Dimensions of Mobile-banking in Greece During Covid-19

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Abstract: The Covid-19 pandemic reveal the need for structural reforms in various economic sectors including the banking sector. In Greece the banking sector needs to promote structural reforms promoting new products and services or improve existing ones to improve contactless transactions. The purpose of the paper is to explore the determinants (in terms of demographic, personal and behavioral factors) that are affecting the use of mobile banking during the Covid-19 pandemic in Greece. A multiple logistic regression and a structural equation model analysis are employed, in conjunction with confirmatory factor analysis, based on a proposed extended technological acceptance model (TAM). The data derived from a field survey on 617 users and non-users of mobile banking, using an appropriately-constructed questionnaire. The results showed that the demographics as well as the personal and technology acceptance factors contributed significantly to the adoption of this form of online banking in Greece. From the extended TAM model, perceived usefulness, perceived ease of use, perceived risk, hedonic motivation and social influence were found to have a significant impact on the use of mobile banking. Furthermore, perceived awareness combined with subconscious factors such as personal characteristics of Greek consumers play an important role. This is the first study for Greece, to the best of our knowledge, which examines the determinants affecting the use of mobile banking both in terms of consumers' perceptions and attitudes during a period where contactless transactions became necessary in the everyday life of consumers worldwide.

Keywords: Mobile Banking, Extended TAM, Adoption, Intention, Structural Equation Model

1. Introduction

By February 2020, the Covid-19 pandemic had already spread to most European countries, with the respective governments of every country, including Greece, imposing strict restrictive measures to reduce the virus's spread. As was expected, actions such as social distancing have caused economic disruption in many countries, indicating the urgent need for changes in various sectors of society worldwide. The banking sector is no exception. In Greece (as in many countries) the pandemic has forced consumers to carry out their banking transactions remotely, i.e. without any direct contact with the bank. However, Greek consumers tend to have a low level of familiarity with electronic banking and so the Greek banking system needs to create new, or restructure existing, electronic products and services. Those banking services should facilitate contactless transactions based on consumer perceptions and need to be in place particularly during a pandemic. Furthermore, their use should be maintained even after Covid-19 has passed.

Various studies have shown that online banking, including mobile banking, has advantages over traditional banking that can increase the satisfaction of a bank's customers, for example, by saving money saving time, providing speedy transactions or executing those transactions without needing to visit the bank [6, 21, 25, 40, 54]. Mobile banking is an electronic banking service that enables a bank to manage a client's bank account and their financial transactions through a wireless banking network and a device, such as their mobile phone [36].

An individual's mental health, including their personal and social well-being and development, is greatly affected by their psychological needs and the extent to which their expectations are being met [17]. Thus, in order for a mobile banking service to be widely adopted and extensively used, it must be in line with consumer needs, lifestyle and work [12, 35], but also with the way they manage their banking transactions [45]. The perceived value of mobile banking, that is, the benefits of its use, such as saving time and money [18], creates the belief that there is an advantage to be gained by using it compared to other banking services [33]. Such a perception can increase the use and satisfaction of a bank's customers and increase their loyalty to the bank [7]. An obstacle to the adoption of mobile banking could be the lack of confidence either in the bank or in the application [29, 35]. In particular, there could be an initial lack of trust in the application as to whether it will perform adequately or be reliable, safe and convenient for the user, even without using it a lot [1, 50, 58].

The purpose of the study is to reveal Greek consumers' perceptions about mobile banking, using a unique data collected in the start of the Covid-19 outbreak in Greece. Employing two different econometric methodologies: a multiple logistic regression and a structural equation model (SEM), the paper investigates the effect of a) demographics, b) subconscious personal factors, and c) technological perceptions, on mobile banking use in Greece during the Covid-19 pandemic.

The results of the present study are of utmost importance, especially in the period we are currently going through, as they can inform and, therefore, facilitate the managers of Greek banks to adapt the services they offer, based on their customers' needs and perceptions, to increase user satisfaction. Satisfied customers maintain and even increase their use of these services, resulting in more loyal customers for the bank, not only during the pandemic but also in the post Covid-19 era. The first contribution of the paper lies in the period during which the research conducted; at the time the sampling was taking place, the pandemic had already spread and established itself in many countries, including Greece, and many Greek consumers were trying to change the way they carried out their financial transactions. Another differentiating feature in the present study is that two different econometric methodologies were used to confirm the empirical results.

The study is divided into seven sections. Section one includes the introduction of the present study. Section two consists of the theoretical background, based on the dimensions that lead to the adoption of mobile banking, while sections three and four refer to the research hypothesis development, research methodology, including the data collection and the research tool. Section five outlines the two economic methodologies conducted and their empirical results, including the conceptual model and hypothesis testing. Sections six and seven contain discussions, conclusions, and recommendations.

2. Literature Review

Several researchers have dealt with the factors that prompt someone to use mobile banking. The demographic and personal characteristics of individuals are subconscious factors that affect both use and adoption. The age of the individuals is a particular indicator for the adoption of such banking services, with the younger ages having a preference for them, in contrast to the older generations that prefer to visit a physical bank branch [25, 31]. Mobile banking is mainly used by younger people up to 35 years old, while the positive effect on income in adopting these services does not appear to be negligible [32, 42]. People's technological background can also be a factor in accepting or preventing the use of this service. People's familiarity with computers and their applications, such as managing their email accounts, can form not only a positive attitude towards these services [27] but also affect their belief that its use improves the efficiency of their financial transactions [23, 46]. Managing and familiarizing an individual with the bank's products/services also has an impact on the adoption of mobile banking, as bank clients that extensively use various banking products, such as credit/debit cards, are more likely to become users of online banking [11, 32, 51].

The perception regarding the usefulness of mobile banking applications plays a significant role in their adoption by forming the attitude and the intention to use it [3, 12, 22, 41, 43]. Perceived usefulness refers to someone's belief that the application's usage is a privilege that it is useful; it achieves banking transactions quickly and positively affects attitudes and the intention to use it [3]. Performance expectancy (PE), which can be found in subsequent studies, reflects the expectations of individuals to improve their performance through the fast, productive, efficient, and therefore useful functions of mobile banking [55]. PE can lead directly to the intention to adopt the service, as well as to its actual use [10, 26, 57]. In their study, Mehrad and Mohammadi (2017) who used a theoretical model of extended TAM added that this factor could also prompt non-users to adopt it and existing users to maintain using it [43]. The moderate effect of the factor proved to be of great importance, too, as it can positively and indirectly influence attitudes [50] and perceptions towards usability, such as the ease of use of the application [45]. It is worth mentioning that the usability of a mobile banking application in itself could be a pivotal issue too, influencing its adoption either directly or indirectly. Information and awareness could influence such new technologies [5, 45, 52]. Mohammadi (2015) defined awareness as the degree of someone's perception that he/she is informed about the operation and the benefits provided by using mobile banking [45]. He found that this factor had a positive effect on both the perceived usefulness and the perceived ease of use. Ali and Kaur (2015), in their study of 201 bank customers in India, also found that increasing people's awareness, for example through advertising campaigns, automatically increases the use of the service [5].

Tam and Oliviera (2016), investigating the effect of information provided by the mobile banking application itself, confirmed that when a person receives immediate, accurate, and interesting information, their satisfaction also increases, as does their belief that financial transactions can be carried out more efficiently [52]. Studies have also shown that one motivation to adopt mobile banking is the sense of entertainment that a client feels during the user experience, especially among younger ages [7, 13, 18, 56]. Boonsiritomachai and Pitchayadejanant (2018) confirmed that mainly the Y generation (people aged 18 to 35 years) is affected by the fun feeling offered by a mobile banking application, which increases the intention to continue using it [13]. Baabdullaha et al. (2019) also found that this factor's positive effect is so strong that it positively affects not only the use of the service but also the customer's satisfaction, establishing a loyalty relationship between him/her and the bank [7].

Remarkable factors that influence the adoption of mobile banking are some of the individual's personal characteristics combined with cultural factors. Both the feeling of stress and the feeling of increasing their social prestige when using the service affect the use of mobile banking [3, 45]. Personal attitudes towards innovations also proved to be a subconscious key driver in the adoption of mobile banking [16, 39, 44, 56], while the influence of a person's culture was also found to be quite noticeable in different countries with different cultural elements [10, 39]. Among cultural factors, the element of individualism, in contrast to altruism, was found to affect, either directly [34] or indirectly [9, 15, 53], the adoption of mobile banking.

Perceived risk regarding the implementation of mobile banking can be interpreted as various types of risk and lead to non-adoption of the service. More specifically, individuals may perceive that the application: a) will not meet their requirements (performance risk), b) its use will lead to loss of time and money (time and financial risk), c) it could not protect customers' personal data (privacy and security risk) or even d) reduce their social image (social risk) [37]. Subsequent studies have also confirmed that perceived risk, expressed in its various forms, negatively affects the use of this service directly [2, 4, 30], and indirectly through the negative impact on the intention to use it [3, 41]. The perceived risk could also reduce the perception of mobile banking's usefulness and ease of use, [44-45], or even the level of trust [38] that users have in the service. At younger ages (20 to 29 years), the size of the effect is such that it can lead to its non-adoption and its non-recommendation to others [49]. Even among existing and experienced users, it could provoke a negative relationship with the bank, reducing the service's perceived value [26, 28]. Finally, the influence of the social environment on the adoption of the service was found to be significant in some studies, while in others the effect was negligible or very small, depending on the sample and the type of information transmitted from the social environment. [25, 31].

3. Research Model and Hypothesis

The research model used was an extended TAM model, which includes factors both from TAM and UTAUT models, combined with demographics and personal factors. The following hypotheses are stated:

A) Demographics and Personal characteristics

H $(1_a, 2_a, 3_a, 4_{a-c}, 5_{a-g}, 6_a)$: Age, income level, banking products (credit/debit cards) usage, technological background, information about online banking and a feeling of stress affect the probability of being a mobile banking user.

H $(1_b, 2_b, 3_b, 4_{d-f}, 5_{h-n}, 6_b)$: Age, income level, banking products (credit/debit cards) usage, technological background, information about online banking and feeling stressed have a direct impact on the actual use (UB) of mobile banking.

B) Technological acceptance model factors

H $(7, 8, 9, 10, 11, 12, 13, 14)_a$: Personal factors, perceived usefulness, perceived ease of use, perceived awareness, perceived risk, hedonic motivation, social influence and both attitude and behavioral intention affect the probability of being a mobile banking user.

H $(7, 8, 9, 10, 11, 12, 13)_b$: Personal factors, perceived usefulness, perceived ease of use, perceived awareness, perceived risk, hedonic motivation and social influence have a direct impact on the attitude (ATT) towards mobile banking.

H $(7, 8, 9, 10, 11, 12, 13)_{c,d,e,f}$: Personal factors, perceived usefulness, perceived ease of Use, perceived awareness, perceived risk, hedonic motivation and social influence have an impact (direct and indirect) on behavioral intention (BI) and on actual use(UB) of mobile banking.

H $(14)_{b,c,d}$: The attitude (ATT) towards these services and behavioral intention (BI) to use it have a (direct and indirect) impact on actual use (UB).

4. Data Collection Research Methodology

The data of the study were collected from 617 consumers of which 394 were users of mobile banking and 223 were non-users from Athens, Greece during the initial spread of Covid-19 that is during the period January 2020 to March of 2020, using an appropriately constructed questionnaire. The questionnaire contained two sections: (i) demographics and personal characteristics and (ii) technological acceptance factors, including cultural and innovativeness characteristics. All the variables' attributes were designed using a five Likert point scale from strongly disagree to strongly agree. The hypotheses were tested using two different econometric methodologies, a multiple logistic regression and a structural equation model (SEM), using Stata 14 and SPSS Amos 23 software. Scale items used in the questionnaire and their definitions according to the bibliography are presented in Table 1.

Table 1. Mobile-Banking questionnaire's items and definitions.

Dimensions	Definitions according to the literature	Items
Perceived usefulness (PU)	The belief that by using mobile banking, financial transactions will be accomplished 24 hours a day, more conveniently and quickly.[1, 18, 21, 25, 35, 55, 57]	4
Perceived ease of use (PEoU)	The belief that mobile banking will be easy to learn and use.[1, 4, 18, 35, 43, 57]	3
Perceived risk (PR)	The fears of the respondent that mobile banking will not operate properly and put at risk his/her private information and bank account details. [3-4, 19, 37]	4
Perceived awareness (PA)	The belief that the respondent is aware of mobile banking use and its benefits. [45, 49]	3
Personal factors (PF)	Perceptions towards innovation, cultural characteristics (individualism) and perceived compatibility with the respondent's status. [28, 39, 53]	4
Hedonic motivation (HM)	The sense of entertainment felt by the respondent when using mobile banking. [7, 10, 18]	3
Socialinfluence (SI)	The intention of the respondent to adopt these services when his/her social environment, including media and social media, promote its use. [18]	3
Attitude (ATT)/ Behavioral intention (BI)	Attitude toward mobile banking and Behavioral Intention to adopt it or continue to use it. [18, 22, 35]	3
Actualuse (UB)	The use of mobile banking by the respondent. [7, 10]	1
Stress	Feeling stressed when using it. [48]	1
Technological backround	Use of PC, smartphones and tablet.[39, 47]	3

5. Data Analysis and Results

5.1. Descriptive Analysis

The results showed that 59.2% of the sample was women, while the average age was 29.24 years. A sizeable proportion of the sample had a university education, with 47.2% being at the undergraduate level, while 40.2% of them were unemployed. Regarding the marital status, most of the sample was unmarried, while the monthly income results seemed more balanced, with 25.6% having zero income, 16.9% an income between 1 and 300 euros, and 16.7% with monthly earnings in the range of 901-1200 euros. Finally, the majority of our sample seemed to have quite good computer literacy.

5.2. Logistic Regression Model (First Methodology)

To test some of the research hypotheses, two models of multiple logistic regressions were performed. Table 4 shows the logistic regression results, including the estimated coefficients, the odds ratio, and the marginal effect for mobile banking users and non-users. We first conducted a principal component analysis to reduce the number of indicators. The results about the factors and the validity of the methodology are shown below in tables 2 and 3.

In the final model (Model II), we derived log likelihood=-264.789, hosmer-lemeshow test=10.07, and pseudo R2= 0.345, so clearly there is a good fit of the data and therefore a good fit of the percentage distribution of observations in groups.

From the empirical results, we conclude that all the variables we used are statistically significant, except perceived usefulness, perceived ease of use, and social influence. Thus, the research hypotheses H1a, H2a, H3a, H4a, H4b, H4c H5a, H5b, H5c, H5d, H5e, H5f, H5g, H6a, H7a, H10a, H11a, H12a, and H14a are confirmed, but H8a, H9a, and H13a are not.

It is worth mentioning that the hypotheses of perceived risk, perceived awareness and personal factors all had a special significance, with a significant statistical level of 1%

from the technology acceptance factors. Thus, someone who is individualist and technologically innovative is likely to be aware of these services and believe that these services have no risk. Therefore, the probability of being a mobile banking user increases.

5.3. Structural Equation Model (Second Methodology)

5.3.1. Explanatory Factor Analysis -Internal Consistency and Validity

To confirm our previous empirical results a structural equation model analysis was performed, in which the explanatory factor analysis (EFA) was necessary to proceed. The Kaiser-Meyer-Olkin (KMO = 0.895) and Bartlett's test of sphericity and the corresponding p-value (Chi-Square=12526.952, df = 435, p-value = 0.000<p-value=0.005) confirms the validity of the specific method. Tables 5 and 6 show: a) the factors that resulted from the implementation of the specific methodology, b) the loads or otherwise the correlation coefficients of the observable variables with each factor, c) the eigen values of each factor, d) the percentage of variance explained by each factor, e) the percentage of total variance explained by all the factors that emerged, as well as g) the reliability index of each factor (Chronbach's alpha). The most important factors that emerged from the analysis are the first nine, which explain 76.6% of the total variance. All factor loads are greater than 0.40, while cronbach's alpha reliability index values are over 0.70, which demonstrates good reliability of the factors. Convergent validity was tested in conjunction with the reliability of the resulting factors, as shown in Table 7. From the results it is clear that our data does not have any convergent validity and reliability problems. Indeed, according to the literature [8, 20], certain conditions should be met to avoid problems with data reliability and convergence validity: a) the value of the reliability index (CA) should be over 0.70, b) the value of the complex reliability index (CR) should be over0.70, and c) the value of the average variance (AVE) should be over 0.50 for all factors.

***Table 2.** Component transformation matrix (Discriminant validity).*

Component	1	2	3	4	5	6	7	8
ABI	0.616	-0.328	0.263	0.354	0.282	0.339	0.306	0.177
PR	-0.245	0.333	-0.082	-0.193	0.509	-0.048	0.369	0.623
PA	0.325	0.583	-0.565	0.433	-0.164	0.016	0.126	-0.064
PU	0.045	0.638	0.74	0.082	0.028	0.018	-0.083	-0.172
PF	-0.201	-0.046	0.188	0.283	-0.677	0.108	0.018	0.61
PEoU	-0.304	0.065	-0.134	0.173	0.246	0.754	-0.476	0.02
HM	0.205	-0.046	0.002	0.275	0.264	-0.496	-0.672	0.336
SI	0.528	0.162	-0.066	-0.676	-0.212	0.239	-0.262	0.25

Extraction method: Principal component analysis. Rotation method: Varimax with Kaiser normalization.

***Table 3.** Factor loading and variance explained.*

		ABI	PR	PA	PU	PF	PEoU	HM	SI
Eigen value		9.937	2.777	2.356	2.058	1.62	1.348	1.166	1.014
% of variance		33.123	9.255	7.853	6.861	5.399	4.494	3.887	3.88
Cumulative %		33.123	42.379	50.231	57.093	62.491	66.985	70.872	74.251
Chronbach's alpha		0.937	0.87	0.923	0.826	0.792	0.827	0.833	0.792
Attitude/Behavioral	BI2	0.837							
Intention (ABI)	BI3	0.825							
	BI1	0.786							
	A3	0.755							
	A2	0.73							
	A1	0.727							
Perceived risk	SR		0.896						
(PR)	PR		0.86						
	FR		0.857						
	PeR		0.647						
Perceived awareness	PA2			0.913					
(PA)	PA3			0.895					
	PA1			0.884					
Perceived usefulness	PU3				0.789				
(PU)	PU4				0.737				
	PU1				0.678				
	PU2				0.629				
Personal factors	Ind1					0.853			
(PF)	Ind2					0.844			
	PI					0.663			
	Pcomp					0.559			
Perceived ease of use	PEoU2						0.791		
(PEoU)	PEoU1						0.771		
	PEoU1						0.7		
Hedonic motivation	HM2							0.831	
(HM)	HM1							0.827	
	HM3							0.67	
Socialinfluence	SI2								0.878
(SI)	SI3								0.85
	SI1								0.675

Extraction method: Principal component analysis/ Rotation method: Varimax with Kaiser normalization.

***Table 4.** Results from logistic regression.*

Variables	Model I	Model II		
	Estimated coefficients	Estimated coefficients	Odds ratio	Marginal effect
Constant	-0.294 (0.894)	1.892* (1.013)		
Age	-0.064*** (0.015)	-0.088*** (0.017)	0.915	-0.0186
Income	0.257*** (0.081)	0.279*** (0.089)	1.322	0.3416
Cards	0.501*** (0.297)	0.479*** (0.130)	1.614	0.1053
Usepc	-0.930** (0.401)	-1.419*** (0.452)	0.241	-0.2116
Usesmart	2.801*** (0.721)	2.362*** (0.794)	10.614	0.5322
Usetab	0.390* (0.212)	0.510** (0.249)	1.665	0.1049
Stress	-1.165*** (0.191)	-0.634*** (0.230)	0.529	-0.1359
Infobankpc	-	-0.506* (0.281)	0.602	-0.1134
Infosocialpc	-	-0.613*** (0.233)	0.541	-0.1251
Infobankmob	-	0.598* (0.293)	1.818	0.1324
Infoadvermob	-	-0.464* (0.266)	0.628	-0.1087

Variables	Model I	Model II		
	Estimated coefficients	Estimated coefficients	Odds ratio	Marginal effect
Noinfomob	-	-1.614*** (0.447)	0.199	-0.3873
Infobankeban	-	-0.533* (0.294)	0.586	-0.113
Noinfoeban	-	-0.752** (0.384)	0.471	-0.167
ABI	-	0.720*** (0.130)	2.018	0.1498
PR	-	-0.587*** (0.115)	0.555	-0.1249
PA	-	0.597*** (0.124)	1.817	0.1236
PF	-	0.548*** (0.118)	1.729	0.1185
HM	-	0.253** (0.116)	1.288	0.0558
Pseudo R2	0.159	0.345		
Loglikelihood	-339.647	-264.789		
Hosmer and Lemeshow	10.07	4.33		
Prob Ch2	0.26	0.826		

Note that ***,** and * represent the significance levels of 1%, 5% and 10%, respectively

Table 5. *Factor loading and variance explained.*

		PU	PR	PA	BI	PF	HM	SI	PEoU	ATT
Eigen value		9.937	2.777	2.356	2.058	1.62	1.348	1.166	1.014	0.726
% of variance		33.123	9.255	7.853	6.861	5.399	4.494	3.887	3.38	2.421
Cumulative %		33.123	42.379	50.231	57.093	62.491	66.985	70.872	74.251	76.672
Chronbach's alpha		0.826	0.87	0.923	0.91	0.792	0.833	0.792	0.827	0.936
Perceived usefulness	PU1	0.987								
(PU)	PU2	0.867								
	PU3	0.544								
	PU4	0.427								
Perceived risk	SR		-0.955							
(PR)	FR		-0.847							
	PR		-0.843							
	PeR		-0.512							
Perceived awareness	PA2			0.953						
(PA)	PA3			0.876						
	PA1			0.859						
Behavioralintention	BI2				1.038					
(BI)	BI3				0.821					
	BI1				0.649					
Personal factors	Ind1					0.907				
(PF)	Ind2					0.886				
	PI					0.501				
	PComp					0.435				
Hedonic motivation	PP2						0.914			
(HM)	PP1						0.893			
	PP3						0.501			
Socialinfluence	SI2							0.927		
(SI)	SI3							0.812		
	SI1							0.496		
Perceived ease of use	PEoU2								0.974	
(PEoU)	PEoU1								0.878	
	PEoU3								0.485	
Attitude	Att3									0.832
(ATT)	Att2									0.798
	Att1									0.78

Extraction method: Maximum likelihood. Rotation method: Promax with Kaiser normalization.

Table 6. *Discriminant validity.*

Factor	1	2	3	4	5	6	7	8	9
PU	1	0.305	0.273	0.65	0.263	0.424	0.216	0.57	0.647
PR	0.305	1	0.278	0.376	0.22	0.239	0.132	0.395	0.444
PA	0.273	0.278	1	0.345	0.248	0.23	0.127	0.36	0.359
BI	0.65	0.376	0.345	1	0.33	0.452	0.143	0.554	0.751
PF	0.263	0.22	0.248	0.33	1	0.453	0.371	0.36	0.389
HM	0.424	0.239	0.23	0.452	0.453	1	0.394	0.416	0.524
SI	0.216	0.132	0.127	0.143	0.371	0.394	1	0.219	0.185
PEoU	0.57	0.395	0.36	0.554	0.36	0.416	0.219	1	0.57

Factor	1	2	3	4	5	6	7	8	9
ATT	0.647	0.444	0.359	0.751	0.389	0.524	0.185	0.57	1

Extraction method: Maximum likelihood. Rotation method: Promax with Kaiser normalization.

Table 7. *Cronbach's alpha (CA), Composite reliability (CR) – Average variance explained (AVE).*

Constructs	CR	AVE	CA
PU	0.826	0.555	0.826
PR	0.88	0.655	0.87
PA	0.924	0.803	0.923
BI	0.914	0.78	0.91
PC	0.808	0.525	0.792
HM	0.845	0.65	0.833
SI	0.81	0.596	0.792
PEoU	0.847	0.656	0.827
ATT	0.936	0.83	0.936

5.3.2. Confirmatory Factor Analysis (Measurement Model)

The second method for the implementation of structural equation model analysis, that performed, was the confirmatory factor analysis. This method also investigates the relationship between observable and unobserved variables and is the model for measuring the analysis of structural equations (SEM). From this method, nine unobserved variables emerged: perceived usefulness (PU), perceived ease of use (PEoU), perceived awareness (PA), perceived risk from the use of the application. (PR), hedonic motivation (HM), influence from social environment (SI), personal characteristics (PF), attitude towards these services (ATT), and behavioral intention of adopting or continued use of these services (BI). Table 8shows the metric model's leading adaptation indicators, proving its good adaptation to the data. The CMIN (x^2) / df value is 2.17, the x^2 (df) value is 798.426, with 368 degrees of freedom, and the comparative fit index (CFI) value is 0.965, which proves good adaptation of our metric model as, according to the literature, the acceptable levels are CMIN value (x^2) / df<3 and CFI over 0.90 [8]. The estimated root mean square error of approximation (RMSEA= 0.044, p-close=0.995) and standardized root mean square residual (SRMR= 0.0578) indicators, which refer to the percentage of estimation error and the residuals in our hypothetical metric model, also prove

satisfactory for our metric model since, according to the literature, RMSEA should be up to 0.10, p-close more than 0.05 and SRMR up to 0.08 [14].

Table 8. *CFA model fit indices.*

Indices	Final measurement model
x2(df)	798.426 (368)***
CMIN/df	2.17
CFI	0.965
RMSEA(P-close)	0.044 (0.995)
SRMR	0.0578

Note that***represents the significance level of 1%

5.3.3. Structural Equation Model

i. Goodness of Fit Test for SEM

Regarding the fit of the structural model produced; in Table 9 the values of indices show good fit. They were calculated according to the generated model while the proposed and acceptable values of these statistical indices were based on the literature. The first absolute adjustment index calculated is the CMIN (x^2) / df index, which is the x^2 index adjusted to degrees of freedom. The proposed values of this index, based on the literature [8], are CMIN (x^2)/df<3, wherein the hypothetical model its value is CMIN (x^2) / df =2.248<3, which demonstrates good data conformity.

The goodness of fit index (GFI) and the adjusted goodness of fit index (AGFI) indicators follow, where GFI is equal to 0.874, and AGFI is equal to 0.853, consistent with the suggested values according to the literature, as both should be over 0.80 [20, 24]. The next indicators are CFI and TLI, whose values are 0.932 and 0.924, respectively; their suggested value should be over 0.90 [8]. The final indices showing that our hypothetical model fits well with our data are RMSEA and p-close, whose values are 0.045 and 0.998, and SRMR is 0.0885. The suggested values are RMSEA <0.10, P- Close> 0.05 and SRMR <0.09 [14].

Table 9. *Model fit SEM.*

Fit index	CMIN (x^2)/df	CFI	GFI	TLI	AGFI	RMSEA(P-close)	RMR	SRMR
Recommended value	<3	>0.9	>0.80	>0.90	>0.80	<0.08 (>0.05)	<0.08	< 0.090
Actual value	2.248	0.932	0.874	0.924	0.853	0.045 (0.998)	0.163	0.0885

ii. Results from Structural Equation Model

In Figure 1, the proposed model is illustrated. The results of the structural equation model are also shown in Table 10.

Regarding demographics and personal characteristics, the following factors were found to have a positive direct effect on the actual use of mobile banking (UB): a) the level of income (B=0.173, p<0.01), b) the possession of bank cards by the individuals in the sample (B=0.118, p<0.01), c) the use of a smartphone by the respondent (B=0.099, p<0.01), and d) the perception of individuals that they have been informed by the

bank itself concerning the mobile banking service (B=0.073, p<0.10), which confirms the research hypotheses H2b, H3b, H4e and H5j. On the contrary, the following factors had a direct negative effect: a) the age of the respondents (B=-0.258, p<0.01), b) the use of the computer (B=-0.107, p<0.01), c) the perception of people that they have been informed by their social environment about the online banking service (B=-0.091, p<0.01), d) the perception of people that they have not received any information about the use of mobile banking services (B=-0.131, p<0.01) nor about electronic banking services in general (B=-0.102, p<0.05), e) the perception of people that they have

been informed by the bank itself about the electronic banking services in general (B=-0.1, p<0.05) but also g) the stress that they feel when using these banking services (B=-0.128, p<0.01), which confirm the research hypotheses H1b, H4d, H5i, H5l, H5m, H5n and H6b. Regarding the personal characteristics (PF), it was found that: a) they have a positive and direct effect on attitude (ATT) (B = 0.099, p <0.01) and on the actual use of this service (UB) (B=0.182, p<0.01). They also have an indirect effect on the intention to use or to continue using mobile banking (Users) (BI), on ATT (B=0.064, p<0.05) and on UB (B=0.008, p<0.01), through the overall impact of ATT and BI. The research hypotheses H7b, H7d, H6e and H7f are confirmed but H4f, H5h and H5k are not.

In the extended TAM model, the factors of perceived usefulness (PU), perceived ease of use (PEoU), perceived awareness (PA), perceived risk (PR),

Hedonic motivation (HM), and Social influence (SI) were investigated for both their direct and indirect influence on the attitude (ATT), intention to use (BI) and actual use of mobile banking services (UB).

The results showed that the factor of perceived usefulness (PU) had a positive and direct effect on ATT (B=0.433, p<0.01) and on BI (B=0.198, p<0.01) but not on UB, therefore research hypotheses H8b and H8c are confirmed but H8d is not. PU was also found to have an indirect and positive effect on BI through attitude (B=0.280, p<0.01), as well as on UB through the overall effect on ATT and BI (B=0.052, p<0.01), confirming the research hypotheses H8e and H8f.

As regards the usage of mobile banking services, the factor of perceived ease of use (PEoU) also had a positive and direct effect on ATT (B=0.163, p<0.01). Regarding its indirect effect, PEoU had a positive effect on BI and UB through ATT (B=0.105, p<0.01) and through the overall effect on ATT and BI (B=0.013, p<0.01), respectively. Thus, the research hypotheses H9b, H9e and H9f are confirmed but H9c and H9d are not.

Perceived awareness (PA) is the third factor that was found to affect the use of mobile banking services, both directly and indirectly. More specifically, this factor had a positive direct effect on a) ATT (B=0.08, p<0.01), b) BI (B=0.064, p<0.05), and c) UB (B=0.134, p<0.01), confirming research hypotheses H10b, H9c and H9d. The indirect positive effect of PA was found in BI, through its direct effect on them ATT (B=0.052, p<0.05) and in UB through the overall direct impact of ATT and BI (B=0.014, p<0.01), confirming the research hypotheses H10e and H10f.

Perceived risk (PR) was found to have a direct and negative effect both on ATT (B=-0.176, p<0.01) and UB (B=-0.154, p<0.01), confirming the research hypotheses H11b and H11d. The direct effect of this factor on BI had not been established, and therefore the research hypothesis H10b is not confirmed. Nevertheless, there was an indirect negative effect on the BI through ATT (B=0.114, p<0.01), as well as on UB through the overall impact of ATT and BI (B=-0.014, p<0.01). Thus, the research hypotheses H11e and H11f are confirmed, while H11c is not.

Table 10. *SEM hypothesis test.*

Hypothesis	Hypothesized path	Path coefficient	S. E.	C. R.	p-value	Remarks
H1b	Age→ UB	-0.258	0.02	-5.11	***	Supported
H2b	income→ UB	0,173	0.012	3.435	***	Supported
H3b	Cards→ UB	0.118	0.04	3.459	***	Supported
H4d	Usepc→ UB	-0.107	0.064	-3.15	***	Supported
H4e	Usesmart→ UB	0.099	0.084	2.846	***	Supported
H5i	Infosocialpc→ UB	-0.091	0.033	-2.687	***	Supported
H5j	Infobankmob→ UB	0.073	0.039	1.766	0.077	Supported
H5l	Noinfomob→UB	-0.131	0.06	-3.38	***	Supported
H5m	Infobankeban→UB	-0.1	0.04	-2.306	0.021	Supported
H5n	Noinfoeban→UB	-0.102	0.054	-2.477	0.013	Supported
H6b	Stress→ UB	-0.128	0.031	-3.768	***	Supported
H7b	Person→ ATT	0.099	0.024	2.733	0.006	Supported
H7d	Person→ UB	0.182	0.017	4.616	***	Supported
H7e	Person→ ATT → BI	0.064	0.026	1.653	0.011	Supported
H7f	Person→ ATT → BI →UB	0.008	0.004	0.75	0.006	Supported
H8b	PU → ATT	0.433	0.046	10.993	***	Supported
H8c	PU → BI	0.198	0.051	4.617	***	Supported
H8e	PU→ ATT → BI	0.28	0.035	9.542	***	Supported
H8f	PU → ATT →BI →UB	0.052	0.022	2	0.003	Supported
H9b	PEoU→ ATT	0.163	0.036	4.139	***	Supported
H9e	PEoU→ ATT → BI	0.105	0.033	2.969	0.001	Supported
H9f	PEoU→ ATT → BI →UB	0.013	0.007	1.142	0.002	Supported
H10b	PA→ ATT	0.081	0.022	2.633	0.008	Supported
H10c	PA → BI	0.064	0.022	2.15	0.032	Supported
H10d	PA → UB	0.134	0.02	3.257	0.001	Supported
H10e	PA→ ATT → BI	0.052	0.023	1.695	0.014	Supported
H10f	PA → ATT → BI →UB	0.014	0.007	1	0.002	Supported
H11b	PR→ ATT	-0.176	0.04	-5.186	***	Supported
H11d	PR → UB	-0.154	0.032	-3.785	***	Supported
H11e	PR→ ATT → BI	-0.114	0.024	-5.75	0.001	Supported
H11f	PR→ ATT → BI →UB	-0.014	0.006	-1.833	0.002	Supported

Hypothesis	Hypothesized path	Path coefficient	S. E.	C. R.	p-value	Remarks
H12b	HM→ ATT	0.227	0.031	5.922	***	Supported
H12e	HM→ ATT → BI	0.147	0.031	3.935	0.001	Supported
H12f	HM→ ATT → BI →UB	0.018	0.007	1.285	0.002	Supported
H13b	SI→ ATT	-0.074	0.023	-2.135	0.033	Supported
H13e	SI→ ATT → BI	-0.048	0.025	-1.32	0.045	Supported
H13f	SI → ATT → BI →UB	-0.006	0.004	-0.75	0.024	Supported
H14b	ATT→ BI	0.647	0.046	14.299	***	Supported
H14c	BI→ UB	0.12	0.026	2.928	0.003	Supported
H14d	ATT → BI →UB	0.078	0.03	1.7	0.003	Supported

Note that***represents the significance level of 1%
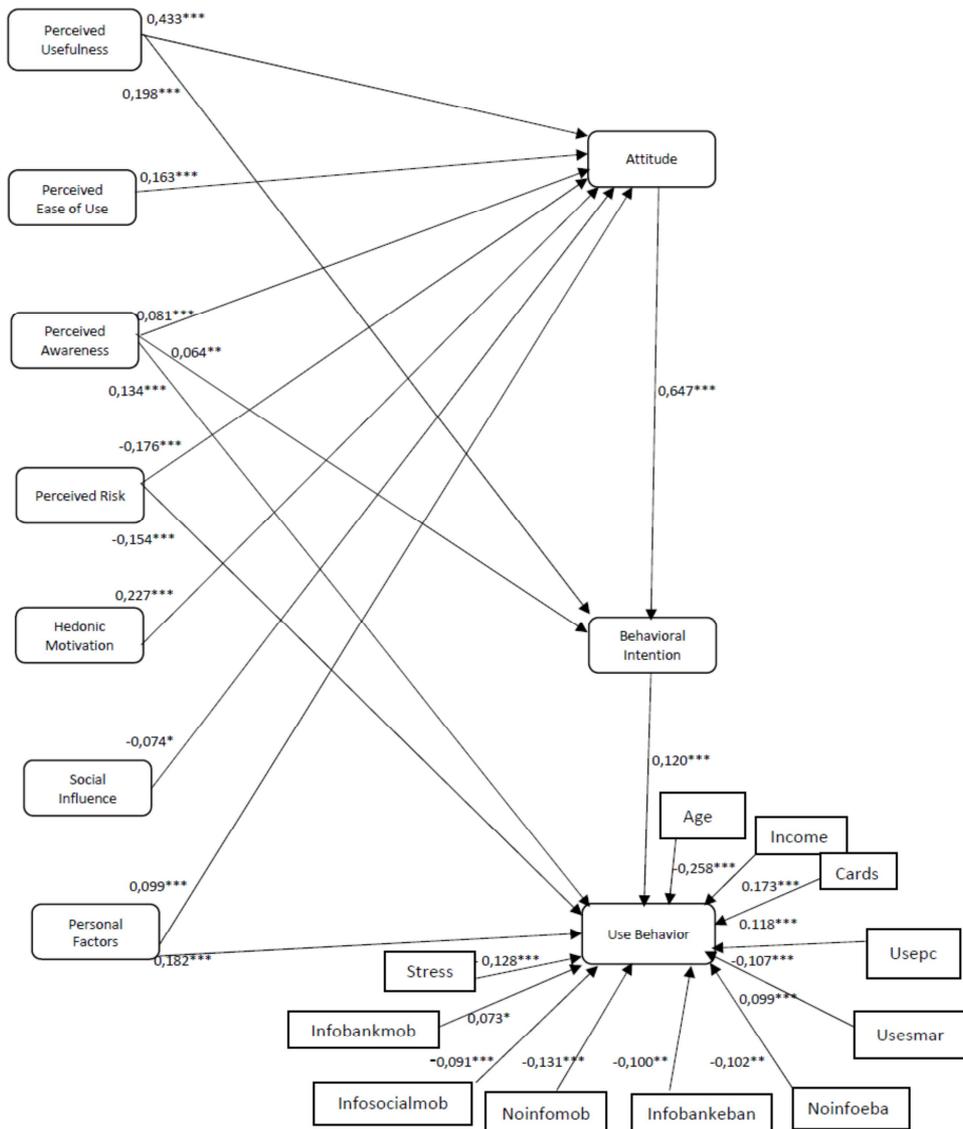
Figure 1. *The structural equation model results from Table 10, with the relationships between independent and dependent variables (Hypothesized path), standard coefficients (Path coefficient) and significance level (P-value). [Note: ***, ** and * represent the significance levels of 1%, 5% and 10%, respectively].*

With regard to hedonic motivation (HM), it is worth mentioning that it was found to have a direct positive effect on ATT (B = 0.227, p<0.01), while no direct effect was found on either BI or UB, thus the research hypothesis H12b is confirmed and the research hypotheses H12c and H12d are not. On the contrary, an indirect and positive effect on HM was found in BI, through ATT (B = 0.147, p<0.01),

confirming the research hypothesis H12e. The same happened with UB (B = 0.018, p<0.01), where HM had an indirect and positive effect on UB through ATT and BI's overall impact, confirming the research hypothesis H12f.

Social influence (SI) on the use of mobile banking services was found to have a direct negative effect on ATT (B = -0.074, p<0.05), but not on BI or UB. It is also worth

mentioning that, although no direct effect of this factor was found in BI, SI was found to have an indirect and negative effect on BI (B = -0.048, p<0.05), through ATT, as well as on UB (B=-0.006, p<0.05), through ATT and BI. Therefore, research hypotheses H13b, H13e and H13f, are confirmed, while H13c and H13d are not.

Finally, it is worth mentioning that attitude (ATT) had a direct and positive effect on BI (B = 0.647, p <0.01), BI had a positive and direct effect on UB, while ATT had an indirect effect on UB through BI (B=0.078, p <0.01), which confirms research hypotheses H14b, H14c and H14d.

6. Discussion

The empirical analysis in the present study investigates those factors that affect the use of mobile banking services in Greece, and thus those that can lead to its adoption by non-users or to maintaining its use by existing users, especially during Covid-19. The empirical results show that demographic characteristics such as age and income level affect the use of these services, indicating that older people and the low paid in Greece are not likely to be familiar with such technologies [32, 42]. On the contrary, a familiarity of Greeks with a bank's products, such as bank cards, and with new technologies, such as computers and smartphones, positively influences mobile banking [23, 46, 51]. Information about electronic banking services, combined with people's perception regarding their awareness of its use, appears to be the most vital factor for the adoption and maintenance of its use. Individuals' perception about their knowledge regarding both the operation of, and the benefits provided by, those banking services, in addition to the negative effect of the feeling stressed when using these banking services, demonstrates the urgent need for individuals to be informed by those in charge, especially during this challenging period. The results are in line with those of Mohammadi (2015a,b), Tam and Oliviera (2016) and Singh et al. (2020) [44-45, 48, 52].

In new technological applications, individuals' perceptions are vital factors that either increase or decrease the uptake of such banking services. According to the empirical results, perceptions toward usefulness [10, 43], ease of use, but also the entertainment value of these applications [13, 18, 56] have a positive impact on the adoption of mobile banking by Greek consumers. When an individual considers such a banking service to be useful in their daily life, easy to operate and entertaining to use, they tend to become a user. Personal characteristics of individuals, such as their receptiveness toward innovative applications [44, 55], the increased sense of individualism [15, 34, 53] and the perception that using such services increases one's status [3, 45] turn out to be subconscious critical drivers of mobile banking's adoption in Greece.

According to the results, Greeks tend to be weary of these new banking services due to the perceived risk effect. The users also fear that, by using such services, there is a risk of non-protection of their privacy and personal information, or that the application will not operate properly and they will lose money which, as a consequence, leads them to either develop a negative attitude towards these services or not adopt them at all. The results are in line with those of Malaquias and Hwang (2016), Jankovic and Brodic (2017), and Katjaluoto et al. (2019) [26, 28, 38].

It is worth mentioning that the influence of an individual's social environment, referring mainly to the promotion of mobile banking by the media and social media, negatively shapes attitudes towards these services. This result was found in the SEM analysis, while in the logistic regression analysis, no effect of this factor was found, which indicates that this factor has only a small impact on mobile banking usage. The results are partly in line with those of Alalwana et al., 2018 and Howcroft et al., 2002, who found little or no effect of online banking promotion, especially by promotional campaigns, on that service's usage, while Kolodinsky et al., (2004) found that this factor only influences the usage of phone banking [4, 25, 27]. Forming a positive attitude towards these services in Greece is extremely important since the positive perceptions regarding these banking services can lead to a positive intention to use them and ultimately increase customers' use of mobile banking services.

7. Conclusions and Recommendations

7.1. Conclusions

The purpose of the paper is to explore those factors affecting the use of mobile banking application in Greece. The empirical results, employing two different econometrical methodologies, support the hypotheses that demographic and personal characteristics as well as perceptions regarding the use of mobile banking have a direct impact on the use of mobile banking services. In particular, personal and cultural characteristics of individuals, such as their receptivity to innovation and their sense of individualism, were important subconscious factors in determining mobile banking application usage. People's perceptions regarding the awareness of the use, usefulness, ease of use, hedonic motivation and the risk of these applications have proven to be valuable factors influencing the adoption of mobile banking application.

7.2. Recommendations

Greek banks should ensure that their mobile-banking applications will be simple to use, easy to understand, available 24 hours a day and entertaining for users. They should have greater appeal for those who tend to be unfamiliar with, or even reject new technology innovations. As a result, they would feel more capable to use such applications and it would be more likely that they will continue using the mobile-banking application in the after Covid-19 period. Banks also, need to ensure that mobile-banking applications are user friendly and reliable using

appropriate software programs. Explanatory information is also considered necessary to reassure users to completely trust such applications.

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