The Determinants of the Adoption and Use of E-banking by the Customers of Commercial Banks in Bukavu, DRC

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Abstract

Purpose: This study aims to identify the determinants of the adoption and use of e-banking by the customers of commercial banks in Bukavu, DRC.

Method: A conceptual framework based on the UTAUT model was developed, followed by flat sorting and econometric analyses of data from a survey based on a sample of 215 customers. Logistic regression and ordered Logit enabled us to address our research question

Results: Perceived usefulness and social influence, modulated by profession and level of education, favour the likelihood of adopting e-banking. The cost perceived, on the other hand, has a negative impact. Trust decreases the likelihood of using a wide range of e-banking services, while gender, profession and app rating have positive effects on use.

Originality / relevance: In addition to a methodology combining the logit and ordered logit models, the originality of this work lies in the analytical aspect focused on the number of e-banking services used by customers in a developing country context.

Keywords: E-banking, Banks, Customers, DRC

Les déterminants de l'adoption et de l'utilisation de l'e-Banking par les clients des banques commerciales de Bukavu, RDC

Résumé

Objectif : Cette étude vise à identifier les déterminants de l'adoption et de l'utilisation de la banque en ligne par les clients des banques commerciales à Bukavu.

Méthode : Un cadre conceptuel basé sur le modèle UTAUT a été développé, suivi d'un tri à plat et d'analyses économétriques des données d'une enquête menée auprès d'un échantillon de 215 clients. La régression logistique et le modèle Logit ordonné nous ont permis de répondre à notre question de recherche.

Résultats : L'utilité perçue et l'influence sociale, modulées par la profession et le niveau d'éducation, favorisent la probabilité d'adopter la banque en ligne. En revanche, le coût perçu a un impact négatif. La confiance diminue la probabilité d'utiliser une large gamme de services bancaires en ligne, tandis que le genre, la profession et la note de l'application ont des effets positifs sur l'utilisation.

Originalité / pertinence : En plus d'une méthodologie combinant les modèles Logit et Logit ordonné, l'originalité de ce travail réside dans l'aspect analytique axé sur le nombre de services bancaires en ligne utilisés par les clients dans un contexte de pays en développement.

Mots clés : E-Banking, Banques, Clients, RDC

1. Introduction

Thanks to the combination of communication and information technology, it is now possible to circulate information around the world (Brangier et al., 2010). Information is the raw material of the future; whoever has it has power (Maury, 2011). Because of this importance, the wave of information and communication technology saw the advent of the Internet accessible to the public in the 90s (Cheikho, 2015; Venkatesh et al., 2007). To this end, banks have modernized by implementing an e-banking application in their services in recent years (Hasan & Dridi, 2010; Indrasari et al., 2022; Stoica et al., 2015; J. Yang et al., 2023; T. Yang & Zhang, 2022).

E-banking comprises the electronic system by which a customer can access his account via the internet without going to the bank branch (Bisimwa et al., 2019; Bobillier-Chaumon et al., 2003; Kupesa, 2017; Nathiya & Janaki Priya, 2023; Uppal & Bala, 2017). The development of mobile networks and the growing use of the internet by customers have opened up new prospects for banks (Halime & Kirmi, 2016). On average, 64.4% of the world's population has access to the internet, compared with 23.1% in East Africa in 2023, with average annual growth of 1.9% (statista, 2023)1. This growth in Internet use is accompanied by a growth in the use of online banking, with its advantages in terms of cost, availability, speed, ease and immediacy compared with traditional banking services (Sandhu, 2023).

Even so the e-banking system offers several services such as transfers, remittances, direct debits, bill payments, account openings, balance queries, stock market transactions, credit and card applications etc. (Stoica et al., 2015). However, these practices are still in their infancy in most African countries in general and in the Democratic Republic of Congo in particular (Kupesa, 2017). As a result, e-banking services are used partially and differently by customers of Congolese commercial banks; some limit themselves to checking their account balances while banks in Congo offer the full range of e-banking services, while others are reluctant to adopt them or are unaware of them (Akbar et al., 2020). Given this situation, a conceptual framework on the use of e-banking deserves to be developed in the context of the city of Bukavu in the Democratic Republic of Congo. One question thus emerges and guides this research: what are the determinants of the adoption and use of e-banking by commercial bank customers in Bukavu in the Democratic Republic of Congo?

E-banking is a recurring theme in many theoretical and even empirical studies. The literature includes, for example, work on strategies for improving e-banking services (Alarifi et al., 2017; Malarvizhi & Geetha, 2019; Sandhu, 2023; Stoica et al., 2015); the factors influencing its adoption (Akbar et al., 2020; Ananda et al., 2020; Bellahcene & Khedim, 2016; Hernández-Murillo et al., 2010; Uppal & Bala, 2017); its use by customers (Ahmed & Sur, 2023; Ailli, 2014; Bobillier-Chaumon et al., 2003), its impact on financial inclusion and the quality of banking services (Cheikho, 2015; DeYoung et al., 2007; Jacquemot, 2013; Zagalaz Jiménez & Aguiar Díaz, 2019; Zhu, 2023, 2023)its use, strengths, weaknesses and requirements (Ahmed & Sur, 2023; Amin & Ramayah, 2010; Bisimwa et al, 2019; Bobillier-Chaumon et al, 2003; Brahim, 2014; Kannabiran & Narayan, 2005; Khan, 2017; Shannak, 2013; Zhu, 2023).

However, to the best of our knowledge, most of these studies have only been carried out in developed countries, particularly in the USA, Europe and a few in North Africa. What's more, they do not provide a conceptual framework for the adoption and use of e-banking by customers. It is therefore necessary to understand the use of e-banking and, more specifically, to determine the factors that characterise it in the context of a developing country. To this end, the present study is part of the process of enriching previous studies by filling this gap and aims on the one hand to identify the characteristic factors of adoption and on the other hand to highlight the determinants of the use of e-banking services by customers of banks in Bukavu. This also responds to the recommendation of Hernandez-Murillo et al (2010), who carried out research in the USA and asked for the specification of a dynamic model of e-banking adoption in other countries. Similarly, the answer to the above question would make it possible to follow up the research by Bauer and Hein (2006), who addressed the question of e-banking adoption and left the question of use unanswered.

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[1] https://datareportal.com/report-embed-issues?utm_source=Global_Digital_Reports&utm_medium=Partner_Article&utm_campaign=Digital_2024 Accessed on 18/04/2024 at 02: 20

As well as adding to the scientific literature by developing a theoretical model to explain and predict the use of e-banking in a southern country, the results of this research would also be of interest from a marketing perspective for bankers. Taking account of consumer preferences in the adoption and use of e-banking services would make it possible to respond favourably to their needs and improve the relationship between banks and their customers.

This research is based on the results of statistical analyses of data processing using the maximum likelihood approach of the probit/logit model on the one hand and the ordered probit/logit model in R software on the other. The town of Bukavu formed the geographical boundary of our investigations. The data used in this study were collected from a survey of 215 customers of commercial banks in Bukavu. Apart from the introduction (1.) and conclusion (6.), we presented the literature review (2.), the methodology (3.) and the results and discussions (4.).

2. **Literature Review**

2.1. Digital finance concepts

Digital finance is a broader term that includes all forms of financial services provided by digital means. This includes not only Fintech, but also online banking. It encompasses the use of information and communication technology to make financial transactions more efficient and accessible (Su et al., 2024).

2.1.1. Type of digital finance

Some authors have categorized the different elements of e-finance into sub-groups for detailed analysis. This is the case of Riyadh et al (2010), who have highlighted the different types of digital finance (Internet banking, e-lending, e-credit, e-trade finance, e-factoring, e-insurance, e-leasing, e-microfinance, e-warehouse, e-tax, e-payment) in a table that defines and proposes their potential benefits for businesses.

Table 1 − E − finance Benefits for SMEs

E-Finance Types	Description	Potential Gains for SMEs
Internet Banking	Provision of banking services like balance inquiries, funds transfer, bill payment	Current account management, collection of debts, payment to suppliers, download account statements; funds transfer
E-Lending	Lending to entities using internet and other ICT	Apply for finance online, less transaction cost and more finance, quick loan sanction
E-Credit Information	Online data bases on SMEs credit history and financial health	Quicker access to information, quick loan sanction, less info collection costs
E-Trade Finance/ E-Factoring	Online brokerage, pledge receivables or notes to secure finance	Lower transaction costs, greater liquidity of assets
E-Insurance	Online applications for insurance and online payment of premiums	Easier access to insurance, online lodgement of applications and payment of premiums
E-Leasing	Internet-mediated leasing services.	Lower application costs, easier payments
E-Microfinance	Use of Internet and ICTs for designing micro credit initiatives.	Less cost access to microfinance, widens sources of finance
Other e-finance	E-Warehouses, electronic models of asset-based financing, E-Tax payments.	Easy tax lodgement, more finance

Riyadh et al (2010, p.2)

In addition, Riyadh et al (2010) discussed the four main channels through which digital finance can be delivered as a product and/or service, such as the Internet, the Telephone, the ATM (automated teller machine for the bank) and the Mobile (in terms of the mobile branch).

2.2. FinTech and e-banking at the bottom of the pyramid

Over the past decade, the world has witnessed the meteoric growth of FinTech (Allen et al., 2022). Fintech is a term that combines the words "finance" and "technology". It refers to all the technologies used to improve and transform financial services. While developed and emerging countries have seen rapid development in this area, this is unfortunately not the case for countries at the bottom of the pyramid (Su et al., 2024). Fintechs have flourished mainly in the more advanced economies, where access to the internet, smartphones and computers is more widespread. In southern countries, barriers such as lack of technological infrastructure, financial illiteracy and poverty have hampered the adoption of these new financial technologies. However, initiatives have been put forward to reduce this disparity and extend the benefits of using Fintech to all socio-economic levels (Griffin et al., 2023; T. Yang & Zhou, 2024). The adoption of this new technology in the banking sector has the potential to bridge the digital divide and bring financial services within the reach of people at the bottom of the pyramid (Ravnbøl, 2023). Since 2021, the Democratic Republic of Congo has adopted a roadmap for digital transformation focused on electronic finance (Actualité.cd)2. During this period, some commercial banks have already launched online banking services.

E-banking refers to all banking services accessible via the Internet. Unlike fintech, which can operate independently of traditional banks, e-banking involves the dematerialization of financial services, where transactions and/or interactions with banks are carried out entirely online via websites or mobile applications (DeYoung et al., 2007). E-banking services are provided by traditional banks themselves to complement or replace their physical branches (Stoica et al., 2015). It has been shown that e-banking contributes to a country's socio-economic development and can therefore help developing countries to emerge from the crisis (Ashoer et al., 2024; Uppal & Bala, 2017; Bertsch et al., 2020; Cai et al., 2024).

2.3. Parallels between digital finance, fintech and e-banking

Digital finance, fintech and e-banking are three closely related but distinct concepts, each playing a crucial role in the transformation of the financial sector. Here is an overview of their parallels and differences:

Digital finance is a broader term that includes all forms of financial services provided by digital means. This includes not only fintech, but also online banking.

Fintech (financial technology) encompasses technological innovations applied to financial services. It includes startups and companies that use technology to improve or automate financial services. Fintech is a subset of digital finance, which itself is broader and includes e-banking.

E-banking is more specific to online banking and is an integral part of digital finance, while Fintech represents a specific category of innovation within digital finance.

Although FinTech and digital finance are closely related, FinTech focuses more on innovating and disrupting traditional financial services, while digital finance aims to improve the efficiency and accessibility of day-to-day financial transactions in general.

These three concepts are complementary, and each plays an essential role in the modernisation and innovation of the financial sector (Griffin et al., 2023).

2.4. The financial system in Bukavu

Bukavu's financial system, which is still in its infancy, includes the provincial branch of the Central Bank, banking financial institutions (Equity-BCDC, FBN, RAWBANK, ACCESS BANK, TMB, BOA, etc.), non-

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2 https://actualite.cd/2021/06/26/rdc-le-programme-du-numerique-avec-une-feuille-de-route-des-actions-et-strategie Accessed on 07/05/2024 at 01 :47

banking financial institutions (CADECO, COOPEC, CNSS, SONAS) and microfinance institutions (Finca, PAIDEK, SMICO, Hekima, etc.).

Many financial institutions are now developing applications to bring their financial services closer and faster to the people. This is the case for Rawbank with Illico cash, TMB with Pepele mobile, Equity-BCDC with cash express, coopec Cahi with Cahi digital and many others, but the population is still reluctant to embrace these technological advances, as they can be seen queuing at financial institutions in Bukavu (Njangala & Irenge, 2023).

2.5. Implementing e-banking in Bukavu: challenges and prospects

The city of Bukavu is experiencing rapid demographic growth, with an estimated population of over one million and a high mobile penetration rate of 49% (Bisoka et al., 2021). This trend makes the city an ideal location for promoting banking services via mobile applications, facilitating access to financial services for many local users and reducing the costs associated with setting up physical bank branches. However, poor financial education, lack of confidence, limited infrastructure (electricity, internet connectivity) in some areas of Bukavu, the need for secure electronic transactions and insufficient awareness-raising have resulted in a low rate of bank use (6%), which is an obstacle to the implementation of e-banking in Bukavu (Njangala, 2023). As a result, the question of the adoption and use of e-banking in Bukavu remains unanswered to date.

2.6. Adoption and use of e-banking in Bukavu

Competitive pressure between Bukavu's many banking institutions has acted as a catalyst for reform in the banking sector. The advent of new technologies has acted as a lever for these reforms. As a result, all the banks operating in Bukavu (TMB, RAWBANK, EQUITY/BCDC, FBNBANK, ACCESS BANK, ECOBANK and BOA) have incorporated e-banking into their offer (Zhu, 2023). Once it has been implemented, e-banking is a key concern for the managers of these banks, who are working on its adoption and use by customers.

Despite the many advantages, there are still many customers who resist adopting e-banking in Bukavu and prefer to continue using the traditional banking system (Akbar et al., 2020). Some are not aware of it, others avoid the cost of using it (Ananda et al., 2020; Malarvizhi & Geetha, 2019) and still others have adopted it to be able to manage their transactions themselves due to a lack of trust in their bank (Ailli, 2014; Halime & Kirmi, 2016; Stoica et al., 2015). Given this situation, it is necessary to identify the determinants of the adoption and use of e-banking in the context of the city of Bukavu.

2.7. Need to analyze the use of e-banking by customers in Bukavu.

As mentioned above, several studies have already tackled the issue of e-banking from different angles. Some studies have looked at the link between Fintech and e-banking and their contribution to the development and financial inclusion of developing countries (Allen et al., 2022; Ashoer et al., 2024; Bertsch et al., 2020; Cai et al., 2024; DeYoung et al., 2007; Griffin et al., 2023; Ravnbøl, 2023; Stoica et al., 2015; Su et al., 2024; Uppal & Bala, 2017). The combined results of these studies show the inescapable role that Fintech and e-banking play in mass financial inclusion, but some of them point to risks linked to fraud, cyber-attacks and capital flight in the absence of a control system.

Other studies gather questions on the implementation, challenges and improvement of e-banking services (Alarifi et al., 2017; Birbirsa et al., 2019; Bobillier-Chaumon et al., 2003; Cheikho, 2015; Hussain et al., 2017; Keil & Ongena, 2024; Sandhu, 2023; Stoica et al., 2015; J. Yang et al., 2023; T. Yang & Zhang, 2022). The results of these studies reveal that several banks have stopped implementation without any follow-up measures on customer adaptation. The authors therefore propose techniques that could improve the delivery of online banking services.

Other works cover topics related to factors influencing the adoption of e-banking by highlighting some resistance to this adoption in different contexts (Ailli, 2014; Akbar et al., 2020; Ananda et al, 2020; Birbirsa et al., 2019; Cai et al., 2024; Cheikho, 2015; Halime & Kirmi, 2016; Hewavitharana et al., 2021; Lee & Chung, 2009; Malarvizhi & Geetha, 2019; Mer & Virdi, 2023; Sandhu, 2023; Stoica et al., 2015;

Zhu, 2023). The aggregated results of these works raise the variables in the literature that presented positive and negative effects on e-banking adoption depending on the case.

The following Table 2 presents the main topics, methodologies and limitations of the empirical literature review on e-banking:

Table 2 – Main topics, methodologies and limitations of the literature on e-banking

| Authors	Main Topics	Main Methodological Approaches	Key Findings and Limitations
Allen et al. (2022) ; Ashoer et al. (2024) ; Cai et al. (2024); Cai et al. (2024) ; Griffin et al. (2023) ; Su et al. (2024)	Fintech, Cryptocurrencies, and e-banking	Comparative analyses of different Fintech practices; structural equation modelling with PLS approach and analysis of satellite data combined with office statistics	The combined results of these studies show the inescapable role that Fintech and e-banking play in mass financial inclusion, but some of them point to risks linked to fraud, cyber-attacks and capital flight in the absence of a control system. No adoption and/or utilization factors are discussed in these papers
Alarifi et al. (2017) ; Birbirsa et al. (2019) ; Cheikho (2015) ; Hussain et al. (2017) ; Keil & Ongena, (2024) ; Sandhu (2023) ; Stoica et al. (2015)	Implementation, challenges, and improvement of e-banking services; Impact of e-Banking on the Performance of Banks	Evaluative research on the usability and security of e-banking; descriptive analysis; statistical analyses of regression and correlation; structural equation modeling with PLS approach; polar extreme approach analysis; Data wrapping analysis.	The results of these studies reveal that several banks have stopped at implementation without any follow-up measures on customer adaptation. The authors therefore propose techniques that could improve the delivery of online banking services. These works have mentioned e-banking services without focusing on the number of services used by customers.
Ailli (2014); Akbar et al. (2020); Ananda et al. (2020); Halime & Kirmi (2016) ; Mer & Virdi (2023)	factors influencing the adoption of e-banking and resistance to this adoption in different contexts	Descriptive and regression analyses; Structural equation modeling with PLS approach.	The aggregated results of these works raise the variables in the literature that presented positive and negative effects on e-banking adoption depending on the case. These works do not take into account post-adoption factors

Source: our design in MS. Word

As a result, we have found that most of the above work has been carried out only in developed country contexts, notably in the United States, Europe and some in North Africa. In addition, this work does not provide a specific conceptual framework for the use of e-banking by customers and leaves the need to analyze the use of e-banking by customers. Based on the above, we formulate the following hypothesis: H1: the level of e-banking use by customers in the city of Bukavu would be slightly above average.

Understanding the individual adoption of a new technology is one of the most common concerns in information systems work (Ananda et al., 2020; Birbirsa et al., 2019; Cai et al., 2024; Cheikho, 2015; Hewavitharana et al., 2021; Mer & Virdi, 2023; Sandhu, 2023; Venkatesh et al., 2003). Several theoretical models have been developed to explain technology adoption and use. The main aim of these models is to identify the determinants of acceptance and use, making it possible to explain and predict the behaviour of individuals regarding the use of technologies. To better analyze the use of e-banking, we will draw on the empirical models of technology acceptance (TAM) by Davis (1989) and

the unified theory of acceptance and use of technology (UTAUT) as unified by Venkatesh et al. (2003) and modified by Hewavitharana et al. (2021).

Before unification, research into the acceptance and use of technology was based mainly on the Theory of Reasoned Action (Fishbein and Ajzen, 1975)3, the technology acceptance model (Davis, 1989) and the Theory of Planned Behaviour (Ajzen, 1991). However, although these theories use different terminologies, they all explain the same concepts, which necessitate centralization into a single theory, given that the limitations and complementarity between them have been recognized (Min et al., 2008, cited by Cheikho, 2015). That said, efforts have been combined by Venkatesh et al. (2003) to unify all these theories into one. They thus proposed a new theory, the Unified Theory of Acceptance and Use of Technology (UTAUT). The UTAUT model unified eight different theories and models, including the theory of reasoned action (Fishbein and Ajzen, 1975); social cognitive theory (Bandura, 1986); the technology acceptance model (Davis, 1989) the theory of planned behaviour (Ajzen, 1991); the model of PC use (Thompson et al., 1991); the motivational model (Davis et al., 1992); the theory of diffusion of innovation (Rogers, 1995); and a model combining the technology acceptance model and the theory of planned behaviour (Taylor & Todd, 1995a). UTAUT justifies the use of technology based on four fundamental determinants. These are expected performance, expected effort, social influence and facilitating conditions (Venkatesh et al, 2003). They added moderating variables (age, experience and gender) to control for these determinants.

Like Hewavitharana et al (2021) and Mer and Virdi (2023), we also modified and contextualized this theory before using it to analyze and predict the adoption and use of e-banking in Bukavu. In doing so, this work is based directly on the UTAUT theory, modified and supplemented by the 'trust' factor in the determinants of e-banking adoption and use (Mer & Virdi, 2023). The unified theory of technology acceptance and use is illustrated in Figure 1 below:
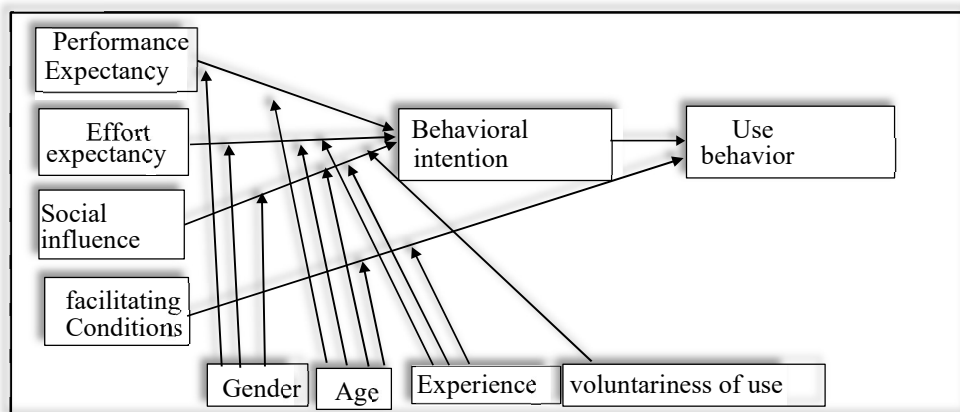
Source : Venkatesh et al. (2003, p. 447)

Figure 1 - The UTAUT model (unified theory of acceptance and use of technologies)

The above theories allow us to formulate the following hypothesis: H2: perceived usefulness, perceived security, social influence, expected effort, trust and perceived cost would be the determinants of the adoption and use of e-banking by commercial bank customers in Bukavu.

We control age, gender, education, occupation, experience and customer rating of the application. Hence the following hypothesis: H3: Age, gender, level of education, profession, experience and evaluation of the application would have a significant influence on the use of e-banking by customers of commercial banks in Bukavu.

3. **Methodology**

3.1. Sample

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3 Although some of the articles presented in this work are beginning to date, they are still relevant because of their importance and their numerous appearances in recent works.

This study analyses primary data collected from customers of commercial banks in Bukavu. To get an idea of customers' e-banking behaviour, we conducted individual semi-directive remote interviews with 5 customers, 3 of whom are e-banking users, before launching the online survey questionnaire via the kobo toolbox platform. An iterative follow-up system enabled us to collect 215 submissions, with a non-response rate of less than 29%. To achieve this, we made use of the snowball sampling technique whereby the customers themselves passed on the link to other customers on the one hand, and on the other, directed the interviewers who were out in the field to other customers they knew.

3.2. Data processing

The data were processed using flat sorting, logistic regression and ordered logistic regression. The flat sort enabled us to describe the behaviour of commercial bank customers in Bukavu regarding the various dimensions of e-banking adoption and use, with particular emphasis on the importance that these customers attach to the adoption and use of e-banking services. Logistic regression was used to identify the determinants of e-banking adoption using the maximum likelihood method. The logit model was used with the glm (Generalized Linear Models) command to fit the logistic function (sigmoid) $P(Y = 1|X_i) = \frac{1}{1+e^{-z}}$ under R in order to detect the change in the binary dependent variable (use) following the unit variation of the latent independent variables obtained from the items (Bourbonnais, 2015 ; Hosmer, Lemeshow & Sturdivant, 2013). The ordered logistic regression also enabled us to determine the factors likely to influence the use of one to five e-banking services. The ordered logit model was used in turn with the Polr (Proportinal Odds Linear Regression) command to fit the normal cumulative distribution function (CDF) $\phi(x) = \int_{-\infty}^{x} \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$ and the link function is P(Y≤j) = F (αj–Xβ) under the R software. This is a statistical technique used to model an ordinal dependent variable. The function P(Y≤j) is the probability that the dependent variable number of e-banking services is less than or equal to category j on the Likert scale and αj is the category-specific parameter j of the ordinal dependent variable (number of e-banking services) (Baetschmann et al., 2015; Retherford & Choe, 1993; Sisay, 2018; Bourbonnais, 2021).

In addition, the Akaike information criterion (AIC), the analysis under the ROC (Receiver Operating Characteristic) curve (AUC) and the likelihood ratio were used to test the goodness of fit of the models, their performance and the significant contribution of their variables, respectively. The logit model selected had the lowest AIC value (225.92), residual deviance (195.92) and the highest area under the ROC curve (AUC) (0.8531, i.e. 85.31%), proving its better performance (Table 4). The likelihood ratio test for all its variables was significant. This justifies their significant contribution to the model. With 128 true positives and 24 false positives, the model achieves a good prediction rate of 82.33% (Hilbe, 2009; Mer & Virdi, 2023; O'Brien & Dunson, 2004).

As for the ordered logit model, the values of the area under the ROC curve at the level of each class are all greater than 0.6. This suggests that the performance of this model is better than a random choice for each class. The model predicted more than half of the cases for each of its classes with the lowest AIC value (357.43) and the likelihood ratio test significant for all variables (Table 4) (Bourbonnais, 2021). The variables used for the two models are shown in Figure 2 below:

Figure 2 - Conceptual model for analysing the use of e-banking by the customers of commercial banks in Bukavu
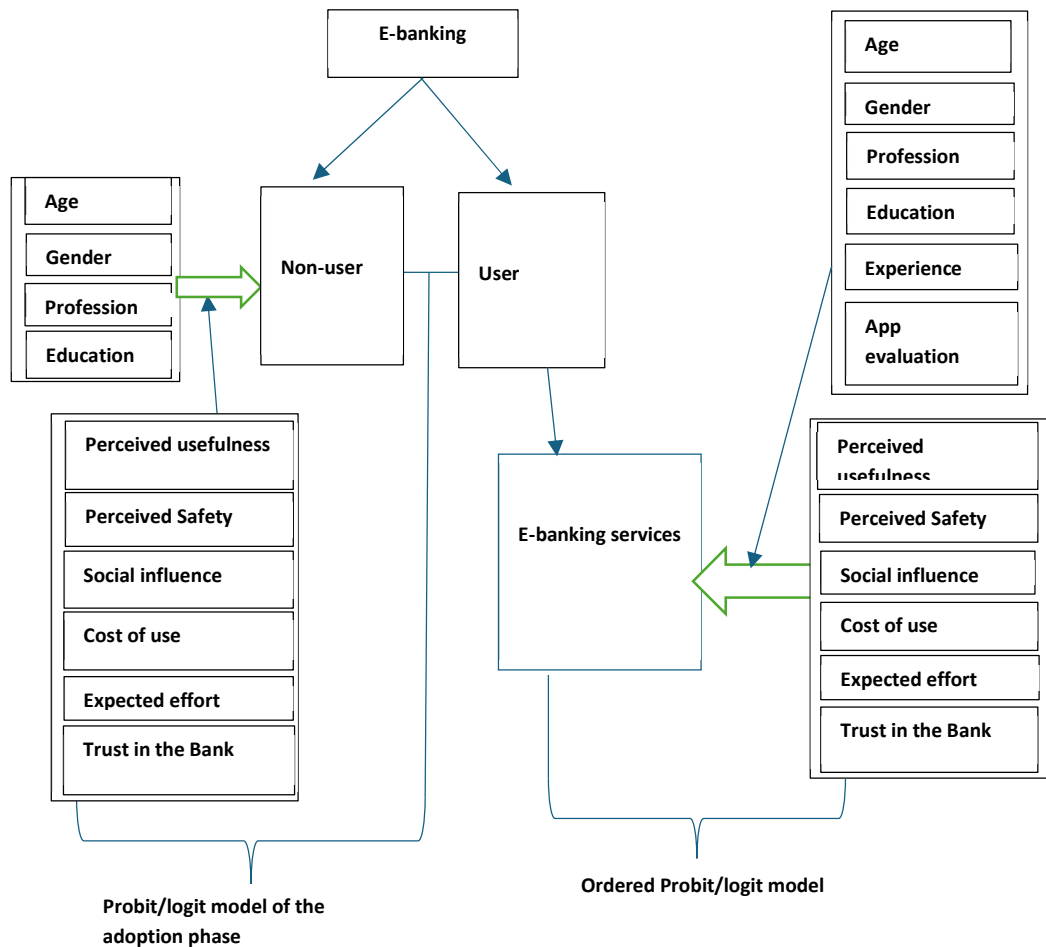
Source: Our design in MS Word

4. Results and discussion

4.1. Flat sorting

The results in Table 3 below show that the average score for e-banking use by customers in the city of Bukavu is 0.66 (66%), revealing that e-banking use in this city is above average and that online banking has been adopted by most customers. These results corroborate our first hypothesis (H1), according to which commercial bank customers in Bukavu have an above-average level of e-banking usage. These results qualify those of Akbar et al (2020) who showed that in India, many people prefer to have a traditional banking system rather than online banking services. On the other hand, the average number of e-banking services used by customers is 1.85 (7.75%), indicating that commercial bank customers in Bukavu use fewer e-banking services than the average. This indicates that most of these customers barely manage to use two of the services available in the mobile banking application. These results concur with those of Ailli (2014) and reveal that the use of e-banking services by customers remains limited in Africa. To successfully use a wide range of e-banking services in Bukavu, commercial banks should raise customer awareness of the digitalization of financial services by emphasizing the benefits of e-banking; train users in secure online practices and involve local authorities and technology companies to support the use of this new technology. The average score given to the evaluation of the

e-banking application is 3.62 (54.22%), indicating that bank customers in Bukavu consider the functionality of the e-banking application they use to be above average. The average score for experience with e-banking is 2.17 (26.05%) revealing that customers of banks in Bukavu rate their experience with e-banking as low compared to the average.

In addition, the coefficient of concentration (Kurtosis) of e-banking use is negative (-1.549) (Table 3), which shows that bank customers' opinions on the adoption of e-banking are divided. In terms of the number of e-banking services, the coefficient of concentration is positive (Kurtosis = 0.105) indicating that many customers use at most two e-banking services (the average being 1.85) but that there are a significant number of customers who use many more or many fewer services than the average. The negative coefficient of symmetry for e-banking use (-0.682) indicates that the observations were concentrated towards the higher values overall. This proves that commercial bank customers in Bukavu attach great importance to the use of e-banking. In the Bukavu context, these results could be justified by the avoidance of queues at physical bank counters. These results are consistent with those found by Ailli (2014) who found that customers adopt e-banking because of its advantages over traditional banking services.

On the other hand, the coefficient of symmetry is positive for the number of e-banking services (Skewness = 1.017), revealing that the observations are overall weighted towards the lower values. This shows that these customers attach less importance to using a wide range of e-banking services. In the context of Bukavu, these results could be justified by the lack of awareness of the use of these services.

Table 3 also shows that bank customers in Bukavu attach great importance to the various determinants of e-banking adoption and use. The mean scores for most of the dimensions are above average. All the items have a dispersion of less than 50% in relation to the central value. These results confirm the work of Hewavitharana et al (2021) and Venkatesh et al (2003) who argue that perceived usefulness, perceived safety, expected effort, social influence and perceived cost are among the factors that influence the acceptance and use of a new technology.

Table 3 – Average Scores for the Adoption and Use of E – Banking by Commercial Bank customers in Bukavu, DRC

Variable/items	Average	Standard deviation	CV4	Scores- in %	Skewness	Kurtosis
usage5	,66	,475	,720	66,05	-,682	-1,549
experience	2,17	,850	,392	26,05	1.050	1,883
n_services	1,85	1,061	,574	7,75	1,017	,105
evaluation_application	3,62	,769	,212	54,22	,109	-,522
util_16	3,46	1,359	,392	56,74	-,464	-1,043
util_2	3,80	1,293	,340	69,76	-,914	-,311
util_3	3,80	1,272	,335	69,30	-,924	-,209
util_4	3,42	1,216	,356	54,88	-,501	-,670
util_5	3,68	1,272	,346	66,51	-,802	-,420
util_6	4,08	1,157	,284	76,28	-1,206	,531
util_7	3,67	1,281	,349	65,58	-,811	-,385
secur_1	3,73	1,350	,362	66,51	-,853	-,477
secur_2	3,79	1,274	,336	67,44	-,845	-,392
secur_3	3,61	1,244	,345	61,86	-,752	-,330
infl_1	3,27	1,399	,428	49,30	-,345	-1,120
infl_2	3,07	1,498	,488	43,72	-,078	-1,424
infl_3	2,90	1,399	,482	42,79	-,072	-1,362

[4] Coefficient de variation

[5] It is a binary variable that takes the value 1 if the customer is an e-banking user and 0 otherwise, 0.66 is the proportion of users

[6] The number represents the item. Here it is item 1 of the variable "perceived utility"

effor1	3,69	1,318	,357	66,98	-,765	-,635
effor2	3,62	1,287	,356	62,79	-,701	-,588
effor3	3,25	1,257	,387	50,23	-,362	-,928
effor4	3,89	1,233	,317	72,56	-1,054	,145
cout_1	2,90	1,202	,414	33,95	,043	-,941
cout_2	3,27	1,245	,381	48,83	-,398	-,799
cout_3	3,00	1,259	,420	40,46	-,165	-1,035
conf_1	3,49	1,318	,378	58,60	-,572	-,812
conf_2	3,47	1,245	,359	53,02	-,529	-,583
conf_3	3,43	1,232	,359	57,21	-,615	-,550

Source : Obtained from SPSS 25

4.2. Presentation of the econometric analysis of data for the two phases

The results in table 4 below (logit model) show that the variables perceived usefulness, social influence and perceived cost have statistically significant effects on the probability of adopting e-banking at the 5% threshold. The same results (ordered logit model) reveal that trust in the bank is likely to have a negative influence on the number of e-banking services used by commercial bank customers in Bukavu. Because the coefficients of the variables expected effort and perceived security were not statistically significant in either of our two models, these results qualify our second hypothesis (H2), according to which perceived usefulness, perceived security, social influence, expected effort, trust and perceived cost are the determinants of the adoption and use of e-banking by commercial bank customers in Bukavu. They also qualify the theory of UTAUT as modified and supplemented in previous work (Hewavitharana et al., 2021; Venkatesh et al., 2003). In fact, the various advantages linked to usage (perceived usefulness) and the customers' social environment (social influence) have on average and all other things being equal, positive effects on the probability of adopting e-banking. This can be explained by the fact that customers look for a comparative advantage of e-banking over traditional bank services before deciding to adopt it. These results corroborate those of Ailli (2014) and Bobillier-Chaumon et al. (2003) who also found that customers adopt e-banking because of its relative advantages; this same result confirms previous work that has supported the influence of personal advantage on the adoption of new technology (Hewavitharana et al., 2021; Venkatesh et al., 2003). In addition, the opinions of friends, peers, family, line managers and the social networks of bank customers in Bukavu were found to have an impact on their likelihood of adopting e-banking. These results are in line with previous studies that have shown that e-banking is a factor in improving the social status and image in the reference group of those who adopt it (Mer & Virdi, 2023; Venkatesh et al., 2003). However, the cost of use seems to be the main barrier to adoption. As a result, bank customers in Bukavu are reluctant to adopt e-banking when the cost of using it is mentioned. This is quite intuitive, especially in the context of an underdeveloped economy. These results are like the theoretical propositions and empirical findings of other researchers in the context of e-banking (Ananda et al., 2020; Malarvizhi & Geetha, 2019). The negative effect of trust on the likelihood of shifting to a greater number of e-banking services is one of the anomalous but predictable results in the context of southern countries in general and the DRC in particular. Indeed, users who lack confidence in their banks seem determined to exploit all the e-banking services available, enabling them to exercise personal control over their accounts.

In parallel, level of education and profession are socio-demographic variables that control the probability of adopting e-banking services in the context of the city of Bukavu on the one hand, and on the other hand, profession, gender and evaluation of the application are variables that control the use of a wide range of e-banking services. Consequently, our third hypothesis (H3), according to which age, gender, level of education, profession, experience and evaluation of the application would have a significant influence on the adoption and use of e-banking by commercial bank customers in Bukavu, is qualified. These results complement those of Ananda et al (2020), who also included the variables level of education and profession in their research but did not verify their effects on the adoption of

e-banking. The positive effect of the level of education variable on e-banking adoption means that customers with more than secondary education are more likely to adopt e-banking than those with university education. It was assumed that the personal relationships and ease of travel of university-educated customers would be the reason for this. The same results were also found with Spanish customers in the context of e-banking (Zagalaz & Díaz, 2019). Similarly, civil servants on average have a high probability of adopting e-banking compared to unemployed people. This is easily explained by the fact that there are many civil servants in Bukavu and that they are turning to e-banking to avoid the long queues at physical banks since the banking of the salaries of state employees in Rd. Congo. In addition, civil servants are more likely to try out many services when they use e-banking. The significant effect of the customers' profession on the number of e-banking services used qualifies the results of Bellahcene and Khedim (2022) who found that this variable has no significant influence on the use of e-banking in Algeria. Similarly, the positive effect of gender on the use of many e-banking services implies that men are likely to be able to use more services than women when they have all adopted these services. However, there was no significant effect of experience on the use of many e-banking services in the city of Bukavu. But it turns out that a positive evaluation of the online banking application by its user increases the probability of using more e-banking services. This trend undermines the theory of the UTAUT model, which considers the impact of experience on the use of new technology (Venkatesh et al., 2003).

Table 4 – Results of logistic and ordered logit regressions

Coefficients	Logit	Ordered logit
	Estimate Std. Error	Estimate Std. Error
(Intercept)	-3.4807*** 1.0304	- -
1|2	- -	1.6162. 0.8776
2|3	- -	2.2252* 0.8810
3|4	- -	3.1357*** 0.8956
4|5	- -	3.7758*** 0.9237
Sex	-0.2851 0.4153	3.843e-01. 0.2194
Age	0.2016 0.6406	3.319E-01 0.3975
Level of education	3.1177*** 0.9042	2.718E-01 0.3392
Other Profession[7]	0.3860 0.6684	4.267e-03 0.5053
Military	0.4982 1.3105	1.633E-01 0.7157
Teachers	0.9991. 0.5477	4.510E-01 0.3656
Traders	0.9354 0.5841	2.081E-01 0.3913
Officials	2.5043*** 0.7242	7.904e-01* 0.3670
Experience1	-	1.558E-01

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[7] The variable "Profession" has been exploded into several (Other profession, military, teacher, trader, civil servant and no profession. The latter is the reference variable)

	-	0.2436
App evaluation	-	4.280e-01**
	-	0.1526
Perceived usefulness	0.6907 *	-2.648E-01
	0.2793	0.1840
Perceived Safety	0.1539	1.987e-01
	0.2512	0.1637
Effort	-0.1188	2.049e-01
	0.2616	0.1667
Confidence (trust)	-0.1082	-2.645e-01*
	0.2510	0.1308
Social influence	0.8007***	-1.718E-01
	0.2056	0.1222
Perceived cost	-0.4851*	8.713E-05
	0.2314	0.1103
Null deviance	275.51 /214 df	-
Residual deviance	195.92 /200 df	317.43
AIC	225.92	357.43
Likelihood ratio test/Pr(>Chisq):	3.374e-11 ***	0.02179 *
Signif. codes :	0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1	

Source : Our data analyses under R

5. Conclusion, implications, limitations and future research

This research focused on analyzing the use of e-banking by customers of commercial banks in Bukavu. In the introductory section of the paper, we set out to identify the determinants of e-banking use by customers of commercial banks in Bukavu.

Existing theories on digital finance, fintech and e-banking were the subject of the second part of this study, before constructing a conceptual research model inspired by the model of acceptance and use of technology as unified and modified in the literature, in the third part.

Apart from this conclusion, the final section is devoted to the main results of the flat sort and the econometric models from the two phases of this research.

The results of the analysis of the use of e-banking by customers of commercial banks in the city of Bukavu in the DRC show that the determinants of the adoption of e-banking by customers of commercial banks in the city of Bukavu are perceived usefulness, social influence and perceived cost, moderated by profession and level of education. After this adoption, the move to the next level in the use of e-banking services is determined by customers' confidence in their respective banks and controlled by gender, profession and evaluation of the application used. These results also reveal that customers place a high importance on adopting e-banking but a lower importance on using a wide range of e-banking services.

The main contribution of this research lies firstly in its conceptual model, which enables both phases of e-banking use to be addressed in a single research project, thereby building a comprehensive framework of upstream and downstream use. This conceptual model could inspire banking service managers to better direct their marketing actions and raise customer awareness of the appropriate use of e-banking. Secondly, the results of this work are intended to fill the gap in research that has developed the analysis of combined adoption and use with a focus on the number of e-banking services in use. The methodological contribution is not negligible either, with the combined use of logistic regression and ordered logit. Finally, this study analyses the use of e-banking as a new technology in the context of an underdeveloped economy. In this respect, it is one of the few studies to have

addressed the advent of new information and communication technologies in the financial system of a sub-Saharan African country.

Although the results of this study are scientifically convincing, it nevertheless suffers from two main limitations. Firstly, the study focused on just one characteristic of the urban population. This could limit the scope and generalizability of the results across the whole country. Research targeting both rural and urban banks would complement the results of this research. A study analyzing the use of e-banking by customers of Congolese banks could be envisaged. Secondly, this study was based on a single post-adoption variable: trust. Future research inspired by the conceptual model developed in this work and incorporating the 'satisfaction' and 'loyalty' variables into its own model would best complete this study.

The low score given to the use of a high number of e-banking services suggests that there is a need to raise awareness in the city's banking sector. Hence the conceptual model developed could inspire financial services managers to better direct their marketing actions and raise customer awareness of the appropriate use of e-banking.

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