

ANTECEDENTS OF E-BANKING USE: A TRUST-EXTENDED TECHNOLOGY ACCEPTANCE MODEL REPLICATION AMONG BANK CUSTOMERS IN LIVINGSTONE, ZAMBIA

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Abstract

Although E-banking has expanded rapidly in Zambia, evidence on what drives its use outside Lusaka and the Copperbelt remains limited, and it is not known whether earlier Zambian findings hold in other urban settings when the relationships are estimated simultaneously. This study addresses this gap by replicating and extending a trust-extended Technology Acceptance Model (TAM) that incorporates the attitude-intention-behaviour sequence shared with the Theory of Planned Behaviour (TPB). It examines how perceived usefulness, perceived ease of use and perceived trust (security and safety) shape attitude towards E-banking, and how attitude translates into intention to use and actual use. Survey data from 318 bank customers in Livingstone, Zambia, most of whom already used E-banking, were analysed using partial least squares structural equation modelling (PLS-SEM) in SmartPLS, supported by IBM SPSS. All five hypotheses were supported. Perceived usefulness had the strongest effect on attitude, followed by perceived trust and perceived ease of use, and together the three antecedents explained a large share of the variance in attitude. Attitude strongly predicted intention, which in turn strongly predicted actual use. Theoretically, the study shows that the model transfers to a new Zambian setting, that usefulness outweighs ease of use among largely experienced users, and that the model is best interpreted here as explaining continued rather than initial use. Practically, banks seeking to deepen E-banking use should emphasise demonstrable functional benefits and visible security assurances rather than ease of use alone.

Keywords: E-banking, Technology acceptance model, Perceived trust, Attitude, Behavioural intention, Continued use, Zambia.

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1.0 Introduction

As we move deeper into the 21st century, the world is changing significantly and quickly, and innovation is typically seen as the major force behind these changes in our environment. These contemporary technologies, which have the Internet at their core, are widely used today, especially in the field of business. Modern information technology has been incorporated into the banking industry over time, causing it to change and become digital. This is done to keep up with growing social trends, shifting customer needs, market trends and competition. Intuitively, this has led to the implementation of an electronic system called E-banking (Lusaya, 2018). Electronic Banking is defined as all the transactions that can take place through an electric system like the web, automated teller machines (ATMs), point of sale machines (POS) in shops and mobile banking (Khurshid *et al.*, 2014).

E-banking is a way that generates connections between the service provider and the customers, this has also resulted in the interconnectedness and interdependence of countries on one another across the globe (Teka, 2020). In the most recent Global Findex 2025 survey, 79% of adults worldwide now have a financial account, up from 51% in 2011, and 62% of adults in low- and middle-income economies made or received a digital payment in 2024, a 27-percentage-point increase since 2014 (Klapper *et al.*, 2025). The shift from traditional banking to alternative channels like merchant services, internet banking, agency services, automated teller machines (ATMs), and mobile banking has been brought about by the digitalisation of the banking industry around the world (Sakala and Phiri, 2019), a shift that accelerated during the COVID-19 pandemic (Klapper and Miller, 2021).

The relationship between digital payments and the decrease in corruption has received attention in policy circles, although it has received little scholarly research (Setor *et al.*, 2021). The principles of financial transparency, which address issues of information asymmetry, unregulated monopoly power, uncertainty, and opportunism, serve as the foundation for the argument for adopting digital technology as a tool for decreasing corruption (Setor *et al.*, 2021). The excessive use of physical currency in underdeveloped nations is a major barrier to the fight against corruption. More recently, the African Banking Digital Transformation Report 2024 found that 76% of banks across Africa now rank digital transformation as either their top priority or among their top three strategic priorities, and that around 60% of African banks have already digitally transformed most of their operations (African Banker and Backbase, 2024).

The banked populace in Zambia has not fully embraced technology as a substitute for a costly type of banking (Sakala and Phiri, 2019). More recently, Zambia's internet penetration stood at 33.0% of the population in January 2025, still well below the global average of 67.9% though closer to the Sub-Saharan African average of around 36% (Kemp, 2025). According to the FinScope surveys 2020 Financial Access Strands in Zambia, 37.2% of adults used formal financial services only (2015, 21.4%); 24.1% of adults used both formal and informal services (2015, 16.8%); and 8.1% of adults used informal

financial services only (2015, 21.1%) (Bank of Zambia/ Finmark Trust, 2020). It should be of significant concern to policymakers, practitioners, and scholars that Zambia has not fully adopted E-banking, as the statistics show very slight growth in financial accessibility measures from 2015. This is imperative because the successful implementation of information systems is dependent on the extent to which such a system is used and eventually adopted by potential users (Mwiya *et al.*, 2017).

Based on the theory of planned behaviour (TPB) (Ajzen, 2011) and the technology acceptance model (TAM) (Davis, 1989), studies have been conducted in many parts of the world, including Lebanon (Tarhini *et al.*, 2016), Pakistan (Khurshid *et al.*, 2014) and Zambia (Sakala and Phiri, 2019), to explore and determine factors influencing the adoption of E-banking amongst bank customers. In Zambia, Mwiya *et al.* (2017) established that perceived usefulness, perceived ease of use and perceived trust each positively influence attitude towards E-banking, which in turn shapes intention and actual adoption of E-banking services.

Although relational studies (Mccauley *et al.*, 2021) have dominated the field for the past ten years, comparative studies have recently become more popular. A literature review by Hanafizadeh *et al.* (2013) posits that Asia has conducted most of the studies on adopting electronic banking, followed by Europe and America. North Europe, West Asia, and Southeast Asia make up the top three geographical regions (Hanafizadeh *et al.*, 2013). Investigating the variables influencing the adoption of electronic banking in less developed areas, particularly in sections of Africa, Asia, and South America, with special attention to the distinctive cultural elements of these locations, represents important research opportunities (Hanafizadeh *et al.*, 2013).

Mwiya *et al.* (2017) provided the first Zambian test of the modified TAM, drawing on bank customers in Lusaka and the Copperbelt and analysing the data with the Statistical Package for the Social Sciences (SPSS). Three gaps remain. First, contextually, it is not known whether the model holds beyond the country's two largest urban centres – for example, in Livingstone, a smaller city whose economy is closely tied to tourism (McLachlan and Binns, 2014). Second, methodologically, the relationships in the Zambian model have not been estimated simultaneously within a structural equation model, so the relative strength of the belief constructs and the variance explained in actual use have not been reported for Zambia. Third, conceptually, prior Zambian work does not distinguish between initial adoption and continued use, even though E-banking use has expanded considerably since that study was conducted. This paper addresses these gaps through a replication and extension of Mwiya *et al.* (2017) among bank customers in Livingstone, using partial least squares structural equation modelling (PLS-SEM). Its theoretical contribution is threefold: (i) it tests the transferability of the trust-extended TAM to a new Zambian setting, responding to calls for adoption research in less-developed regions (Hanafizadeh *et al.*, 2013); (ii) it establishes the relative importance of perceived usefulness, perceived ease of use and perceived trust as antecedents of attitude, contributing to debates about the weight of trust relative to usefulness and ease of use (Ben Abdennebi, 2023; Hornuf *et al.*,

2025); and (iii) it clarifies the scope of the model by showing how it performs when applied predominantly to existing users, that is, as a model of continued use.

The remainder of the study reviews the body of prior research and makes hypotheses in the first place. It also describes the research design and how it was carried out. Thirdly, the study findings are reported and discussed in the paper. Finally, recommendations, restrictions, and future research directions are discussed.

2.0 Literature Review and Hypotheses Development

2.1 E-banking and Adoption

One of electronic banking's main benefits and a major factor in its uptake is its convenience. Being able to use the bank's services whenever and wherever is said to be convenient (Kommers *et al.*, 2019). This is regarded as a crucial benefit of E-banking, especially in the modern world when everyone wants to have access to services from any location at any time. Customers can use several devices to access banking services anytime, anywhere. There has been extensive research on the benefits of E-banking (Gefen, 2000; Sikdar *et al.*, 2015; Abikari *et al.*, 2022). E-banking has become increasingly popular in recent years as more and more clients choose its ease and adaptability (Safeena *et al.*, 2012).

Recent literature continues to affirm the centrality of perceived usefulness and perceived ease of use to E-banking and fintech adoption across developing-country contexts. In a systematic review and meta-analysis of mobile fintech adoption across Sub-Saharan Africa, Hornuf, Safari and Voshaar (2025) confirm that perceived ease of use and perceived usefulness are the most consistently significant determinants of adoption, while noting that supply-side and field-experimental evidence remains scarce. Similar patterns are reported in Ethiopia, where Andaregie *et al.* (2024) find that socioeconomic characteristics and digital infrastructure access shape digital payment adoption, and in Tunisia, where Ben Abdennebi (2023) reports that perceived usefulness and perceived ease of use, rather than perceived security or trust, drive mobile banking adoption intention. Within Zambia specifically, Hassan (2024) demonstrates that mobile money adoption is already reshaping the performance of informal businesses, underscoring the pace at which digital financial services are being taken up, even though uptake of formal E-banking has historically lagged (Sakala and Phiri, 2019). These recent findings reinforce the continued relevance of the trust-extended TAM applied in this study, while also suggesting that the relative weight of trust versus usefulness and ease of use may vary across contexts – a nuance this study's Zambian findings help to further illuminate.

As more people and organizations choose electronic banking as their preferred method of banking, the adoption of e-banking has become a global phenomenon (Cravero, 2015). The cost reductions that electronic banking provides to banks and clients alike are one of the factors pushing its growth (Nduta and Wanjira, 2019). The need for physical bank branches and staff is

diminishing because of electronic banking, which lowers expenses for banks. Customers may receive these cost savings in the form of lower fees. Cost reductions were noted as one of the main factors influencing the adoption of electronic banking in a study by Nduta and Wanjira (2019).

Previous research has highlighted attitude as a central construct in theoretical models of Internet banking adoption (Yousafzai, 2012). In Ethiopia, for example, Teka (2020) found that perceived usefulness, perceived usability, attitude toward E-banking, perceived behavioural control, subjective norms, behavioural intention, awareness, as well as the availability of internet/network connection have a significant positive impact on users' practice of using E-banking. The impact of perceived risk is, however, very detrimental. Overall, electronic banking adoption is a complex phenomenon that involves multiple factors. Banks must understand these factors to design effective strategies for promoting electronic banking adoption among their customers.

2.2 E-Banking Adoption Models

According to Sakala and Phiri (2019), E-banking adoption is an application that has resulted from the widespread use of computer technologies that are shaping all aspects of everyday life. The adoption of E-banking, or electronic banking is influenced by various factors and typically goes through several stages.

2.3 Theory of Planned Behaviour

The theory of planned behaviour (TPB) is an expanded version of the theory of reasoned action (TRA) (Ajzen, 2011; Mwiya *et al.*, 2017). The TRA emanates from social psychology and it identifies the determinants of consciously intentional behaviour (Mwiya *et al.*, 2017). It assumes that individuals are rational and are constantly evaluating relevant behavioural beliefs in the process of forming their attitude toward the behaviour (Khurshid *et al.*, 2014). To help improve the prediction of behavioural intention, the TPB was proposed. According to the theory (TPB) (Ajzen, 2011) Individuals' readily accessible behavioural, normative, and control beliefs provide the cognitive foundation for; attitudes, subjective norms, and perceived control, respectively.

Behavioural performance might be predictable from intentions to perform the behaviour and in turn, predictable from an attitude towards the behaviour, subjective norm, and perceived behavioural control (Ajzen, 2011). Attitude is the sum of beliefs about a particular behaviour either favourably or unfavourably. Subjective norms would be the influence of people in one's social environment on his/her behavioural intentions. References (Al-gharaibah, 2020; Mwiya *et al.*, 2017) define perceived behavioural control as an individual's perception of the ease or difficulty of performing the behaviour of interest in light of possible barriers. E-banking, the suggestion of an intention to adopt or reject E-banking would be determined by personal attitudes, subjective norms, and perceived behavioural control toward E-banking (Sakala and Phiri, 2019).

Empirically, the TPB and related acceptance models have been used widely to examine individuals' acceptance and use of different technologies, including E-banking in Lebanon (Tarhini *et al.*, 2016), Malaysia (Al-gharaibah, 2020) and Jordan (Alalwan *et al.*, 2016). However, research on the topic is limited in Africa (Hanafizadeh *et al.*, 2014), and very few studies have been conducted in the Zambian context (Mwiya *et al.*, 2017; Lusaya, 2018; Sakala and Phiri, 2019) on E-banking adoption based on the TRA and TPB. There are considerable socio-economic and cultural discrepancies in the research on Zambia as an independent country, which incorporates such unique traits (Sakala and Phiri, 2019); this limits the generalisability of prior research conclusions and creates knowledge and contextual gaps. Accordingly, this study draws on the TPB specifically for the attitude–intention–behaviour sequence that it shares with TAM; the positioning of the study relative to the full TPB is explained in Section 2.2.

2.4 The Modified Technology Acceptance Model

The traditional Technology Acceptance Model (TAM) has served as a fundamental framework for comprehending people's decisions to use technology (Rusu *et al.*, 2011). Building on the social-psychological tradition of the theory of reasoned action, Davis (1989) proposed TAM as a parsimonious model for predicting the actual use of a particular technology. In TAM, users' adoption of a computer system depends on their behavioural intention to use it, which in turn depends on attitude, shaped by two beliefs, namely Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) (Davis, 1989). TAM theorises that a technology that is easy to use, and that is found to be useful, will have a positive influence on the intended user's attitude, which in turn increases intention towards using the technology and, ultimately, adoption behaviour.

To apply these notions to the technology acceptance context, it is necessary to measure beliefs regarding the use of technology, rather than the technology itself (Mwiya *et al.*, 2017). Empirically, the TAM has been used widely to examine individuals' acceptance and use of different technologies (Sakala and Phiri, 2019), including E-banking in Malaysia (Al-gharaibah, 2020), Nigeria (Salimon *et al.*, 2015) and Jordan (Alalwan *et al.*, 2016). The modified TAM, extended with perceived trust, has been used as the foundation for investigating the factors driving E-banking uptake in Zambia (Mwiya *et al.*, 2017). Building on this work, the present study retains the trust-extended TAM and makes explicit the attitude–intention–behaviour sequence it shares with the TPB, rather than claiming a full integration of the two theories (see Section 2.2).

2.5 Conceptual Framework and Hypotheses

Figure 1 presents the research model. Perceived usefulness, perceived ease of use and perceived trust are modelled as antecedents of attitude towards E-banking; attitude is modelled as an antecedent of intention to use E-banking; and intention is modelled as an antecedent of actual E-banking use. Each relationship corresponds to one hypothesis (H1–H5).

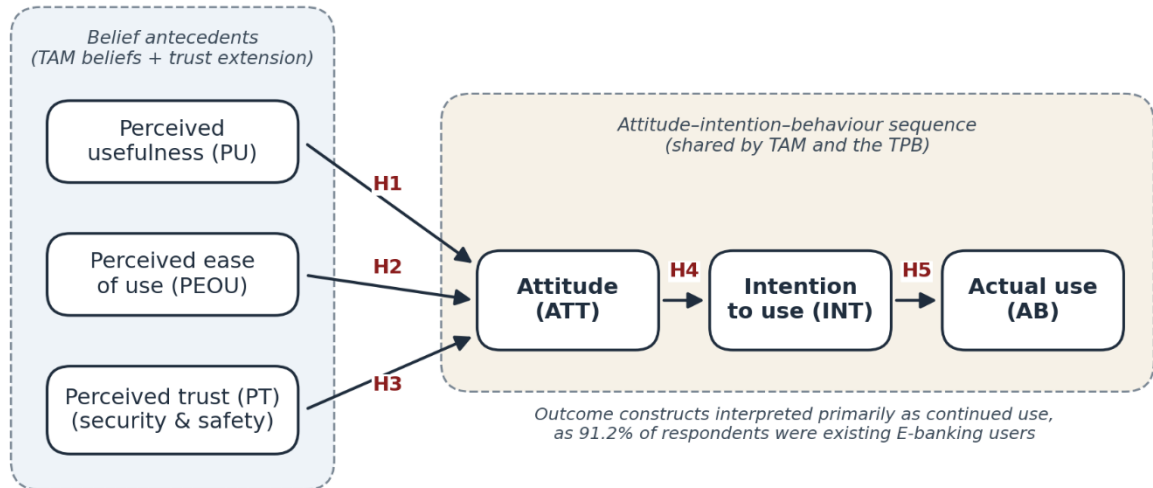


Figure 1: Research model: trust-extended TAM with the attitude–intention–behaviour sequence; **Source:** Authors’ construction, adapted from Davis (1989), Ajzen (2011) and Mwiya *et al.* (2017).

2.6 Positioning Relative to Mwiya *et al.* (2017) and the Theory of Planned Behaviour

The structural paths in Figure 1 deliberately mirror those tested by Mwiya *et al.* (2017), because holding the model constant allows the Livingstone results to be compared directly with the earlier Zambian evidence. The study differs from that work in its setting (Livingstone rather than Lusaka and the Copperbelt), its sample (318 respondents, predominantly existing users), its estimation method (simultaneous PLS-SEM, which reports the relative strength of each antecedent and the variance explained) and its interpretation of the outcomes as continued use (see Section 3).

The study does not claim to test a full integration of TAM and the TPB. In the TPB, intention is determined by attitude, subjective norms and perceived behavioural control (Ajzen, 2011). The present model borrows only the attitude → intention → behaviour sequence, which is common to both theories because TAM itself built on the theory of reasoned action (Davis, 1989). Subjective norms and perceived behavioural control were not included in the survey instrument, which retained the constructs of Mwiya *et al.* (2017) to preserve comparability. The model is therefore best described as a trust-extended TAM, and the omission of the remaining TPB constructs is acknowledged as a limitation.

2.7 Perceived Usefulness and Attitude Toward E-banking

Regarding technology use, perceived usefulness refers to users' perceptions of the experience's results (Mwiya *et al.*, 2017). The user would feel better about using that technology if the results were advantageous. Others define perceived usefulness as the degree to which a person believes a specific system will improve his or her ability to accomplish their job (Mooya and Phiri, 2021; Solomon *et al.*, 2013). The perceived usefulness of E-banking technology takes into account whether users view it to be more affordable,

practical, adaptable, and effective (Sakala and Phiri, 2019). Customers are also more likely to view user-friendly self-service technology favourably if they believe that doing so gives them more freedom to conduct banking transactions, get information on financial advice, and buy other financial products. According to empirical research (George and Kumar, 2013), customers are more likely to see using E-banking favourably if they find it useful. The study makes the following assertions based on these viewpoints. :

H1: Perceived usefulness positively influences attitude towards E-banking.

2.8 Perceived Ease of Use and Attitude toward E-banking

The term "perceived ease of use" (PEOU) describes how much a user thinks using a certain piece of technology will involve little to no work (Alalwan *et al.*, 2016). A person's attitude toward adopting a new information system is more affected by perceived ease of use than it is by whether or not they use it (Mwiya *et al.*, 2017). If information systems have a high user-friendliness, it will have a positive impact on the user and create a positive attitude towards using the new technology. According to empirical research conducted in the past (Prasadh, 2018; George and Kumar, 2013), customer satisfaction and a good attitude toward E-banking are significantly influenced by perceived ease of use. Therefore, the hypothesis is as follows:

H2: Perceived ease of use positively influences attitude towards E-banking.

2.9 Perceived Trust and Attitude Toward E-banking

Trust is defined as "dependence on and faith in the strength, ability, surety, and integrity of a person, a system, or thing." (Alalwan *et al.*, 2016) Security, integrity, authentication, and authorization are the four components that make up trust in E-banking and e-commerce. When sharing information during electronic transactions, the risks and dangers associated with transactional integrity, authentication, and authorisation should be avoided. This is what is referred to as security (Salimon *et al.*, 2015). Transactional integrity is the belief that the information will not be generated, intercepted, changed, or removed illegally (Mwiya *et al.*, 2017). Customers may be confident that only legitimate transactions will be approved because of the authenticity belief. Lastly, authorization belief proves that the parties to an electronic transaction are who they say they are. Nobody desires to have his or her money stolen. It makes sense why experts (Salimon *et al.*, 2015) claim that users' decisions to accept or reject E-banking or e-commerce technology must take trust into account. This is due to the potential for favourable client attitudes and satisfaction with finance-related technology (Ahmed *et al.*, 2021). The study makes the following assumptions in light of these factors. :

H3: Perceived trust positively influences attitude towards E-banking.

2.10 Attitude's Influence on Intention to Use E-banking

Users can have a positive, negative, or neutral attitude. This is because attitudes are evaluations, either positive or negative, of things, people, or events (Yates, 2020). The adoption of E-banking and attitude are related. One important influencing factor in the decision to adopt an innovation is one's attitude toward it (Mwiya *et al.*, 2017). The user's attitude toward using the information system has an impact on their intention to utilise it (Solomon *et al.*, 2013). As a result, attitude toward a certain information technology is viewed as a potential user's evaluation of whether wanting to use that technology is desirable. If the attitudes of potential users are favourable (positive) there will be higher intentions to adopt, and if the attitudes are unfavourable (negative), intentions to adopt will be lower (Mwiya *et al.*, 2017). As a result, the following hypothesis is proposed:

H4: Attitude towards E-banking positively influences intention to use E-banking.

2.11 Intention and Actual Behaviour

The term “behavioural intention” is used to describe “the extent to which a person has established conscious plans to perform or not to perform some specified future behaviour” (Ajzen, 2011). Intentions are influenced by how technology is used and how useful one believes it to be (Mwiya *et al.*, 2017). There may be favourable or unfavourable attitudes toward employing the technology. A behaviour is more likely to be carried out when there is a higher level of intention. Based on empirical data (Khurshid *et al.*, 2014), researchers have found that people who have stronger intentions of adopting E-banking are more likely to utilise E-banking services. Based on these findings, the following hypothesis is put forth:

H5: Intention to use E-banking positively influences actual E-banking use.

3. Methods and Measurement

2.12 Population, sample and Data Collection

The purpose of this study was to replicate and extend the trust-extended TAM in an under-researched Zambian commercial banking context. Specifically, the study sought to examine the effects of perceived usefulness, perceived ease of use and perceived trust on attitude towards E-banking, and the effects of attitude on intention to use and actual use of E-banking among bank customers in Livingstone. A correlational research design was used because it allows for both prediction and explanation of the relationships between variables. Correlational research is well suited to examining multiple variables and establishing a comprehensive pattern of relationships among them (Creswell, 2012). Previous studies have also examined associations between variables using correlational designs (Khurshid *et al.*, 2014; Mwiya *et al.*, 2017; Sakala and Phiri, 2019).

Data were collected over three weeks using self-administered questionnaires distributed to walk-in customers at the 7 commercial banks that pioneered E-banking services in Livingstone. Because questionnaires were given to customers who were present and willing to participate, the study used non-probability (convenience) sampling. Before completing the questionnaire, each respondent was informed of the purpose of the study and signed an informed

consent form. Of the 377 questionnaires distributed, 318 usable responses were returned, a usable response rate of 84.35%. Pallant (2020) suggests a minimum sample size of 200, or 10 cases per item. The 318 responses therefore provide an adequate data set for factor and reliability analyses, for assessing departures from normality, and for PLS-SEM estimation.

The questionnaire measured six reflective constructs: perceived usefulness (PU, five items), perceived ease of use (PEOU, four items), perceived trust (PT, six items), attitude towards E-banking (ATT, four items), intention to use E-banking (INT, three items) and actual E-banking use (AB, four items) all adopted from Mwiya et al. 2017.

In addition to the primary survey data, the study drew on published secondary sources – peer-reviewed journal articles, academic books and institutional reports such as the FinScope 2020 survey (Bank of Zambia/FinMark Trust, 2020) and the Global Findex database (Klapper *et al.*, 2025) – to develop the conceptual framework and hypotheses, to contextualise the Zambian E-banking environment and to interpret the findings.

Table 1 presents the profile of the 318 usable responses. The sample was balanced by gender (50.6% female; 49.4% male), and respondents aged 20 to 30 years formed the largest age group (46.2%). The largest share of respondents banked with Zanaco (37.1%). Notably, 91.2% (n = 290) of respondents reported that they already used E-banking services, while 8.8% (n = 28) did not.

2.13 Clarification of the Outcome Constructs

Because 91.2% of respondents already used E-banking at the time of the survey, the outcome constructs are interpreted as follows. Intention (INT) captures respondents' intention to use E-banking in the future; for current users this represents continued-use intention, and for the 28 non-users it represents initial adoption intention. Actual behaviour (AB) captures respondents' self-reported current use of E-banking services. Accordingly, the structural model is interpreted primarily as a model of continued use among experienced users, and the term 'adoption' in this paper refers to the acceptance and ongoing use of E-banking rather than to first-time uptake alone. Because non-users made up only 8.8% of the sample, the data do not permit a separate test of initial adoption intention; this is acknowledged as a limitation of the study.

Table 1 Sample Profile

Variables	Responses	Frequency	Valid Percent	Cumulative Percent
Gender	Male	157	49.4	49.4
	Female	161	50.6	100.0
Age Group	20-30	147	46.2	46.2
	31-40	78	24.5	70.8
	41-50	54	17.0	87.7
	50+	39	12.3	100.0
Marital Status	Single	199	62.6	62.6
	Married	119	37.4	100.0
Education Level	Certificate	66	20.8	20.8
	Diploma	47	14.8	35.5
	Bachelor's degree	85	26.7	62.3
	Masters	34	10.7	73.0
	PHD	20	6.3	79.2
	University student	66	20.8	100.0
Bank Institution	Others/Multiple	78	24.5	24.5
	Zanaco	118	37.1	61.6
	Absa	15	4.7	66.4
	FNB	43	13.5	79.9
	standard chartered	30	9.4	89.3
	Atlas Mara	34	10.7	100.0
Ebanking Services	YES	290	91.2	91.2
	NO	28	8.8	100.0
Ebanking Tools	Multiple	114	35.8	35.8
	Mobile Phone	144	45.3	81.1
	Laptop/Computer	23	7.2	88.4
	Bank machine	28	8.8	97.2
	Not applicable	9	2.8	100.0

3.0 METHODS OF DATA ANALYSIS

According to Henseler *et al.* (2015), Structural Equation Modelling (SEM) is a generic modelling technique that combines factor analysis and regression analysis and enables the researcher to simultaneously analyse all the relationships between observable indicator variables and numerous outcome variables.

The partial Least Squares (PLS) method is regarded as an appropriate technique when the goal of the research is prediction or exploratory modelling (Henseler *et al.*, 2015). The structural model's various complex relationships and constructions serve as the second argument for the usage of PLS in this investigation. PLS-SEM should be chosen when the structural model is complicated, and incorporates numerous constructs, indicators, and model connections, (Chawala, 2022; Hair *et al.*, 2017).

The research model specifies a sequence of relationships in which three belief constructs (PU, PEOU and PT) influence attitude, which in turn influences intention and actual use, so that attitude and intention act as intervening

constructs. PLS-SEM allows these relationships to be estimated simultaneously, and prior studies grounded in TAM and the TPB have used SEM-based approaches (Farokhian and Sadeghi, 2011; Malhotra and Kumar Baag, 2023; Rahi *et al.*, 2019; Sleimi *et al.*, 2020), which supports the use of PLS-SEM in this investigation. The significance of the path coefficients was assessed through bootstrapping in SmartPLS using 5000 **bootstrap subsamples and SmartPLS 4**. IBM SPSS was used for descriptive statistics, Pearson correlations, reliability checks and collinearity diagnostics (variance inflation factors), an approach also followed by Chawala (2022).

3.1 Measurement Model Assessment

When evaluating reflective models, Hair et al. (2017) suggest that four steps are required: assessing indicator loadings, internal consistency reliability, convergent validity, and discriminant validity.

Indicator Loadings Assessment - Outer Loadings

Checking indicator loadings is considered a crucial criterion for confirming that each indicator shares sufficient variance with the latent variable it is intended to measure (Adepoju, 2020). Loadings above 0.708 serve as a suitable benchmark since they demonstrate that the construct accounts for more than 50% of the variance in the indicator and, as a result, provide excellent item reliability (Chawala, 2022). All the items in Table 2 had loadings higher than 0.708 and hence accounted for more than 50% of the variability of each indicator.

Table 2 Outer Loadings

Construct (Latent Variables)	Outer loadings
Actual Behaviour	
AB_1	0.884
AB_2	0.892
AB_3	0.889
AB_4	0.880
Attitude	
ATT_1	0.890
ATT_2	0.877
ATT_3	0.887
ATT_4	0.887
intention	
INT_1	0.913
INT_2	0.928
INT_3	0.907
Perceived Ease of Use	
PEOU_1	0.884
PEOU_2	0.892
PEOU_3	0.880
PEOU_4	0.882
Perceived Trust	
PT_1	0.828
PT_2	0.884
PT_3	0.876
PT_4	0.878
PT_5	0.852
PT_6	0.883
Perceived Usefulness	
PU_1	0.863
PU_2	0.861
PU_3	0.910
PU_4	0.824
PU_5	0.811

Internal Consistency Reliability Assessment

The reliability of the construct is deemed to increase with higher values (Chawala, 2022). Hair *et al.* (2017) suggest that reliability values ranging from 0.70 to 0.90 are acceptable and good; values of 0.95 or higher, however, are viewed with suspicion since they suggest the items are redundant, which lowers construct validity.

Table 3 presents the constructs' composite reliabilities: actual behaviour (AB) (0.909), attitude (ATT) (0.908), intention (INT) (0.904), perceived ease of use (PEOU) (0.908), perceived trust (PT) (0.935), and perceived usefulness (PU) (0.910). These values are all high, yet remain below the 0.95 threshold, indicating that they are not problematic and reflect high levels of internal consistency reliability.

Table 3: Composite Reliabilities

Latent Variable	Composite reliability (rho_a)
Actual Behaviour	0.909
Attitude	0.908
Intention	0.904
PEOU	0.908
PT	0.935
PU	0.910

Convergent Validity Assessment

Convergent validity was assessed using the average variance extracted (AVE). Convergent validity refers to the degree to which the construct converges to explain the variance of its elements (Chawala, 2022; Garson, 2016).

An AVE of 0.50 or more is considered acceptable since it shows that the construct accounts for at least 50% of the variation of its elements (Hair *et al.*, 2011). For actual behaviour, for example, the four items used to measure the construct explain an average of 78.5% of its variance. The convergent validity test is satisfied, as shown in Table 4 below.

Table 4: Average Variance Extracted (AVE)

Latent Variable	Average variance extracted (AVE)
Actual Behaviour	0.785
Attitude	0.783
Intention	0.839
PEOU	0.782
PT	0.752
PU	0.730

Discriminant Validity Assessment

The reflective model was further assessed for discriminant validity using the Fornell-Larcker criterion. Discriminant validity is the extent to which a construct is empirically distinct from other constructs in the structural model (Chawala, 2022; Hair *et al.*, 2017). Using the Fornell-Larcker criterion,

discriminant validity is present for any latent variable if the square root of AVE is higher than its correlation with any other latent variable (Chawala, 2022; Garson, 2016). Hair *et al.* (2017) further recommend comparing each construct's AVE with the squared inter-construct correlations between that construct and every other reflectively measured construct in the structural model.

Furthermore, the shared variance between constructs should not exceed their respective AVEs. The results in Table 5 show that each construct's AVE exceeds its squared inter-construct correlations with the other constructs. Therefore, the Fornell–Larcker criterion and discriminant validity conditions were met for all the constructs.

Table 5: Fornell–Larcker Criterion

Latent Variable constructs	Actual Behaviour	Attitude	Intention	PEOU	PT	PU	Discriminant Validity met? Square root of AVE>LVC?
Actual Behaviour	0.886						YES
Attitude	0.836	0.885					YES
Intention	0.829	0.865	0.916				YES
PEOU	0.758	0.802	0.758	0.885			YES
PT	0.777	0.796	0.748	0.837	0.867		YES
PU	0.803	0.860	0.799	0.824	0.804	0.855	YES

Note: The square root of AVE values is represented by diagonal values in bold and non-diagonal elements represent latent variable correlations (LVC).

4.0 RESULTS

4.1 Correlation analysis

Correlation analysis was used to describe the strength and direction of the linear relationship between two variables. Interpretations of correlation strength vary across scholars; however, Cohen (1988) recommends the following thresholds: $r = 0.10$ to 0.29 indicates a small effect, $r = 0.30$ to 0.49 a medium effect, and $r = 0.50$ to 1.0 a large effect. Correlations were considered significant at the $p < 0.05$, $p < 0.01$, and $p < 0.001$ levels, (Pallant, 2016). Table 6 shows that inter-correlations among the variables are all below 0.80 , suggesting that multicollinearity is not a concern for this study (Pallant, 2016).

Table 6 shows that attitude toward E-banking is significantly and positively associated (all $p < 0.01$) with each independent variable: perceived usefulness (PU) ($r = 0.759^{**}$), perceived ease of use (PEOU) ($r = 0.799^{**}$), and perceived trust (PT) ($r = 0.796^{**}$). The effect sizes are large based on Cohen's criteria (Cohen, 1988), indicating that PU, PEOU and PT are each strongly and positively associated with attitude. The significant positive correlations indicate that the more favourable a customer's attitude toward E-banking, the stronger their intention to use E-banking services ($r = 0.787^{**}$, $p < 0.01$, large effect size). Similarly, more favourable attitudes toward E-banking are associated with higher levels of actual E-banking use ($r = 0.734^{**}$, $p < 0.01$,

large effect size). Lastly, higher levels of intention are associated with higher levels of actual E-banking use ($r = 0.753^{**}$, $p < 0.01$, large effect size).

All three antecedents of E-banking adoption are significantly and positively correlated with adoption, confirming that each independent variable is individually related to E-banking adoption. As shown in Table 6, all these correlations fall within the large-effect range: perceived usefulness (PU) ($r = 0.700^{**}$, $p < 0.01$), perceived ease of use (PEOU) ($r = 0.756^{**}$, $p < 0.01$), and perceived trust (PT) ($r = 0.775^{**}$, $p < 0.01$). This indicates that these independent variables significantly influence individuals' adoption of E-banking.

Table 6 Correlations among All Variables

#	Variables	Mean	Std. Dev	N	1	2	3	4	5	6	7	8	9
1	Actual Behaviour	3.962	.914	318	-								
2	Intended Behaviour	3.927	.906	318	.753**	-							
3	Attitude	3.917	.885	318	.734**	.787**	-						
4	Gender	.511	.501	318	-.063	-.081	-.042	-					
5	Age Group	.951	1.060	318	.043	-.036	-.042	.223**	-				
6	Marital Status	.370	.485	318	.048	-.052	-.041	.153**	.636**	-			
7	Education Level	3.291	1.769	318	.243**	.219**	.223**	-.072	-.136*	-.110	-		
8	Perceived Usefulness	3.934	.891	318	.700**	.721**	.759**	-.069	-.047	-.023	.224**	-	
9	Perceived Ease Of Use	3.841	.889	318	.756**	.780**	.799**	-.033	.004	-.012	.238**	.724**	-
10	Perceived Trust	3.783	.8771	318	.775**	.766**	.796**	-.030	.045	.009	.190**	.705**	.737**

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

4.2.1 Structural Model Results

Attention now turns to the structural relationships among the technology acceptance model (TAM) constructs, reported through the path coefficients (β) and the coefficient of determination (R^2) generated by the structural equation model.

Structural Model Path Coefficients

Structural model path coefficients help establish the relationships between the model's components (Ringle and Sinkovics, 2009). Table 7 shows that all structural model path coefficients are positive and significant, supporting the study's hypothesised relationships between the constructs.

Table 7 Structural Model Path Coefficients

Hypothesis	Structural Model Paths	Path Coefficients	Mean	Standard deviation	t-statistics	Significance Levels	P values	Hypothesis
H1	PU -> ATT	0.545	0.545	0.057	9.637	***	0.000	Supported
H2	PEOU -> ATT	0.178	0.178	0.064	2.782	***	0.005	Supported
H3	PT -> ATT	0.210	0.210	0.064	3.253	***	0.001	Supported
H4	ATT -> INT	0.865	0.865	0.020	42.682	***	0.000	Supported
H5	INT -> AB	0.829	0.829	0.026	31.728	***	0.000	Supported

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$,

Strength of relationships

The path coefficients of the PLS structural model indicate the strength of the relationships between the dependent and independent variables and, according to Hair *et al.* (2017), are comparable to standardised regression coefficients. The path coefficient between PU and ATT (0.545) is significant and denotes a strong positive relationship. The path coefficient between PEOU and ATT (0.178) is positive and significant, though relatively weak in magnitude, indicating a modest link between the two constructs. The path coefficient between PT and ATT (0.210), while relatively weak, is also significant. The path coefficient between ATT and INT (0.865) is strong and positive. The path coefficient between INT and AB (0.829) is likewise strong, positive, and significant.

Coefficient of Determination (R^2)

Coefficient of Determination (R^2) values indicates the amount of variance in the dependent variable that is explained by the model (Pallant, 2016). It's also crucial to remember that the R^2 values produced by PLS are identical to those obtained from conventional regression analysis (Chawala, 2022).

The model's three R^2 values are displayed in Figure 2: Attitude (ATT) (0.778), Intention (INT) (0.748), and Actual Behaviour (AB) (0.687). AB is the main variable of interest, with the other constructs in the model accounting for roughly 68.7% of its variance. Hair *et al.* (2017) proposed that R^2 values of 0.75, 0.50, or 0.25 for the endogenous construct might be characterized as large, moderate, and weak, respectively. Applying this benchmark, the R^2 values for ATT (0.778) and INT (0.748) are large, while AB (0.687) is moderate.

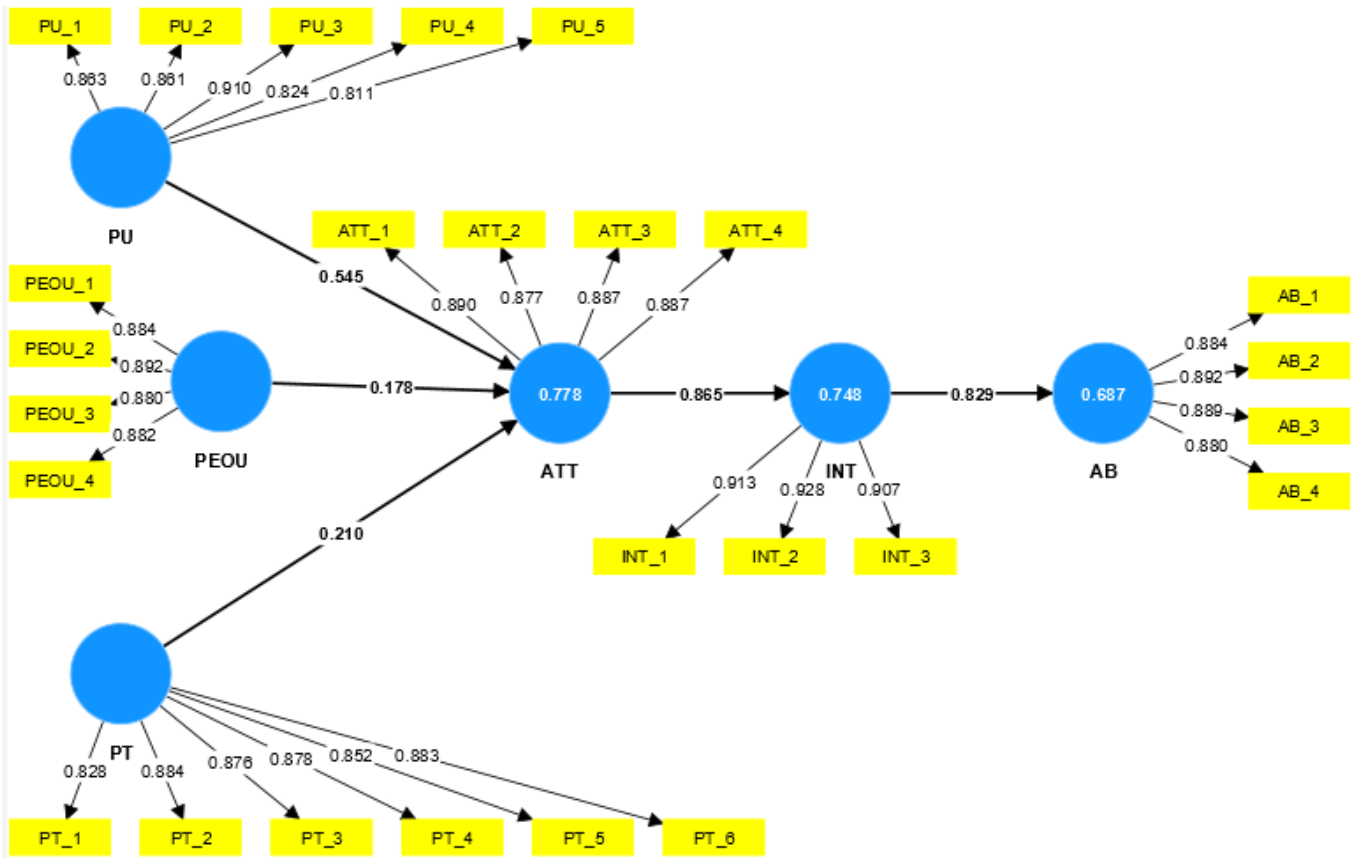


Figure 2. Structural model showing Path Coefficients and Coefficients of Determination

Based on the measurement model assessment and the structural model results, Table 8 below summarises the results of hypotheses testing.

Table 8 Hypothesis Testing Summary of Results

No.	Hypothesis	Path	β	t-statistic	p-value	Result
H1	Perceived usefulness positively influences attitude towards E-banking	PU → ATT	0.545	9.637	< 0.001	Supported
H2	Perceived ease of use positively influences attitude towards E-banking	PEOU → ATT	0.178	2.782	0.005	Supported
H3	Perceived trust positively influences attitude towards E-banking	PT → ATT	0.210	3.253	0.001	Supported
H4	Attitude towards E-banking positively influences intention to use E-banking	ATT → INT	0.865	42.682	< 0.001	Supported

No.	Hypothesis	Path	β	t-statistic	P-value	Result
H5	Intention to use E-banking positively influences actual E-banking use	INT $\rightarrow$ AB	0.829	31.728	< 0.001	Supported

Note: β = standardised path coefficient; t-statistics and p-values from SmartPLS bootstrapping (see Table 7). PLS-SEM = partial least squares structural equation modelling.

5.0 DISCUSSION

The results show that all three antecedents – perceived usefulness, perceived ease of use and perceived trust – are significantly and positively related to attitude towards E-banking, that attitude strongly shapes intention to use E-banking, and that intention is, in turn, strongly associated with actual use. The direction and significance of these relationships replicate the pattern reported by Mwiya *et al.* (2017) for Lusaka and the Copperbelt, and they are consistent with other Zambian and international studies (Khurshid *et al.*, 2014; Lusaya, 2018; Daka and Phiri, 2019). The replication in Livingstone therefore strengthens confidence that the trust-extended TAM transfers across Zambian urban settings beyond the two largest cities in which it was first tested.

Beyond confirming the direction of the relationships, the PLS-SEM estimates reveal a clear hierarchy among the antecedents of attitude. Perceived usefulness had by far the largest effect ($\beta = 0.545$), followed by perceived trust ($\beta = 0.210$) and perceived ease of use ($\beta = 0.178$). One plausible explanation lies in the composition of the sample: because more than nine in ten respondents already used E-banking, most were familiar with how the services operate, so ease of use may have become a less salient consideration than the practical benefits the services deliver. This interpretation should be treated with caution, as the study did not compare users and non-users directly. It is, however, in line with recent evidence that usefulness and ease of use are the most consistent predictors of fintech adoption in Sub-Saharan Africa (Hornuf *et al.*, 2025) and that usefulness can outweigh security-related perceptions in shaping mobile banking intentions (Ben Abdennebi, 2023). At the same time, the significant effect of perceived trust in this study suggests that, in contrast to the Tunisian evidence reported by Ben Abdennebi (2023), security and safety perceptions remain a meaningful, if secondary, influence on attitudes among Zambian bank customers.

Bank customers, however, remain particularly concerned with the reliability of E-banking systems in terms of risk and security, reflecting an understandable reluctance to risk financial loss through fraud or theft. These results resonate with earlier research (Solomon *et al.*, 2013), which found that customers' perceptions of, and satisfaction with, financial technology are positively influenced by trust. This finding also corroborates research by

Alalwan *et al.* (2016) demonstrating that trust is a critical factor users weigh when deciding whether to accept or reject E-banking or e-commerce technologies.

Taken together, perceived usefulness, perceived ease of use and perceived trust each have a significant, positive effect on attitude, which in turn positively influences intention to use E-banking. Both the correlation analysis and the structural model show that intention is strongly associated with actual use. Because most respondents were already users, and intention and use were measured at the same point in time, this link is best interpreted as evidence that continued-use intention is reflected in current usage behaviour, rather than as a test of the transition from initial intention to first-time adoption. These results are consistent with earlier research conducted in a range of cultural contexts, including Nigeria (Adepoju, 2020), Vietnam (Luong *et al.*, 2022) and Iran (Kimiagari and Baei, 2021).

6.0 CONCLUSION

This study set out to test whether the trust-extended Technology Acceptance Model, previously applied to bank customers in Lusaka and the Copperbelt (Mwiya *et al.*, 2017), holds in Livingstone, Zambia, and to estimate its relationships simultaneously using PLS-SEM. Using a correlational design and a sample of 318 bank customers, most of whom already used E-banking, the study found that perceived usefulness, perceived ease of use and perceived trust each positively influenced attitude towards E-banking, with usefulness exerting the strongest effect. Attitude, in turn, strongly predicted intention to use E-banking, and intention was strongly associated with actual use.

6.1 Contribution to Knowledge and Implications

This study makes three theoretical contributions. First, as a replication and extension of Mwiya *et al.* (2017), it provides evidence that the trust-extended TAM transfers to a further Zambian urban setting, with all hypothesised relationships again supported; such evidence helps to establish the boundary conditions of acceptance models in under-researched regions (Hanafizadeh *et al.*, 2013). Second, by estimating the model simultaneously with PLS-SEM, it shows the relative weight of the antecedents: usefulness dominated attitude formation, whereas ease of use had the weakest effect, adding Zambian evidence to the debate on the relative importance of usefulness, ease of use and trust (Ben Abdennebi, 2023; Hornuf *et al.*, 2025). Third, it clarifies the scope of the model: because the sample consisted mainly of existing users, the results speak primarily to continued use, and the study makes explicit that its link to the TPB is confined to the attitude–intention–behaviour sequence rather than a full integration of the two theories.

Methodologically, the study complements the SPSS-based analysis of Mwiya *et al.* (2017) by combining reliability and collinearity checks in IBM SPSS with PLS-SEM in SmartPLS, and it reports the variance explained in attitude (77.8%), intention (74.8%) and actual use (68.7%).

For practitioners, the dominance of perceived usefulness suggests that banks seeking to deepen E-banking use should communicate concrete, demonstrable benefits – for example, time saved, lower transaction costs and round-the-clock access – rather than relying on generic awareness campaigns. The significant effect of perceived trust indicates that visible security assurances, such as clear fraud-protection policies, prompt transaction notifications and responsive complaint handling, remain important. Because ease of use had the weakest effect among these largely experienced users, investments in interface simplicity may matter most for first-time users, a group this study could not examine in depth.

E-banking enables wider access to financial services, especially for individuals living in remote areas. This can contribute to financial inclusion by providing banking services to the unbanked population, promoting economic growth, and reducing poverty levels. E-banking allows banks to reduce operational costs associated with traditional brick-and-mortar branches. This can lead to lower transaction fees and service charges, making banking services more affordable for customers. The increased adoption of e-banking requires robust technology infrastructure, including reliable internet connectivity and secure digital platforms. Practitioners and policymakers need to focus on improving and expanding these infrastructures to support e-banking services across the country.

6.2 Research Limitations and Future Directions

The limitations of this study, like those of other studies, provide a foundation for future research. Firstly, the study used a convenience sample of walk-in customers in Livingstone only, so the results may not generalise to other parts of Zambia or to customers who rarely visit bank branches. Future research should use probability sampling across several provinces.

Secondly, 91.2% of respondents were already E-banking users. The study therefore speaks mainly to continued use and could not test separately how the antecedents shape initial adoption among non-users. Future studies should deliberately sample non-users, or compare users and non-users through multi-group analysis.

Thirdly, the study did not measure subjective norms or perceived behavioural control and therefore does not test the full TPB. Future research could integrate these constructs with the trust-extended TAM to assess whether social influence and perceived control add explanatory power in the Zambian context.

Fourthly, because the study was cross-sectional and intention and use were measured at the same time, the results provide only a snapshot. Future research should use longitudinal designs to examine the change from intention to behaviour over time. Fifthly, because the design is correlational, causal inferences cannot be drawn from the results. Future researchers could

use experimental or quasi-experimental designs to identify the mechanisms through which the antecedents influence the uptake of electronic banking.

Finally, future scholars could formally test the sequential mediating roles of attitude and intention, for example through serial mediation analysis using Hayes' PROCESS macro (Model 6), or through the specific indirect effects available in PLS-SEM.

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