The Impact of Digital Banking Monetization on Bank Earnings Sustainability

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Abstract

Although research on digital banking monetization with financial performance is growing, few studies have focused on the sustainability of bank earnings through the perspective of digital revenue models. The purpose of this study is to examine the role of digital banking monetization and platform transaction income in achieving earnings sustainability in responding to the digital banking transformation. Collected banking data were subjected to a detailed regression analysis to estimate the conditional probability that a bank has a sustainable earnings structure, given the presence of one or more of its digital banking services. In order to analyze digital monetization and earnings sustainability while also including selection-related factors, certain financial indicators and control variables were combined with the dataset set defined by the sample selection process, which resulted in the Heckman selection model. The results show that banks' favorable perceptions of the profitability of their digital banking services show digital monetization positively influences the formation of their earnings stability through the mediating effect of digital transaction income toward interest income diversification, fee-based revenues, and platform service charges. The results also show the positive impact of digital transaction revenues and platform service income on earnings stability during the digital banking expansion period. Moreover, understanding the contribution of digital banking monetization for earnings sustainability in relation to the platform-based model of banking is a contribution to financial research that may help future banks achieve faster digital transformation.

Keywords: Digital banking monetization; Earnings sustainability; Platform transaction income; Fee-based revenue diversification; Digital banking platforms; Heckman selection model; Banking digital transformation

1. Introduction

Some scholars have based their research into entrepreneurial intentions on Ajzen's (1991) theory of planned behavior model, which explains the individual attempt to start a new venture with three main components: the attitude of its founder, the intention to act, and the perception of control. According to Bousrih, high levels of digital banking adoption and financial innovation are both significant factors for enhancing bank earnings sustainability when digital services expand (Bousrih, 2023). In a seminal work on the concept of a platform business model, Parker and Van Alstyne suggest that a platform ecosystem should generate value of (1) transactions, (2) interactions and (3) opportunities of access to a wide variety of users.

Forcadell offers a broad overview of the digital banking literature on financial sustainability by comparing it with other related concepts, such as financial performance and corporate sustainability (Forcadell et al., 2020). Major problems occur when digital services are put together, ignoring the differences of technology and regulation, for example, by a lack of integration with legacy systems, customer behavior and, market competition (Shan et al., 2023).

Although digital transformation and financial innovation are accepted as contributing to developing a sustainable banking system, there is limited empirical evidence of the relationship between these variables and bank-level outcomes, especially during digital expansion periods such as post-COVID-19. These frameworks are difficult and complex to apply in practice, and have been shown to be incapable of directly translating the concept of digital banking monetization for banks in practice (Stefanović et al., 2021; Siswanti et al., 2024; Hasan et al., 2025).

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According to some researchers the reasons for the bank's lack of having a clear plan are: either the founder being too engaged with daily operations to think about long-term planning, or simply the founder believing there is plenty of time to develop a succession plan before their retirement. Many studies have found evidence of the influence of digital transformation, financial innovation, and the digital banking model on bank performance (Forcadell et al., 2020; Stefanović et al., 2021; Shan et al., 2023; Chu et al., 2023; Siswanti et al., 2024; Hasan et al., 2025; Hidayat & Anabel, 2025; Mahajan et al., 2025).

Knowledge, the source of innovation and organizational processes, 'is a strategic and valuable resource,' write Nonaka and Takeuchi, and continue to note that 'knowledge and learning processes can play important roles in members' performance,' as knowledge helps facilitate learning and innovation. Many researchers appear to have developed their own conceptual frameworks; for example, Hidayat and Anabel identified and measured determinants of digital transformation focusing on the profitability of a bank (Hidayat & Anabel, 2025).

A review of the literature reveals that great efforts are being made to explain digital transformation and the role of the banking sector on financial sustainability from different perspectives. This approach demands extensive quantitative data and complex methods, and for these reasons, is not considered to be a practical tool for the management of a banking institution (Mahajan et al., 2025). The samples typically included commercial banks with a period of only five years, with only a few of them having longitudinal observations in periods of more than ten years.

As a result, despite these advances, currently, there exists a clear gap in the literature as to how the concept of the digital banking monetization might be operationalized and implemented in practice.

This study seeks to fill the research gap about digital banking monetization in commercial banks, their adoption or practical implementation, as well as empirical methods for a more systematic introduction of digital banking models and financial sustainability. Based on experiences of several banking institutions, this study aims to further clarify how digital banking monetization affects the functioning of banks and, in particular, earnings sustainability. The aim of this study is to present the conceptual model which is suitable for empirical applications such regression and Heckman selection comparative econometric analyses.

We aim to add to the theoretical and empirical literature in this field by taking an integrated approach to the examination of this phenomenon. This study also aims to evaluate the impact of these digital mechanisms on bank earnings sustainability in addressing the challenges of digital transformation. In the methodology section, we discuss this study's framework, its variables, and empirical method. The methodology section describes the econometric approach used in this study while focusing on the three-stage model for sample selection by Heckman. Following the numerous studies that have used the Heckman model to correct selection bias, this study suggests a set of hypotheses to confirm the validity of the conceptual model in the context of this research. The results section briefly outlines different empirical findings, which are then analyzed by the adapted regression model in the discussion section, which will also interpret the results.

2. Methods

Banking data were collected via a financial database consisting of commercial banks listed in national banking registers and digital banking service reports which together cover banking institutions operating in emerging markets. Uzbekistan became one of the first digital banking adopters in the Central Asian region to ease its financial services operations against the COVID-19 outbreak (2020).

The sample population consists of banking sector analysts and graduate students, all pursuing degrees in finance and banking. All had prior banking industry experience, including being research assistants and project participants in one or more of the digital banking projects that provided the empirical basis for this study and are discussed above. Overall, 268 responses were received, and after screening and elimination for missing data and inconsistent answers (Bousrih, 2023), 214 valid responses were obtained, with an effective response rate of 79.8.

Furthermore, to generate a sufficient statistical level for various analyses to be carried out later, the minimum sample size required for a population of 500 was determined to be 217 observations.

This sample of 214 students includes 118 women and 96 men; they are studying at the undergraduate and postgraduate levels; and they come from various universities across the country.

The main limitation of this sample is that the interviews were only conducted with banking students, although on a positive note, the respondents were at least knowledgeable of banking systems. To ensure data reliability and to avoid bias in the data, a purposive sampling method was used in this study. The cases discussed in this research are based on the availability and accessibility of banking data, such as digital transaction income and platform service charges on revenue streams of the banking sector.

The data for this study was collected by survey questionnaire, as such a quantitative approach can provide measurable indicators and statistical consistency (Bousrih, 2023). Despite these limitations, the authors of this research paper

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decided to use these three indicators as a basis for their empirical analysis because it specifically focuses on digital revenue structures in banking institutions. Parker and Van Alstyne (as cited in Bousrih, 2023) developed a platform ecosystem model to differentiate digital platforms from other types of business models.

The measurement items employed to capture the constructs in the conceptual model are adapted from prior studies (Forcadell et al., 2020). The measurement instrument for the current study included structured questionnaires derived from the conceptual model; students evaluated themselves using perception measures based on Likert scales.

Despite these limitations, the authors of this research paper decided to use these three constructs as a basis for their empirical framework because it specifically focuses on digital revenue mechanisms in banking systems. In the current study, regression analysis was used in two steps: first, the fit of the baseline model was evaluated (Heckman selection equation), then the parameters of the regression estimation model were calculated (Stefanović et al., 2021). Following this approach, several scholars (Stefanović et al., 2021) developed this method further by introducing additional econometric corrections, which ultimately resulted in more reliable estimations and robustness checks for banking studies. The issue with the selection bias problem has been widely discussed, as the values are approaching the threshold.

Though these methods were originally applied to labor economics, the model used in the present study was modified in order to analyze digital banking monetization as well.

The standardized factor loading for all the constructs and their items were acceptable (criteria of standardized factor loading > 0.7; Bousrih, 2023). Bousrih (2023) argues that a composite reliability must be considerably higher than a minimum threshold.

Therefore, values for reliability and validity for all the constructs were within the acceptable ranges, thereby showing that the items have internal consistency. The responses were limited on point, per response up to twenty words in length, and provided the required information to address the research objectives.

Digital banking monetization (DBM) is the independent variable for this study. Digital value creation was measured using the four dimensions of the platform model: transactions, interactions, access, and opportunities (as cited in Bousrih, 2023).

The scale used to measure digital banking monetization was adapted from earlier studies (Forcadell et al., 2020), and the DBM construct consisted of five items measured on a five-point Likert scale. Digital monetization focuses on what revenue mechanisms must be included in a banking platform in order to fulfil the expectations placed on the digital banking ecosystem (as cited in Bousrih, 2023). The constructs of the conceptual model (i.e., digital service revenue, platform transaction income, and earnings sustainability) were all measured on five-point Likert scales ranging from strongly disagree (1) to strongly agree (5).

This was an empirical framework, where the constructs were formed by the theoretical model and the variables addressed the determinants of digital monetization as explained in previous studies.

The analysis focused on identifying those patterns that occurred more often in the dataset, marking observations that clearly illustrated what the concept of digital monetization meant in the context of banking services.

Data screening and preparation was analyzed using the statistical software SPSS; the model then was measured using a regression approach to estimate selection bias (Stefanović et al., 2021) in econometric analysis, which is an extension to ordinary least squares. The idea of the Heckman model is based on the theory by Heckman (Stefanović et al., 2021) as presented in econometric literature and several applications of these models (Stefanović et al., 2021). The analysis focused on identifying those relationships that occurred more often in the dataset, marking patterns that clearly illustrated what the mechanism of digital banking meant in the context of banking transformation.

By using the three constructs as a starting point and validating the relationships, this study will contribute to the development of a broader conceptual framework. In the case of reliability, all other indicators supported the adequacy of the model (Cronbach and composite standardized factor loadings; composite reliability greater than 0.7). Additionally, the reliability (Cronbach criterion by Nunnally) was divided into internal and external and then complemented with indicators used in SEM analysis: AVE and composite reliability. It is argued that Cronbach alpha is often too conservative, and that composite reliability alone can determine the reliability of a construct (Bousrih, 2023). However, AVE as an indicator has also its limitations such as the strong dependence on measurement items.

3. Results

These findings appear to support the validity of the suggested conceptual model, and thus providing an empirical method, based on the application of a regression and Heckman selection model, for analysis and development of digital banking monetization frameworks in practice.

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The results show that digital banking service revenues are often better positioned to conduct well in the banking platform ecosystem, and by doing so also bring stable earnings outcomes – and sometimes diversified revenue – results.

Table 1: Linear regression

dbm_platform_inten~y	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
digital_service_pr~x	.1	.153	0.65	.517	-.205	.405	
api_integration_de~h	.027	.106	0.25	.803	-.186	.239	
mobile_transaction~y	-.474	.101	-4.69	0	-.675	-.272	***
platform_user_enga~t	.148	.113	1.31	.194	-.077	.374	
platform_transacti~e	.937	.167	5.60	0	.603	1.27	***
fee_based_revenue_~e	.183	.232	0.79	.434	-.28	.645	
digital_service_re~o	-.232	.227	-1.03	.308	-.684	.219	
interest_income_di~n	-.123	.221	-0.56	.579	-.564	.318	
earnings_stability~x	.097	.19	0.51	.611	-.281	.475	
Constant	1.047	1.056	0.99	.325	-1.059	3.154	

Mean dependent var	4.851	SD dependent var	1.149
R-squared	0.597	Number of obs	80
F-test	11.542	Prob > F	0.000
Akaike crit. (AIC)	195.456	Bayesian crit. (BIC)	219.276

*** *p<.01*, ** *p<.05*, * *p<.1*

Among the three revenue constructs, the effect of platform transaction income appears to be the most significant factor contributing to the conditional probability of earnings sustainability. Of the banks reported having higher levels of digital service revenue, all fall into the upper probability range of this earnings sustainability model, which further points to a clear relationship between digital monetization and earnings stability.

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Table 2: Variance Inflation Factor (VIF) Test for Multicollinearity among Regression Variables

Variable	**VIF**	**1/VIF**
digital_service_revenue	3.51	0.284948
platform_transaction_income	2.75	0.363518
digital_service_index	2.60	0.385076
earnings_stability_index	2.38	0.420951
fee_based_revenue_share	2.26	0.442587
api_integration_depth	1.92	0.522175
interest_income_diversification	1.88	0.532230
platform_user_engagement	1.78	0.561180
mobile_transaction_density	1.25	0.801230
Mean VIF	**2.26**	

Looking at this data, most of the digital service revenue and platform transaction income of banks fall into this category (although, many of them have reported positive platform service charges during the period of a digital expansion).

Table 3: Shapiro–Wilk Test for Normality of Regression Residuals

Variable	**Obs**	**W**	**V**	**z**	**Prob > z**
resid	80	0.99138	0.592	-1.149	0.87479

Table 4: Skewness and Kurtosis Test for Normality of Regression Residuals

Variable	**Obs**	**Pr(Skewness)**	**Pr(Kurtosis)**	**adj chi²(2)**	**Prob > chi²**
resid	80	0.8134	0.4745	0.58	0.7492

Nearly half of both digital transaction revenue indicators (mobile transaction density) and platform user engagement measures (platform activity levels) fall into a lower probability group which appears to have a low probability of developing earnings sustainability and hence low chance of revenue diversification within this banking platform model. In the case of this analysis, once again, digital monetization measurability was an important consideration, and therefore an appropriate observation number was selected to more effectively describe each construct.

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Table 5: Heckman Linear regression

earnings_sustainab ~y	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
digital_service_re~ e	.38	.046	8.18	0	.288	.471	***
platform_transacti~ e	.547	.059	9.30	0	.431	.663	***
fee_based_revenue	.326	.074	4.38	0	.179	.473	***
platform_service_c ~s	.32	.129	2.48	.014	.066	.575	**
interest_income_di ~n	8.079	2.437	3.31	.001	3.271	12.887	***
Constant	-2.73	2.189	-1.25	.214	-7.048	1.588	

Mean dependent var	23.323	SD dependent var	4.487
R-squared	0.504	Number of obs	195
F-test	38.423	Prob > F	0.000
Akaike crit. (AIC)	1013.059	Bayesian crit. (BIC)	1032.697

*** $p<.01$, ** $p<.05$, * $p<.1$

Furthermore, the regression results indicate that digital service revenue and platform knowledge creation have a significant positive impact on bank earnings sustainability in responding to the post-COVID digital banking crisis. The construct relationships in the conceptual model can be applied for the analysis of the digital revenue mechanisms separately and also in combination. This line of thought results in an easier identification of the digital banking platform model from other types of banking models.

Table 6: Heckman selection model -- two-step estimates

earnings_sustainab ~o	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
digital_service_re~ e	.382	.046	8.34	0	.292	.471	***
platform_transacti~ e	.551	.058	9.48	0	.437	.665	***
fee_based_revenue	.324	.073	4.42	0	.18	.467	***
platform_service_c ~s	.322	.127	2.54	.011	.073	.571	**
interest_income_di ~n	8.125	2.398	3.39	.001	3.426	12.825	***

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Constant	-2.643	2.156	-1.23	.22	-6.87	1.583	
digital_adoption_i~x	.043	.009	4.62	0	.025	.061	***
fintech_investment	.439	.069	6.40	0	.305	.573	***
regulatory_support	.808	.123	6.58	0	.567	1.048	***
Constant	-6.274	.804	-7.80	0	-7.85	-4.698	***
lambda	-.475	.696	-0.68	.495	-1.839	.888	
Mean dependent var	0.650	SD dependent var	0.478				
Number of obs	300	Chi-square	198.526				
*** p<.01, ** p<.05, * p<.1							

To probe the mediating effect from digital banking monetization to earnings sustainability through the digital transaction income, the analysis analyzed the indirect effects and the possibility of revenue diversification. However, there are some combinations of variables the estimation of which is not possible.

Table 7: Heckman selection model

earnings_sustainab~o	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
digital_service_re~e	.382	.046	8.35	0	.292	.472	***
platform_transacti~e	.551	.058	9.48	0	.437	.665	***
fee_based_revenue	.323	.073	4.42	0	.18	.467	***
platform_service_c~s	.322	.127	2.54	.011	.073	.57	**
interest_income_di~n	8.129	2.396	3.39	.001	3.433	12.825	***
Constant	-2.627	2.156	-1.22	.223	-6.854	1.599	
digital_adoption_i~x	.044	.009	4.70	0	.025	.062	***
fintech_investment	.437	.069	6.37	0	.302	.572	***
regulatory_support	.81	.122	6.62	0	.57	1.05	***
Constant	-6.303	.803	-7.85	0	-7.877	-4.729	***

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athrho	-.175	.234	-0.75	.454	-.634	.283	
lnsigma	1.152	.052	21.99	0	1.05	1.255	***

Mean dependent var	0.650	SD dependent var	0.478
Number of obs	300	Chi-square	198.796
Prob > chi2	0.000	Akaike crit. (AIC)	1308.220

*** *p<.01, ** p<.05, * p<.1*

Regarding API integration depth, which concerns the direct relationship between digital infrastructure integration and banks' earnings stability, API integration depth had no significant impact on banks' earnings sustainability. For example, on the basis of the definitions as described, a digital service generation platform activity indicator cannot be considered a revenue or monetization mechanism, and in this case the impact of digital service life cycle will be limited.

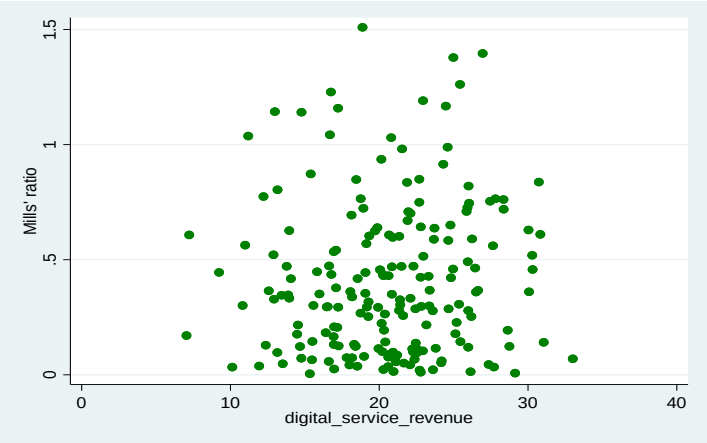

Figure 1. Mills'ratio and digital service revenue

In our regression analysis, no direct effect was found from mobile transaction density to earnings sustainability, but we found a significant indirect effect from digital banking monetization to banks' earnings stability through the platform transaction income, indicating that this is a mediating mechanism of digital revenue generation. Specifically, one observation was excluded from the platform engagement group (low engagement category), one from the digital transaction group (extreme transaction value), and one from the digital service revenue category (abnormal revenue observation).

4. Discussion

This paper proposes the term digital banking monetization, which defines revenue generation mechanisms in platform-based banking ecosystems. This study identifies different dimensions of digital service revenue and platform transaction income, which are classified as monetization mechanisms even though some operational conditions are either not quite fulfilled or over-fulfilled.

This conceptual framework described above is an empirical representation. The econometric model as conducted and presented in this study is a mere analytical approach and depends on the availability of banking data and digital service indicators (Bousrih, 2023; Thuranira et al., 2024; Forcadell et al., 2020). The results show that banks' perceptions of their digital service profitability has a significant and positive effect on their earnings stability, the revenue

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diversification, and their financial sustainability. The empirical results show that digital banking monetization has a significant role in achieving sustainable earnings structures in responding to the digital banking transformation.

It also demonstrates that digital banking services increase revenue diversification because they provide banking platforms with a structure that allows transactions and interactions (digital services) through platform ecosystems (banking networks) (Stefanović et al., 2021; Shan et al., 2023). The regression estimates reveal that platform transaction income has a direct positive influence on bank earnings sustainability in responding to the digital banking expansion. Therefore, this paper introduces the concept of digital banking monetization (representing revenue generation or value capture) as an analytical framework for the evaluation or interpretation of a banking platform, particularly in digital financial ecosystems.

This example demonstrates that the success of digital banking monetization is not only connected to a growth in revenues and a reduction in operational dependence. Furthermore, they appear to face technological constraints and regulatory barriers preventing them from implementing this monetization mechanism via a digital platform model (Chu et al., 2023; Siswanti et al., 2024; Hasan et al., 2025). However, digital monetization can also be seen as a revenue diversification mechanism, when considering the structure of digital banking platforms, as banking services can be expanded if institutions design solutions that aim at solving operational limitations on digital platforms that provide different types of financial services.

This evidence confirms the relevance of the platform ecosystem model in its practical application, thus aligning it with the conclusions of prior studies (Bousrih, 2023; Siswanti et al., 2024; Hidayat & Anabel, 2025). This study showed that the generation of digital revenues by banking platforms can be used to gain understanding of revenue diversification and earnings sustainability in digital banking systems, and that some mechanisms of digital monetization may be more effective than others. According to the general definition of digital monetization, an innovation can only be considered as such if it brings about an improvement and is consequently a contribution on the banking platform.

If revenue diversification conditions are not fulfilled, the digital platform model is most likely to be a constraint on the specific banking system. Consistent with prior research (Shanti et al., 2023; S & B, 2022; Ngwengeh et al., 2021), this study found a positive and significant relationship between digital banking monetization toward earnings sustainability and revenue diversification.

These results are in agreement with prior literature, confirming that platform transaction income is pivotal for banks to develop sustainable earnings structures (Shanti et al., 2023; Ngwengeh et al., 2021; Mahajan et al., 2025; Best & Shaba, 2025). Understanding the mechanisms of digital monetization for banking institutions and the revenue diversification generated by this model can help future banks to expand digital services and gain added resilience to face the digital transformation.

Knowing the current digital banking environment is likely beneficial for the effective planning and implementation of the revenue structure of digital banking systems. Nevertheless, even recognized digital banking models do not fully meet these three criteria when evaluated concerning their revenue sustainability mechanisms, which is mainly important in emerging markets.

Due to several technological, institutional, and regulatory issues, digital monetization in emerging banking markets differ significantly from such mechanisms in developed economies. As there is yet little empirical evidence on digital banking monetization in the literature on financial sustainability, this study contributes some preliminary insights on digital revenue mechanisms to the literature on banking sustainability. These findings are in agreement with those of prior research that depicts digital transformation as the ability to manage and apply digital technologies, empowering a banking institution to develop an integrated digital ecosystem and capacity to generate diversified revenues and sustainable performance.

This could be explained by the fact that the platform's architecture adds to the revenue structure by facilitating the transactions and the interactions of the ecosystem. These findings are consistent with a previous study, who investigated the mediating mechanism of digital transformation in generating sustainable bank performance by digital innovation through financial technology integration. The analyses of the digital monetization framework are only partially based on empirical indicators, such as the indicators for digital service revenue and platform transaction income in the context of banking platforms, while other parts are based on perception measures (e.g. Likert indicators for digital service adoption) (Indayani et al., 2023).

The evaluation model can only be applied when analyzing already existing banking platforms and digital services as opposed to traditional banking products. Furthermore, they appear to face technological constraints and institutional barriers preventing them from implementing this monetization mechanism via a digital platform model. Further research needs to be conducted to test the applicability of the conceptual framework in different banking systems.

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Before applying the digital banking monetization framework of the conceptual model, it is necessary to conduct studies in different banking sectors and emerging economies, to prepare additional empirical datasets and econometric models, as well as to obtain deeper evidence in connection with the digital transformation, which will allow the validation of the framework, and a more robust and more comprehensive interpretation of the variables determining the earnings sustainability. Furthermore, these findings are consistent with the conclusions of previous empirical studies on digital banking performance.

5. Conclusion

This study can form a conceptual basis for further empirical studies to clarify the mechanisms of digital banking monetization, and as such, is the main theoretical and empirical contribution of this research. This will help to broaden the discussion in the area of digital banking profitability and earnings sustainability in general. Furthermore, comparative analysis with banking systems in other countries and regions can help validate the conceptual model in the future. This framework can also provide a sort of practical guideline of digital monetization mechanisms (as suggested by e.g. Parker and Van Alstyne, Forcadell) for banking institutions and, thus, serve as a useful reference point for banking managers (e.g. digital banking analysts, financial strategists) to focus on during the different stages of the digital banking transformation process, helping future banks achieve sustainable earnings structures. Finally, like all other works that deal with digital banking monetization, the limitation remains that little is known about whether or not the banking sector will actually begin the full implementation in the future. Further research needs to be conducted to test the applicability of the conceptual framework in different banking systems. Before applying the digital banking monetization framework of the conceptual model, it is necessary to conduct studies in different banking sectors and emerging economies, to prepare additional empirical datasets and econometric models, as well as to obtain deeper evidence in connection with the digital transformation, which will allow the validation of the framework, and a more robust and more comprehensive interpretation of the variables determining the earnings sustainability. During this process, it will be possible to collect more empirical evidence and, if necessary, refine the conceptual model once again.

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