduces the risk of contracting the virus. Per public health reports, Digital Immigrants are among the generation segments that fall in the higher risk of COVID- 19 infection and health complications due to their age and active professional role in society. Furthermore, Digital Immigrants are often described as the generation segment of society that are responsible for and concerned about their well-being and those around them, such as children. Considering that using cash

has been described as a vehicle of virus spread (WHO, 2020). it is understandable and logical that Digital Immigrants would consider a move towards cashless transactions. Overall, our findings are consistent with other studies and reports that have indicated the need to replace cash and direct contact payment methods with contactless digital payments (C.C and Prathap, 2020) (Aji *et al.*, 2020) (Auer *et al.*, 2020).

However, the constructs of perceived threat alone were not sufficient to determine consumers' continuous intention. 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 has an insignificant influence on attitude and continuous intention to use M-Payment. This may explain that Digital Immigrants are not fully confident of their ability to use M-Payment. These findings are inconsistent with previous studies that shown a direct effect of self-efficacy on continuous use of mobile banking services (Foroughi *et al.*, 2019) (Susanto *et al.*, 2016). Thus, we can argue that as consumers have demonstrated inability to use M-Payment systems, their intentions to use them in the future are less.

Subjective norms significantly influences Digital Immigrants' intention of adopting M-Payment. The results correspond with pre-pandemic studies (Liébana-Cabanillas, Ramos de Luna and Montoro-Ríos, 2017) (Oliveira *et al.*, 2016), and post-pandemic studies (Koch *et al.*, 2020). The result also indicates that subjective norms is significantly associated with perceived usefulness, similar to previous studies (Aji *et al.*, 2020). (Sathye *et al.*, 2018) explained that perceived usefulness mediates the impact of subjective norms on BI. (Sathye *et al.*, 2018) analysis, we argue that if Hungarian family members and friends are adopting a M-Payment system, this will be an added-value in the diffusion of the M-Payment system as they will influence others

to use it. This happens by sharing information and views about the risks, costs, and benefits of using such kinds of services. More specifically, the pandemic and adherence to social distancing forced people to rely more on social media and other forms of communication to exchange views and share information. We believe that family, friends, influencers, celebrities, health experts, and others via different communication outlets affect consumers' views and behaviours. The subjective norms effect on BI was evident in our study as most respondents who adopted M-Payments mentioned the influence of people they viewed as important on their decision. The effect of subjective norms on consumers' BI during the COVID- 19 crisis is expected as previous pre- COVID- 19 studies have shown this relationship to be significant during the crisis (Koch *et al.*, 2020).

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 (Foroughi *et al.*, 2019) whom use TCT to investigate the determinants of m-banking continuance intention to use. And (Rahi *et al.*, 2020) whom integrated TCT with TTF theory in the context of understanding the Internet banking user continuance intention. This implies that Digital Immigrants intend to continue using M-Payment, 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 behaviour (Davis, 1989). Our results showed that perceived usefulness had a significant relationship with attitude. In contrast, perceived ease of use had an insignificant effect on Digital Immigrants' attitude. This result is not consistent with the study of (Rahi *et al.*, 2020) who found a significant effect of perceived ease of use on users' attitude towards continued use of internet banking (Rahi *et al.*, 2020). However, (Foroughi *et al.*, 2019) explained the



non-significant relationship between perceived ease of use and attitude. They argued that in the post-adoption phase, consumers became more experienced and familiar with using the mobile banking system (Foroughi *et al.*, 2019). 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 M-Payment. Based on TCT, consumer satisfaction is driven by confirmation and perceived usefulness (Rahi and Abd. Ghani, 2019). Our study found that consumer satisfaction with M-Payments is driven by confirmation and perceived usefulness, which is consistent with previous studies (Rahi *et al.*, 2020) ((Susanto *et al.*, 2016). These results suggest that if consumers' initial expectations are met and these consumers realize the functional and health benefits of using M-Payment during the pandemic, this will have a positive impact on satisfaction levels. In addition, satisfaction significantly influenced consumers' attitudes and intentions to continue using M-Payment, consistent with previous studies (Foroughi *et al.*, 2019) (Khayer and Bao, 2019).

The researcher conducted the effect size and IPMA analysis to gain a deeper insight into the factors that influence consumers' continuation intention of digital wallets. As shown in the effect size analysis, self-efficacy is the most significant construct in predicting Digital Immigrants' continuance intentions toward M-Payments. Therefore, to improve consumers' attitudes, they should perceive the benefits of M-Payment 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, and satisfaction with

index values ( 37.6%, 28.1%, 18.9%, respectively). The significant role of self-efficacy in determining the Digital Immigrants' continuous intention is confirmed in previous studies (C.C and Prathap, 2020) (Aji *et al.*, 2020). (Foroughi *et al.*, 2019) recommended banks to develop strategies to improve consumers' self-efficacy towards m-banking, such as providing training to bank customers on the features of m-banking services and how to use them (Foroughi *et al.*, 2019).

## **4.2 Novel findings**

This study presents new scientific findings based on research data and results. These findings can be used to develop future studies and research based on the analytical approach and additional constructs in the model.

1. The main theoretical contribution of this study is the development of a validated research model that integrates three theories (TCT, TPB, and PMT). To our knowledge, this empirical study was the first to combine theory focused on people behaviour to cope with health threats (PMT), theory concerns with people motives to engage in a behaviour in certain time and place (TPB), and theory predicts users' willingness to keep using a certain technology based service (TCT). As the COVID- 19 pandemic pushed people to adjust their behaviours including payment behaviours in terms of health protection. Thus, the latter theories were best combination to create a model contributed to understand the factors that influence consumers' intentions to continue using M-Payment during and after the COVID- 19 pandemic.
2. As World health organization expected an increase in the frequency and coverage of the pandemics in the future (World Health Organization, 2022). The R2 value indicated that the model

constructs explained 75.4% of the variance in continuous intention, which is an acceptable substantial level. It means that the model provided a better understanding of the factors influencing Digital Immigrants' intention to continue using M-Payment in the post-COVID- 19 era. Therefore, this model can be reliable to understand people intention to adopt various contactless technologies in times of appearance contact based disease pandemics in the future.

3. The age segment of the participants in this study was one of the determining factors. Based on previous studies, Digital Immigrants have less willingness to adopt new technologies or innovations, as they were born before the digital age and have less knowledge of how to use technical systems. The novelty of this study that it was the first focused on understanding digital immigrant intention to continue using M-Payment in Hungary. Meanwhile, our study proved that Digital Immigrants in Hungary have the intention to use M-Payment more than any time before influenced by varied factors such as the convenience and health safety role of M-Payments played during the pandemic. Thus, as Hungary is an aging country with an average age of 43, the government, policy makers, and financial institutions need to provide easy-to-use financial innovations that match the skills of Hungarian Digital Immigrants and teach them how to use them.
4. One of the main contributions of this study that it provides well-defined insights into the key aspects of M-Payment usage among Digital Immigrants. The primary motivation for Digital Immigrants to use M-Payment is the perceived health risk of using

cash and contact-based payment methods. Digital Immigrants considered M-Payment systems as a health-protective payment method during the pandemic. This view is supported by our results, which show that nearly 36% of respondents used M-Payment for the first time during the pandemic, and 65% of respondents reported that their use had increased since the pandemic began.

5. The study found that the one of the primary motivations for Digital Immigrants is that the service confirms their expectations that resulted from their initial use. This leads to the development of a concept of usability that helps digital immigrant users view M-Payment as a technology whose outcomes outweigh the effort required to use it on a daily basis. Hence, our study found the M-Payment in Hungary met Digital Immigrants expectations in terms of convenience and usefulness, and that reflected positively on their intention to continue use this service.

This work will also serve to shed light on the social factors that determine the long-term use of M-Payment by Digital Immigrants by examining them in the context of a larger social application. Integrating subjective norms one of the pillars of TPB to the model assist significantly in interpretation the intention of Digital Immigrants to continue use M-Payment. The influence of subjective norms on BI was evident in our study, as most respondents who adopted M-Payment mentioned the influence of people they considered important to their decision. The novelty of including subjective norms that the concept wide the society that influence user decisions from family and friends to include health experts and social

media news. During the pandemic, the latter also had a significant influence on Digital Immigrants to adjust their old behaviours and adopt new behaviours such as M-Payment.

### **4.3 Study Implications and Recommendations**

#### **4.3.1 Theoretical implications**

This study has introduced several theoretical contributions to the continuum of M-Payment usage in post of COVID- 19 among Digital Immigrants in Hungary. To our knowledge, this empirical study was the first to combine TPB, PMT 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 construct in driving consumers to use M-Payment during the pandemic. The study viewed adoption at this stage as a health-protective behaviour 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 (Heeks and Ospina, 2019) (Pal *et al.*, 2020) (Afawubo *et al.*, 2020). Moreover, our study highlights the crucial role of self-efficacy as one of the PMT and TPB constructs in determining the continuity of consumers' intentions. However, the effect of self-efficacy on continuous intention were insignificant. Thus, Digital Immigrants in Hungary showed less confidence in their abilities to use M-Payment and that effect on their intention to continue use it. Thus, the study confirmed the lack of knowledge and skills to use M-Payments is one of the crucial barriers that face Digital Immigrants to continue use it (Xiong, 2022). On contrast, subjective norms significantly influence the intention of Digital Immigrants to continue use M-Payment. Following (Sathye *et al.*, 2018) analysis, we argue that if Hungarian family members and friends adopt

a M-Payment system, this will add value to the M-Payment system's spread as they will influence others to use it. This is done by sharing information and views about the risks, costs and benefits of using such types of services. More specifically, the pandemic and adherence to social distancing forced people to rely more on social media and other forms of communication to exchange opinions and share information. We believe that family, friends, influencers, celebrities, health professionals, influence Digital Immigrants views and behaviours through various communication channels.

The study also confirmed TCT factors as triggers for intention to continue using M-Payment. Consequently, confirming consumers' expectations of M-Payment 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 M-Payment 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 (Theocharidis *et al.*, 2020).

### **4.3.2 Managerial implications and Recommendations**

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, and to reduce the direct based financial transactions in the future . The introduction of M-Payment 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 COVID-19 virus or any contact based diseases that might appear in the future. Therefore, policymakers should encourage and make consumers aware of how easy it is to use M-Payment as a healthy financial tool during the pandemics. The Hungarian government and decision makers can launch comprehensive educational campaigns to raise awareness about the health benefits of M-Payments. These campaigns should highlight the reduced risk of exposure to viruses like COVID-19 through contactless transactions. Providing clear, simple instructions on how to use M-Payment platforms will empower digital immigrants to make the switch. Furthermore, they are suggested to initiate widespread financial literacy programs. These programs can educate citizens about the advantages of M-Payments, including security, convenience, and the potential for financial management tools.

On the other hand, the Hungarian government is suggested to support the development of the FinTech industry, including M-Payment projects, by encouraging the creation of these types of projects, facilitating their licensing procedures and reducing taxes. Implementing incentive programs can serve as a powerful motivator. Governments can collaborate with financial institutions and businesses to offer discounts, cashback rewards, or loyalty points for transactions made through mobile payment systems. These incentives not only encourage adoption but also provide immediate economic advantages.

Digital Natives in Hungary also suggested raising awareness among their peers about the use, importance and benefits of M-Payment systems compared to traditional payment channels. In addition, the insignificant effect of perceived ease of use and self-efficacy among Digital Immigrants on the

initial and ongoing adoption should be considered. Service providers, including fintech companies and banks, are recommended to improve the design, content, and features of M-Payment applications to match the capabilities of current users and attract new potential users. In addition, M-Payment service providers are recommended to educate their current and potential customers about M-Payment usage mechanisms by publishing visual and written information about the benefits and mechanisms of using M-Payment systems.

#### **4.4 Study limitations and Suggestions for future research**

Despite the insightful practical and theoretical implications of our study, this study is not without some limitations. First, The study's primary drawbacks is the geographical concern. As this study has only a very limited sampling in a specific country (Hungary). Because of these concerns, the findings of this study cannot be generalized for all Digital Immigrants worldwide. Thus, further research in other countries in Europe and worldwide is recommended to verify the results. Second, Our study focused on the physical risk of becoming infected when using non-digital means of payment. Future studies should also consider other risks such as privacy risk, financial risk, and security risk. In addition, the study did not examine the moderating influence of Digital Immigrants demographic characteristics such as gender, income, and education level. Third, this study used the cross-sectional method, where data has been collected from participants in a single point of time. Future research could investigate the underlying factors in a longitudinal context to have a clear insight of Digital Immigrants' intention to continue using M-Payment in the future.

Fourth, this study uncovered the factors affect Digital Natives in Hungary to continue using M-Payment. Thus, future research suggested to make a



comparison study about the factors affect both Digital Natives and immigrants, to identify the similarities and differences of both generations behaviours in term of using M-Payment. As health threat constructs' effect on the initial adoption is more obvious than the continuous adoption, future research could involve factors like trust as a crucial parameter that affect the consumers' intentions towards M-Payment continuous adoption. Finally, for further research on M-Payment usage, we propose considering these factors along with respondents' place of residence (i.e., rural/urban), household type (i.e., single without children/single with children/married with children/etc.), and employment status. Thus, these factors can be included as control variables to test the degree of their influence on Digital Immigrants behaviour patterns.

## **5 Conclusion and Thesis summary**

The world is taking steady steps towards a cashless society, supported by the increasing percentage of people who access the internet and mobile phone terminals (Liébana-Cabanillas *et al.*, 2020). The Fintech industry in developing countries like Hungary is in its early stages. Amongst Fintech industry branches, payment services are commonly adapted in Hungary (Kft Tanácsadó, 2020). The Hungarian online market during the first half of 2020 increased by 121%, with an estimate of 3.35 million online Hungarian shoppers in that period. This is not surprising considering the effects of the COVID- 19 crisis on people's daily lives and behaviours. Such impact on consumers' purchasing behaviour is attributed to the influence the pandemic news and reports and the shared information of the surrounding environment like family, friends, etc. Therefore, M-Payment has been utilized to complete financial transactions while reducing the virus's risk.

The purpose of this empirical study was to evaluate factors that influence the behavioural intentions of Hungarians Digital Immigrants to use M-Payment services during the pandemic of COVID- 19. To achieve this goal, we conducted an electronic questionnaire-based survey of 415 people of ages within the category of Digital Immigrants. Previous studies argued that Digital Immigrants have less knowledge and capability in term of adopting technology (Rondan-Cataluña *et al.*, 2015; Walker Mark, 2019). However, our study found that Digital Immigrants in Hungary are in an increasing trend in term of using M-Payment as one of the technological payment solutions. Th study revealed that Digital Immigrants increased their usage of M-Payment since the COVID-19 pandemic began, and showed high level of intention to continue using it in the long term.

Structural Equation Modelling (SEM) was used to analyse the eight hypotheses developed based on the research's conceptual model. The current study examines consumers' continuous intention to adopt M-Payments with the integration of TPB, PMT 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, and few have focused on the post-adoption phase. Therefore, this study applied the PMT, which provided significant results to explain the initial adoption of M-Payment systems during the pandemic. We proposed the TCT, which showed high explanatory power for post-adoption behaviour, to investigate continuous adoption. The results showed that attitude, satisfaction, perceived usefulness and self-efficacy have a significant positive influence on consumers' intention to continue using M-Payment. In addition, our model was able to explain 75.4% of the variance in continuous intention.

In addition, the PMT constructs perceived health threat and self-efficacy had a significant influence on the initial acceptance of the M-Payment. In addition, IPMA results showed that perceived health threat 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 M-Payment during the pandemic, which can be considered as protective health behaviour. Therefore, it is recommended that policy makers launch educational campaigns on the recommended behaviours that can help reduce the possibility of contracting the virus and correspond with social distancing measures. Such recommended behaviours include adopting the M-Payment service. On the other hand, M-Payment service providers are recommended to offer modern, renewable services that meet consumers' needs and match their financial and technical capabilities.

## 6 Reference

- Abu Daqar, M.A.M., Arqawi, S. and Karsh, S.A. (2020), “Fintech in the eyes of Millennials and Generation Z (the financial behavior and Fintech perception)”, *Banks and Bank Systems*, Vol. 15 No. 3, pp. 20–28, doi: 10.21511/bbs.15(3).2020.03.
- Adhikari, G.P. (2021), “Calculating the Sample Size in Quantitative Studies”, *Scholars’ Journal*, pp. 14–29, doi: 10.3126/scholars.v4i1.42458.
- Afawubo, K., Couchoro, M.K., Agbaglah, M. and Gbandi, T. (2020), “Mobile money adoption and households’ vulnerability to shocks: Evidence from Togo”, *Applied Economics*, doi: 10.1080/00036846.2019.1659496.

- Aji, H.M., Berakon, I. and Md Husin, M. (2020), “COVID-19 and e-wallet usage intention: A multigroup analysis between Indonesia and Malaysia”, edited by Tan, A.W.K. *Cogent Business & Management*, Cogent OA, Vol. 7 No. 1, p. 1804181, doi: 10.1080/23311975.2020.1804181.
- Ajzen, I. (1991), “The theory of planned behavior”, *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179–211, doi: 10.1016/0749-5978(91)90020-T.
- Akhtar, I. (2016), “Research Design”, p. 17.
- Akintunde, T.Y., Musa, T.H., Musa, H.H., Musa, I.H., Chen, S., Ibrahim, E., Tassang, A.E., *et al.* (2021), “Bibliometric analysis of global scientific literature on effects of COVID-19 pandemic on mental health”, *Asian Journal of Psychiatry*, Vol. 63, p. 102753, doi: 10.1016/j.ajp.2021.102753.
- Al-Marroof, R.S., Salloum, S.A., Hassanien, A.E. and Shaalan, K. (2020), “Fear from COVID-19 and technology adoption: the impact of Google Meet during Coronavirus pandemic”, *Interactive Learning Environments*, Routledge, Vol. 0 No. 0, pp. 1–16, doi: 10.1080/10494820.2020.1830121.
- Ather, A., Patel, B., Ruparel, N.B., Diogenes, A. and Hargreaves, K.M. (2020), “Coronavirus Disease 19 (COVID-19): Implications for Clinical Dental Care”, *Journal of Endodontics*, Vol. 46 No. 5, pp. 584–595, doi: 10.1016/j.joen.2020.03.008.
- Auer, R., Cornelli, G. and Frost, J. (2020), “BIS Bulletin payments”, No. 3, p. 7.
- Awa, H.O., Ukoha, O. and Igwe, S.R. (2017), “Revisiting technology-organization-environment (T-O-E) theory for enriched applicability”, *Bottom Line*, Vol. 30 No. 1, pp. 2–22, doi: 10.1108/BL-12-2016-0044.

- Babuna, P., Yang, X., Gylilbag, A., Awudi, D.A., Ngmenbelle, D. and Bian, D. (2020), “The impact of covid-19 on the insurance industry”, *International Journal of Environmental Research and Public Health*, Vol. 17 No. 16, pp. 1–14, doi: 10.3390/ijerph17165766.
- Baker McKenzie. (2020), *Beyond COVID-19: Supply Chain Resilience Holds Key to Recovery*, Oxford Economics.
- Bakonyi, A. (2021), “Contactless 2021: Hungary’s journey to cashless payments”, 29 June, available at: <https://blog.ingenico.com/posts/2021/06/contactless-2021-hungarys-journey-to-cashless-payments.html> (accessed 5 July 2022).
- Belgavi, V. (2020), *Redefining the FinTech Experience : Impact of COVID-19*, New Delhi.
- Bhattacharjee, A. (2001), “Understanding information systems continuance: An expectation-confirmation model”, *MIS Quarterly: Management Information Systems*, doi: 10.2307/3250921.
- Carracedo, P., Puertas, R. and Marti, L. (2021), “Research lines on the impact of the COVID-19 pandemic on business. A text mining analysis”, *Journal of Business Research*, Vol. 132, pp. 586–593, doi: 10.1016/j.jbusres.2020.11.043.
- C.C, S. and Prathap, S.K. (2020a), “Continuance adoption of mobile-based payments in Covid-19 context: an integrated framework of health belief model and expectation confirmation model”, *International Journal of Pervasive Computing and Communications*, Vol. 16 No. 4, pp. 351–369, doi: 10.1108/IJPCC-06-2020-0069.
- Daqar, M.A., Constantinovits, M., Arqawi, S. and Daragmeh, A. (2021), “The role of Fintech in predicting the spread of COVID-19”, *Banks and Bank Systems*, Mohannad Abu Daqar, Milan Constantinovits, Samer Arqawi, Ahmad Daragmeh, Vol. 16 No. 1, pp. 1–16, doi: 10.21511/bbs.16(1).2021.01.

- Daragmeh, A., Sági, J. and Zéman, Z. (2021), “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)”, *Journal of Open Innovation: Technology, Market, and Complexity*, Multidisciplinary Digital Publishing Institute, Vol. 7 No. 2, p. 132, doi: 10.3390/joitmc7020132.
- Davis, F.D. (1989), “Perceived usefulness, perceived ease of use, and user acceptance of information technology”, edited by *MIS Quarterly*, Vol. 13 No. 3, pp. 319–339, doi: 10.2307/249008.
- Deloitte. (2020), *Impact of the COVID-19 Crisis on Short- and Medium-Term Consumer Behavior*.
- EMILY A. VOGELS. (2019), “Millennials stand out for their technology use, but older generations also embrace digital life”, *Pew Research Center*, available at: <https://www.pewresearch.org/fact-tank/2019/09/09/us-generations-technology-use/> (accessed 16 December 2020).
- Ezati Rad, R., Mohseni, S., Kamalzadeh Takhti, H., Hassani Azad, M., Shahabi, N., Aghamolaei, T. and Norozian, F. (2021), “Application of the protection motivation theory for predicting COVID-19 preventive behaviors in Hormozgan, Iran: a cross-sectional study”, *BMC Public Health*, Vol. 21 No. 1, p. 466, doi: 10.1186/s12889-021-10500-w.
- Fischer-Preßler, D., Bonaretti, D. and Fischbach, K. (2022), “A Protection-Motivation Perspective to Explain Intention to Use and Continue to Use Mobile Warning Systems”, *Business & Information Systems Engineering*, Vol. 64 No. 2, pp. 167–182, doi: 10.1007/s12599-021-00704-0.
- Fishbein and I. Ajzen, F. (1991), “The theory of planned behavior”,

- Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179–211, doi: 10.1016/0749-5978(91)90020-T.
- Flavian, C., Guinaliu, M. and Lu, Y. (2020), “Mobile payments adoption – introducing mindfulness to better understand consumer behavior”, *International Journal of Bank Marketing*, doi: 10.1108/IJBM-01-2020-0039.
- Foroughi, B., Iranmanesh, M. and Hyun, S.S. (2019), “Understanding the determinants of mobile banking continuance usage intention”, *Journal of Enterprise Information Management*, Vol. 32 No. 6, pp. 1015–1033, doi: 10.1108/JEIM-10-2018-0237.
- Frey, F. (2017), “SPSS (software)”, doi: 10.1002/9781118901731.iecrm0237.
- Gai, K., Qiu, M. and Sun, X. (2018), “A survey on FinTech”, *Journal of Network and Computer Applications*, Academic Press, Vol. 103, pp. 262–273, doi: 10.1016/j.jnca.2017.10.011.
- Gbongli, K., Xu, Y. and Amedjonekou, K.M. (2019), “Extended technology acceptance model to predict mobile-based money acceptance and sustainability: A multi-analytical structural equation modeling and neural network approach”, *Sustainability (Switzerland)*, Vol. 11 No. 13, pp. 1–33, doi: 10.3390/su11133639.
- Gipson, S. (2020), “Introduction to Microsoft Excel 101: Notes About MS Excel”, 6 January, available at: <https://www.guru99.com/introduction-to-microsoft-excel.html> (accessed 10 July 2022).
- Glasow, D.P. (2013), “Fundamentals of Survey Research Methodology”.
- Hair, J., Hult, G.T.M., Ringle, D.C.M. and Sarstedt, M. (2017), *A Primer on Partial Least Squares Structural Equation Modeling*, 2nd edition., SAGE Publications, Inc, Los Angeles.
- Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2019), “When to use

- and how to report the results of PLS-SEM”, *European Business Review*, Emerald Group Publishing Ltd., 14 January, doi: 10.1108/EBR-11-2018-0203.
- Hanif, Y. and Lallie, H.S. (2021), “Security factors on the intention to use mobile banking applications in the UK older generation (55+). A mixed-method study using modified UTAUT and MTAM - with perceived cyber security, risk, and trust”, *Technology in Society*, Vol. 67, p. 101693, doi: 10.1016/j.techsoc.2021.101693.
- Heeks, R. and Ospina, A. V. (2019), “Conceptualising the link between information systems and resilience: A developing country field study”, *Information Systems Journal*, doi: 10.1111/isj.12177.
- Henseler, J., Ringle, C.M. and Sinkovics, R.R. (2009), “The use of partial least squares path modeling in international marketing”, in R. Sinkovics, R. and N. Ghauri, P. (Eds.), *New Challenges to International Marketing*, Vol. 20, Emerald Group Publishing Limited, pp. 277–319, doi: 10.1108/S1474-7979(2009)0000020014.
- Hertel, M. and Menrad, K. (2016), “Adoption of energy-efficient technologies in German SMEs of the horticultural sector—the moderating role of personal and social factors”, *Energy Efficiency*, Vol. 9, doi: 10.1007/s12053-015-9400-0.
- Hill, R.J., Fishbein, M. and Ajzen, I. (1977), “Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research.”, *Contemporary Sociology*, Vol. 6 No. 2, p. 244, doi: 10.2307/2065853.
- Hlatshwako, T.G., Shah, S.J., Kosana, P., Adebayo, E., Hendriks, J., Larsson, E.C., Hensel, D.J., *et al.* (2021), “Online health survey research during COVID-19”, *The Lancet Digital Health*, Elsevier, Vol. 3 No. 2, pp. e76–e77, doi: 10.1016/S2589-7500(21)00002-9.
- Horák, L. (2020), “Get more customers in Hungary. Using contactless shipping and payment methods | Mergado.com”, available at:



- <https://www.mergado.com/blog/hungary-contactless-shipping-and-payments> (accessed 10 August 2023).
- Horner, S. and Cunnane, P. (2017), *Value of Fintech*, Kpmg.
- Hubert, M., Blut, M., Brock, C., Zhang, R.W., Koch, V. and Riedl, R. (2019), “The influence of acceptance and adoption drivers on smart home usage”, *European Journal of Marketing*, doi: 10.1108/EJM-12-2016-0794.
- Jatnika, R. (2015), “The Effect of SPSS Course to Students Attitudes toward Statistics and Achievement in Statistics”, *International Journal of Information and Education Technology*, Vol. 5, pp. 818–821, doi: 10.7763/IJIET.2015.V5.618.
- Javed, A. (2020), “Impact of COVID-19 on Pakistan’s services sector”, *Jurnal Inovasi Ekonomi*, Universitas Muhammadiyah Malang, Vol. 5 No. 03, pp. 107–116, doi: 10.22219/jiko.v5i03.12194.
- Jr, H., Ringle, C. and Sarstedt, M. (2011), “PLS-sem: Indeed a silver bullet”, *The Journal of Marketing Theory and Practice*, Vol. 19, pp. 139–151, doi: 10.2753/MTP1069-6679190202.
- Kabir, S.M. (2016), “METHODS OF DATA COLLECTION”, pp. 201–275.
- Kang, J. (2018), “Mobile payment in Fintech environment: trends, security challenges, and services”, *Human-Centric Computing and Information Sciences*, Springer Berlin Heidelberg, Vol. 8:32 No. 1, doi: 10.1186/s13673-018-0155-4.
- Karthikeyan, S. (2012), *Mobile Payments: A Comparative Study between European and Non-European Markets*, School of Information and Communication Technology, KTH-Royal Institute of Technology. Stockholm, Sweden.
- Kft Tanácsadó. (2020), “The COVID 19 pandemic could speed up digitalization of the Hungarian Banking Sector”, KPMG, available at: <https://home.kpmg/hu/en/home/insights/2020/04/the-covid-19->

pandemic-could-speed-up-digitalization-of-the-hungarian-banking-sector.html (accessed 16 December 2020).

- Khayer, A. and Bao, Y. (2019), “The continuance usage intention of Alipay: Integrating context-awareness and technology continuance theory (TCT)”, *Bottom Line*, doi: 10.1108/BL-07-2019-0097.
- Koch, J., Frommeyer, B. and Schewe, G. (2020), “Online shopping motives during the COVID-19 pandemic—lessons from the crisis”, *Sustainability (Switzerland)*, Vol. 12 No. 24, pp. 1–20, doi: 10.3390/su122410247.
- Kothari, S.P., Leone, A. and Wasley, C.E. (2005), “Performance matched discretionary accrual measures”, *Journal of Accounting and Economics*, Elsevier, Vol. 39 No. 1, pp. 163–197.
- KSH Demográfiai Táblázó (Demo). (2021), “People’s movement, 2021”, available at:  
<https://www.ksh.hu/docs/hun/xftp/idoszaki/nepmozg/nepmozg21/index.html#acovid19jrvnyimattjelentsennttahalloszoksza> (accessed 5 August 2023).
- Kumar, A., Adlakaha, A. and Mukherjee, K. (2018), “The effect of perceived security and grievance redressal on continuance intention to use M-wallets in a developing country”, *International Journal of Bank Marketing*, Vol. 36 No. 7, pp. 1170–1189, doi: 10.1108/IJBM-04-2017-0077.
- Laato, S., Islam, A.K.M.N., Farooq, A. and Dhir, A. (2020), “Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach”, *Journal of Retailing and Consumer Services*, Vol. 57, p. 102224, doi: 10.1016/j.jretconser.2020.102224.
- Liao, C., Palvia, P. and Chen, J.L. (2009), “Information technology adoption behavior life cycle: Toward a Technology Continuance Theory

- (TCT)", *International Journal of Information Management*, doi: 10.1016/j.ijinfomgt.2009.03.004.
- Liébana-Cabanillas, F., García-Maroto, I., Muñoz-Leiva, F. and Ramos-de-Luna, I. (2020), "Mobile payment adoption in the age of digital transformation: The case of apple pay", *Sustainability (Switzerland)*, Vol. 12 No. 13, pp. 1–15, doi: 10.3390/su12135443.
- McCarthy, N. (2020), "Infographic: Pandemic Set To Benefit Smartphone Mobile Payments", available at: <https://www.statista.com/chart/23470/global-transaction-value-forecast-of-smartphone-mobile-payments> (accessed 10 August 2023).
- Medve, F. (2021), "France: usage frequency of mobile payment applications after lockdown 2020", available at: <https://www.statista.com/statistics/1121585/frequency-use-mobile-payment-applications-after-lockdown-coronavirus-france/> (accessed 10 August 2023).
- Medve, F. (2022a), "Hungary: frequency of making contactless payments with smart devices 2022", Statista, , available at: <https://www.statista.com/statistics/1308639/hungary-frequency-of-making-contactless-payments-with-smart-devices/> (accessed 1 January 2023).
- Medve, F. (2022b), "Hungary: mobile banking app usage frequency 2022", available at: <https://www.statista.com/statistics/1341926/hungary-mobile-banking-app-usage-frequency/> (accessed 10 August 2023).
- Mesquita, J.M. and Kosteljik, E. (2021), *Marketing Analytics: Statistical Tools for Marketing and Consumer Behavior Using SPSS*, doi: 10.4324/9781003196617.
- Naeem, M. (2020), "Understanding the customer psychology of impulse buying during COVID-19 pandemic: implications for retailers",

*International Journal of Retail & Distribution Management*,  
Emerald Publishing Limited, Vol. 49 No. 3, pp. 377–393, doi:  
10.1108/IJRDM-08-2020-0317.

- Nawayseh, A. and K, M. (2020), “FinTech in COVID-19 and Beyond: What Factors Are Affecting Customers’ Choice of FinTech Applications?”, *Journal of Open Innovation: Technology, Market, and Complexity*, Multidisciplinary Digital Publishing Institute, Vol. 6 No. 4, p. 153, doi: 10.3390/joitmc6040153.
- Nguyen, H.T. and Tang, C.W. (2022), “Students’ Intention to Take E-Learning Courses During the COVID-19 Pandemic: A Protection Motivation Theory Perspective”, *International Review of Research in Open and Distributed Learning*, Athabasca University Press (AU Press), Vol. 23 No. 3, pp. 21–42, doi: 10.19173/irrodl.v23i3.6178.
- Oliveira, T., Thomas, M., Baptista, G. and Campos, F. (2016), “Mobile payment: Understanding the determinants of customer adoption and intention to recommend the technology”, *Computers in Human Behavior*, doi: 10.1016/j.chb.2016.03.030.
- O’Neill, A. (2023), “Hungary - average age of the population 1950-2100”, available at: <https://www.statista.com/statistics/332519/average-age-of-the-population-in-hungary/> (accessed 14 August 2023).
- Pal, A., De’, R. and Herath, T. (2020), “The Role of Mobile Payment Technology in Sustainable and Human-Centric Development: Evidence from the Post-Demonetization Period in India”, *Information Systems Frontiers*, doi: 10.1007/s10796-020-09982-7.
- Pal, R. and Bhadada, S.K. (2020a), “Cash, currency and COVID-19”, *Postgraduate Medical Journal*, doi: 10.1136/postgradmedj-2020-138006.
- Pal, R. and Bhadada, S.K. (2020b), “Cash, currency and COVID-19”, *Postgraduate Medical Journal*, The Fellowship of Postgraduate

- Medicine, Vol. 96 No. 1137, pp. 427–428, doi:  
10.1136/postgradmedj-2020-138006.
- PANDEMIA.HU. (2022), “Koronavírus Magyarországon: halottak száma, elhunytak életkora, betegségei”, available at:  
<http://pandemia.hu/koronavirus-magyarorszagon-halottak-szama-naprol-napra/> (accessed 5 August 2023).
- Park, Y.S., Konge, L. and Artino, A.R.J. (2020), “The Positivism Paradigm of Research”, *Academic Medicine*, Vol. 95 No. 5, pp. 690–694, doi: 10.1097/ACM.0000000000003093.
- Puriwat, W. and Tripopsakul, S. (2021), “Explaining an Adoption and Continuance Intention to Use Contactless Payment Technologies: During the COVID-19 Pandemic”, *Emerging Science Journal*, Vol. 5 No. 1, pp. 85–95, doi: 10.28991/esj-2021-01260.
- Rahi, S. and Abd. Ghani, M. (2019), “Integration of expectation confirmation theory and self-determination theory in internet banking continuance intention”, *Journal of Science and Technology Policy Management*, Vol. 10 No. 3, pp. 533–550, doi: 10.1108/JSTPM-06-2018-0057.
- Rahi, S., Khan, M.M. and Alghizzawi, M. (2020), “Extension of technology continuance theory (TCT) with task technology fit (TTF) in the context of Internet banking user continuance intention”, *International Journal of Quality and Reliability Management*, doi: 10.1108/IJQRM-03-2020-0074.
- Rahi, S., Khan, M.M. and Alghizzawi, M. (2021), “Factors influencing the adoption of telemedicine health services during COVID-19 pandemic crisis: an integrative research model”, *Enterprise Information Systems*, Taylor & Francis, Vol. 15 No. 6, pp. 769–793, doi: 10.1080/17517575.2020.1850872.
- Rahman, A. and Muktadir, M.G. (2021), “SPSS: An Imperative Quantitative

- Data Analysis Tool for Social Science Research”, Vol. V, pp. 300–302, doi: 10.47772/IJRISS.2021.51012.
- Rizun, M. and Strzelecki, A. (2020), “Students’ Acceptance of the COVID-19 Impact on Shifting Higher Education to Distance Learning in Poland”, *International Journal of Environmental Research and Public Health*, Multidisciplinary Digital Publishing Institute, Vol. 17 No. 18, p. 6468, doi: 10.3390/ijerph17186468.
- Rondan-Cataluña, F.J., Arenas-Gaitán, J. and Ramírez-Correa, P.E. (2015), “A comparison of the different versions of popular technology acceptance models a non-linear perspective”, *Kybernetes*, Emerald Group Publishing Ltd., Vol. 44 No. 5, pp. 788–805, doi: 10.1108/K-09-2014-0184.
- Sahay, R., von Allmen, U. E., Lahreche, A., Khera, P., Ogawa, S., Bazarbash, M., & Beaton, K. (2020), *The Promise of Fintech : Financial Inclusion in the Post COVID-19 Era*, International Monetary Fund, Washington, DC 20090, USA.
- Saleeby, J.R. (2000), “Health beliefs about mental illness: An instrument development study”, *American Journal of Health Behavior*, doi: 10.5993/AJHB.24.2.1.
- Sathye, S., Prasad, B., Sharma, D., Sharma, P. and Sathye, M. (2018), “Factors influencing the intention to use of mobile value-added services by women-owned microenterprises in Fiji”, *THE ELECTRONIC JOURNAL OF INFORMATION SYSTEMS IN DEVELOPING COUNTRIES*, Vol. 84 No. 2, p. e12016, doi: 10.1002/isd2.12016.
- Seale, H., Dyer, C.E.F., Abdi, I., Rahman, K.M., Sun, Y., Qureshi, M.O., Dowell-Day, A., *et al.* (2020), “Improving the impact of non-pharmaceutical interventions during COVID-19: Examining the factors that influence engagement and the impact on individuals”,

- BMC Infectious Diseases*, doi: 10.1186/s12879-020-05340-9.
- Shahabi, V., Azar, A., Faezy Razi, F. and Fallah Shams, M.F. (2020), “Simulation of the effect of COVID-19 outbreak on the development of branchless banking in Iran: case study of Resalat Qard–al-Hasan Bank”, *Review of Behavioral Finance*, Emerald Publishing Limited, Vol. 13 No. 1, pp. 85–108, doi: 10.1108/RBF-06-2020-0123.
- Shiau, W.L., Yuan, Y., Pu, X., Ray, S. and Chen, C.C. (2020), “Understanding fintech continuance: perspectives from self-efficacy and ECT-IS theories”, *Industrial Management and Data Systems*, doi: 10.1108/IMDS-02-2020-0069.
- Shmueli, G., Sarstedt, M., Hair, J.F., Cheah, J.H., Ting, H., Vaithilingam, S. and Ringle, C.M. (2019), “Predictive model assessment in PLS-SEM: guidelines for using PLSpredict”, *European Journal of Marketing*, doi: 10.1108/EJM-02-2019-0189.
- Statista. (2020), “• COVID-19: forecasted global real GDP growth 2021 | Statista”, available at: <https://www.statista.com/statistics/1102889/covid-19-forecasted-global-real-gdp-growth/> (accessed 15 December 2020).
- Susanto, A., Chang, Y. and Ha, Y. (2016), “Determinants of continuance intention to use the smartphone banking services: An extension to the expectation-confirmation model”, *Industrial Management and Data Systems*, Vol. 116 No. 3, pp. 508–525, doi: 10.1108/IMDS-05-2015-0195.
- Thakor, A. V. (2020), “Fintech and banking: What do we know?”, *Journal of Financial Intermediation*, Academic Press Inc., Vol. 41:100833, p. 46, doi: 10.1016/j.jfi.2019.100833.
- Theocharidis, A.I., Argyropoulou, M., Karavasilis, G., Vrana, V. and Kehris, E. (2020), “An approach towards investigating factors affecting intention to book a hotel room through social media”,

- Sustainability (Switzerland)*, Vol. 12 No. 21, pp. 1–20, doi: 10.3390/su12218973.
- Uğur, N.G. and Akbıyık, A. (2020), “Impacts of COVID-19 on global tourism industry: A cross-regional comparison”, *Tourism Management Perspectives*, Elsevier B.V., Vol. 36: 100744, doi: 10.1016/j.tmp.2020.100744.
- UNDP. (2020), “Putting the UN Framework for Socio-Economic Response to COVID-19 into Action: Insights”, *Brief 2*, No. June, p. 19.
- Van Teijlingen, E. and Hundley, V. (2002), “The Importance of Pilot Studies”, *Nursing Standard (Royal College of Nursing (Great Britain) : 1987)*, Vol. 16, pp. 33–6, doi: 10.7748/ns2002.06.16.40.33.c3214.
- Veeramootoo, N., Nunkoo, R. and Dwivedi, Y.K. (2018), “What determines success of an e-government service? Validation of an integrative model of e-filing continuance usage”, *Government Information Quarterly*, doi: 10.1016/j.giq.2018.03.004.
- Walker Mark. (2019), “Gen X is Ready for Retirement – Bring on the Technology | The Fintech Times”, available at: <https://thefintechtimes.com/gen-x-is-ready-retirement/> (accessed 16 December 2020).
- Wei, J., Vinnikova, A., Lu, L. and Xu, J. (2020), “Understanding and Predicting the Adoption of Fitness Mobile Apps: Evidence from China”, *Health Communication*, doi: 10.1080/10410236.2020.1724637.
- World Bank and CCAF. (2020), *The Global Covid-19 FinTech Regulatory Rapid Assessment Study*.
- World Health Organization. (2022), “Imagining the future of pandemics and epidemics: a 2022 perspective”, available at: <https://www.who.int/publications-detail-redirect/9789240052093>



(accessed 30 July 2023).

- World Health Organization [WHO]. (2020), “There is current outbreak of coronavirus (COVID) disease”, *World Health Organization*, available at: [https://www.who.int/health-topics/coronavirus#tab=tab\\_1](https://www.who.int/health-topics/coronavirus#tab=tab_1) (accessed 10 December 2020).
- Xiong, H. (2022), *The Factors Influences the Chinese Elderly in Using Mobile Banking: The Case Study of Chongqing Residents*, Thesis.
- Yang, M., Mamun, A.A., Mohiuddin, M., Nawi, N.C. and Zainol, N.R. (2021), “Cashless Transactions: A Study on Intention and Adoption of e-Wallets”, *Sustainability*, Multidisciplinary Digital Publishing Institute, Vol. 13 No. 2, p. 831, doi: 10.3390/su13020831.
- Zhang, T., Lu, C. and Kizildag, M. (2018), “Banking ‘on-the-go’: examining consumers’ adoption of mobile banking services”, *International Journal of Quality and Service Sciences*, Emerald Group Publishing Ltd., Vol. 10 No. 3, pp. 279–295, doi: 10.1108/IJQSS-07-2017-0067.
- Zhou, Q., Lim, F.J., Yu, H., Xu, G., Ren, X., Liu, D., Wang, X., *et al.* (2021), “A study on factors affecting service quality and loyalty intention in mobile banking”, *Journal of Retailing and Consumer Services*, Vol. 60, p. 102424, doi: 10.1016/j.jretconser.2020.102424.

### **List of publications**

1. 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).

*A Daragmeh, J Sági, Z Zéman.*

Journal of Open Innovation: Technology, Market, and Complexity 7 (2),  
132.

2. FinTech payments in the era of COVID-19: Factors influencing behavioral intentions of “Generation X” in Hungary to use mobile payment.

*A Daragmeh, C Lentner, J Sági.*

Journal of Behavioral and Experimental Finance 32, 100574.

3. The role of Fintech in predicting the spread of COVID-19.

MA Daqar, M Constantinovits, S Arqawi, *A Daragmeh.*

Banks and Bank Systems 16 (1), 1.

4. Drivers of post-adoption of e-wallet among academics in Palestine: An extension of the expectation confirmation model.

*A Daragmeh, A Saleem, J Bárcki, J Sági.*

Frontiers in Psychology 13, 984931.

5. Financial intermediation through risk sharing vs non-risk sharing contracts, role of credit risk, and sustainable production: evidence from leading countries in Islamic finance.

A Saleem, *A Daragmeh*, RMA Zahid, J Sági.

Environment, Development and Sustainability, 1-31.

6. The role of the COVID-19 pandemic in boosting digital financial inclusion.

*A Daragmeh, J Bárcki.*

Economics and working capital.

7. Assessing the degree of compliance with TQM practices: Study of banking sector in Palestine.

*A Daragmeh, J Barcki.*

Hungarian Agricultural Engineering, 5-10.

8. The role and challenges of governments in promoting sustainable development.

A Kuci, *A Daragmeh*, J Sági

Prosperitas journal.

9. Market design for sustainable tourism products and services.

M Nekmahmud, *A Daragmeh*, B Oshora, HJ Mohammed.

Tourism Products and Services in Bangladesh: Concept Analysis and Development Suggestions.