PREDICTIVE INSIGHTS INTO DIGITAL-ONLY BANKING ADOPTION IN MALAYSIA USING ARTIFICIAL NEURAL NETWORKS

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ABSTRACT

This study employs an Artificial Neural Network (ANN) to predict the importance of various factors—convenience, economic efficiency, functional risk, security risk, critical mass, number of services, trust, environmental concern, and perceived value—in collectively determining the intention to adopt digital-only banks. The analysis involves 403 respondents in Malaysia, utilising both exploratory factor analysis and the ANN method. The results from the ANN highlight "environmental concern" as the most influential factor shaping individuals' intention to adopt digital-only banks. Additionally, "trust," "perceived value," and "convenience" emerged as crucial factors in predicting adoption intention. These findings not only provide valuable insights for fintech companies and banks aiming to attract new customers or enter new markets but also contribute to expanding knowledge in the field, particularly in the realm of non-linear methods such as ANN. This study enhances the understanding of the evolving landscape in digital-only banking.

KEYWORDS

Artificial Neural Network (ANN); Adoption Intention; Digital-only banks; Perceived Value; Environmental Concern

1. INTRODUCTION

Digital-only banks offer financial services exclusively through remote, internet-based, and mobile channels, including ATMs and call centres, without physical branch locations [1, 2]. These banks made their debut in the United States almost two decades ago, and their footprint has since extended to Japan, Europe, China, and various other regions worldwide. As these institutions proliferate, there is a growing interest in delving into both customers' acceptance and the emerging institutional challenges confronting digital-only banks [3]. Previous literature highlights that digital-only banks encounter challenges related to the uncertainty of long-term viability and low adoption rates, particularly in markets like the United States, Europe, and the United Kingdom [4-6].

The rise of digital-only banks, hailed as a major trend in consumer banking, faces a disparity between expectations and adoption rates [4, 7]. Surveys in the U.S. and the UK reveal low percentages of consumers anticipating the future impact of digital-only banks at 18% and 13%, respectively [8, 9]. In the nascent Malaysian market, scarce literature underscores the need to investigate adoption intentions for fostering adoption, ensuring financial stability, and achieving profitability [1, 4]. In Malaysia, fintech is growing slowly. Even with recent accelerated adoption

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of fintech services, it still represents around 50% (15.96 million) of Malaysia's population in 2021 [10]. Developing a cashless economy and becoming a leader in the digital economy in South East Asia by 2030 may be hampered by the slow pace of progress of the fintech, and digital-only banking industries [10, 11].

Malaysia is generally considered a banked society in terms of savings and payments, however, close to 40% of the population are considered underserved and less than 15% considered unbanked or unserved in terms of access to some banking services (e.g., credit) [12]. The introduction of digital-only banks emerges as a strategic avenue to bridge these gaps, extending the range of products and services to the underserved and unserved segments of the financial system, particularly in Malaysia, where the licensing of digital-only banks was granted in 2022 [12-15]. The primary aim of this article is to predict the inclination to embrace digital-only banks through an analysis of key determinants. Specifically, the study delves into predicting the importance of factors such as convenience, economic efficiency, functional risk, security risk, critical mass, number of services, trust, environmental concern, and perceived value in collectively shaping the intention to adopt digital-only banks.

2. Related Work

2.1 Determinants of Digital-only Banks Acceptance

Despite the existence of digital-only banks over an extended period, they have recently taken a central role in the fintech industry's spotlight [16]. Despite predictions that these banks will lead the future of finance, significantly impacting financial consumers, there is a noticeable scarcity of research into their viability. Intriguingly, while digital-only banks are progressively displacing traditional banks' internet banking, comprehensive insights into their dynamics remain elusive [4, 7, 17].

Several researchers have emphasised the significance of investigating the benefits (e.g., convenience and economic efficiency) in influencing customers' intentions to adopt digital-only banks [2]. These banks offer convenience as users can open accounts within ten minutes after downloading an app to their smartphones and entering personal information, all without leaving their homes [18]. Digital-only banks are economically efficient as they reduce operational cost, thus this has enabled them to provide higher deposit rates, lower loan rates, and more affordable services [19, 20].

The adoption of digital-only banks introduces challenges and risks stemming from the nature of financial transactions and the absence of face-to-face interactions. Addressing trust and perceived risk emerges as pivotal in promoting digital-only banks [2, 5, 20]. Establishing trust is crucial for mitigating uncertainty and risk, enhancing the likelihood of adoption [5, 7, 21]. Perceived risk, heightened by the physical separation between customers and the business, adds another layer of challenge [7, 22]. Particularly, functional and security risks are identified as significant factors influencing customers' attitudes toward digital-only banks.

The justification for investigating the factors examined in this research within the Malaysian context is well-founded due to the recent introduction of digital-only banks in the country as of 2022. This novelty underscores the significance of addressing uncertainties, risks, and trust, which are pivotal considerations for customers when adopting new technological innovations [2, 4, 5, 7, 21, 23]. Digital-only banks operate in an environment characterised by customer risk and uncertainty, posing substantial challenges for their viability and success [2, 18, 21, 23]. In this uncertain market scenario, Jung and Shin [24] emphasise the crucial role of delivering exceptional customer value for the sustainability and prosperity of this emerging business model.

Furthermore, external factors, particularly in the Asian context, exert significant influence over the inclination to adopt innovation [25]. Network externalities (NE), including critical mass and the number of services, have been consistently identified as pivotal elements shaping the acceptance of innovation [26-28]. Lastly, it is imperative to acknowledge that in light of the UN Sustainable Development Goals (SDGs) aiming to address global challenges by 2030 [29], new business models, exemplified by digital-only banks, are anticipated to contribute to these SDGs, with a specific emphasis on environmental concerns [30]. While banks themselves are not traditionally considered to have a direct negative impact on the environment, arguments have been made regarding their indirect effects stemming from extensive paper usage, high energy consumption, and unsustainable behaviours exhibited by their customers [31, 32]. Therefore, a comprehensive examination of the aforementioned factors is of paramount importance within the context of this research.

In essence, the conventional banking models that hinge on clients physically visiting branches are facing comprehensive scrutiny. Consequently, this study aims to rectify this gap in the literature by delving into the importance of factors such as convenience, economic efficiency, functional risk, security risk, critical mass, services, trust, environmental concern, and perceived value in collectively shaping the intention to adopt digital-only banks. In pursuit of this objective, the research proposes a comprehensive model to scrutinize customers' intention to use digital-only banks in Malaysia. This exploration draws on a conceptual model, as depicted in Figure 1, and builds upon existing research contributions [1, 2].

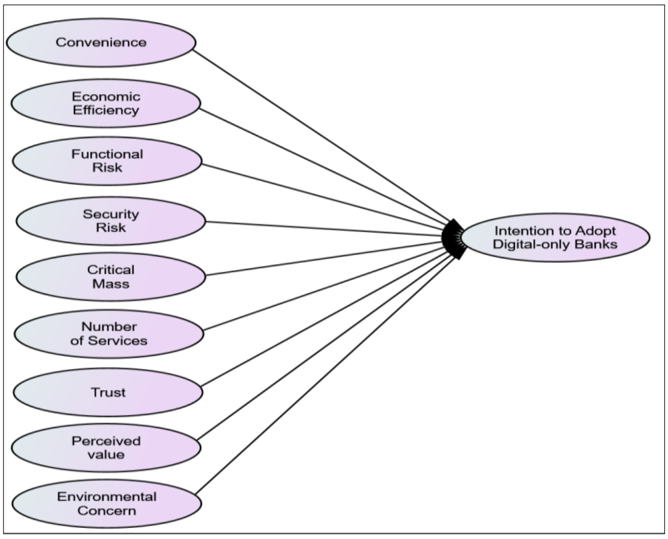

Figure 1: Proposed Conceptual model

2.2 Artificial Neural Networks (ANN)

To fill the existing knowledge gap regarding the key drivers of digital-only bank adoption, this research employs an Artificial Neural Networks (ANN) approach. In contrast to traditional linear techniques like PLS-SEM, CB-SEM, NCA, and others, ANN operates independently of multivariate assumptions such as linearity, normality, or homoscedasticity. Its distinguishing feature lies in its capacity to recognize both linear and nonlinear relationships [33, 34]. When scrutinizing the proposed conceptual model, the chosen ANN method diverges from depending on predefined hypotheses, avoiding the inherent establishment of causal relationships. Instead, its emphasis is on assessing the importance of each independent variable concerning the dependent variable, thereby furnishing valuable insights into the outcomes [33, 34].

3. METHODOLOGY

3.1 Data Collection and Procedures

The study adopted an exploratory and descriptive methodology for research. Data collection involved the distribution of a digital survey, where a total of 420 non-users of digital-only bank participants in the Klang Valley area, Malaysia, responded by scanning a QR code leading to the Google Form survey link. The survey spanned six weeks during May and June 2022, featuring a questionnaire with 46 items derived from pertinent literature. Rationalising this demographic choice is substantiated by an analysis put forth by Moody's analyst Tengfu Li, underscoring that Malaysia is witnessing a burgeoning populace within the prime age group of 25 to 54 years, thereby engendering an augmented demand for financial services [35]. We adapted measures from previous studies as follows: 4 items for convenience from [2, 36], 4 for economic efficiency from [2, 37], 5 items for functional risk from [2, 23], 5 items for security risk from [2, 38], 5 items for critical mass from [2, 3], 4 items for number of services from [2, 28], 5 items for trust from [39], 5 items for perceived value from [40, 41], 4 items for environmental concern from [42], finally, 5 items for the intention to adopt digital-only banks from [39].

Participants rated each item on a five-point Likert-type scale, ranging from 1 – “totally disagree” to 5 – “totally agree.” Data collection instruments were put through certain procedures before data collection to ensure that first, respondents found the questionnaire clear, and second, the items used were appropriate and reflected current research constructs [43]. In the beginning, experts validated the instruments' content by ensuring that elements and dimensions were relevant and understandable. After receiving feedback from four judges, all of whom are lecturers with at least a PhD in the field of this study, minor revisions were made to the questionnaire. The refined questionnaire was then used to conduct a pilot test on 50 respondents, who were randomly selected from the target population (i.e., Malaysians living in Klang Valley and belonging to the prime age population) [44-47].

Several screening questions were used to begin the current study's survey questionnaire. By screening questions, it is ensured that only Malaysians meeting the prescribed criteria (i.e., of prime age, familiar with digital-only banks) participate in the survey. Online questionnaires were distributed to 420 individuals in Klang Valley to achieve the target response rate. In total, 420 questionnaires were collected, but 17 questionnaires were excluded due to issues such as straight lining cases, and not fitting into the research qualifier list. The analysis in our study was therefore limited to the remaining 403 clean responses [48].

3.2 Exploratory Factor Analysis (EFA)

An exploratory factor analysis (EFA) was conducted to examine the underlying factor structure of our dataset. We utilised a principal component analysis (PCA) as the extraction method, and an orthogonal rotation method (i.e., Varimax) to facilitate the interpretation of the factor loadings. The purpose of rotation in factor analysis is to achieve a simple structure, whereby the factor loadings are easily interpretable and make intuitive sense. Prior to conducting the factor analysis, we assessed the suitability of the correlation matrix through Bartlett's Test of Sphericity, which examines the overall significance of the correlations among variables. Moreover, we evaluated the appropriateness of the data for factor analysis using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, which assesses the extent to which the data meet the assumptions of factor analysis. To ensure satisfactory levels of explanation, we also assessed the communality of the scale. Communality reflects the proportion of variance in each variable that is accounted for by the identified factors [49, 50].

The total variance explained was examined to analyse the empirical support for the validity of the factor structure and determine if selected variables share common underlying constructs. Additionally, the reproduce correlations analysis was conducted to assess the model fit. The model demonstrates good fit, if the proportion of significant correlations is less than the threshold of 0.50. Finally, the rotation matrix is utilised to scrutinise the content of items with high loadings from each factor. Each item receives a weight or loading from every factor, and in a "clean" factor analysis, the emphasis is on loadings exceeding 0.5. This threshold helps ensure that the identified loadings are substantial and contribute meaningfully to the interpretation of underlying factors [49, 50].

3.3 Artificial Neural Networks (ANN)

Given the limitations of linear methods in capturing non-linear relationships, this study opted for the Artificial Neural Network (ANN) approach. The choice of ANN enables the identification of both linear and non-linear associations, leveraging the learning capabilities inherent in neural networks [34, 51, 52]. This approach proves valuable in incorporating nonlinearity into predictive models, as illustrated in Figure 2. The model features nine independent variables (CONV, ECE, FR, SR, CM, NS, TR, ENC, and PV) as covariates, with INT as the dependent variable.

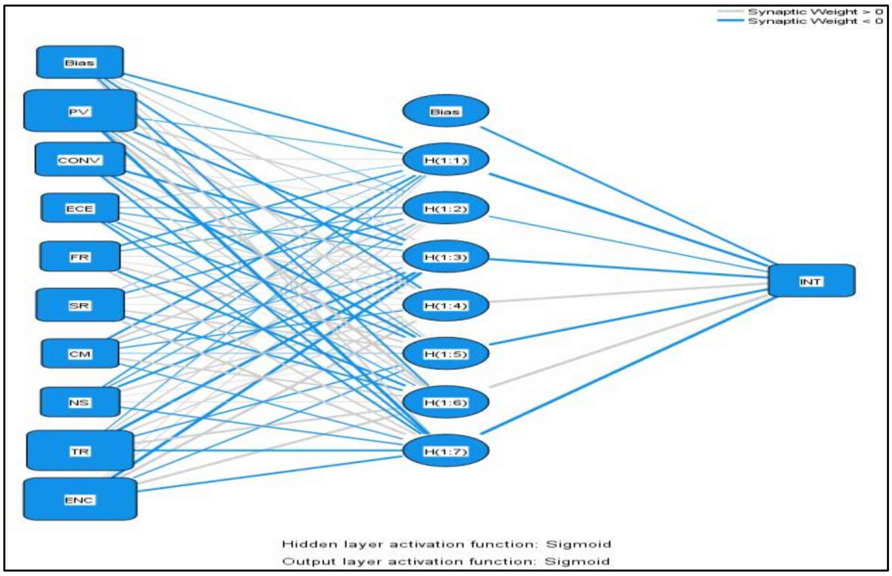

Figure 2:Artificial neural network diagram

The multi-layer perceptron (MLP) training algorithm was employed to train the neural networks. The MLP comprises nine independent imputed variables, seven hidden layers (calculated automatically by the software, typically representing 2/3 of the imputed variables), and an output layer corresponding to the dependent variable – INT. Normalization of each variable's items ($\overline{V_i}$) was performed by rescaling the average of the items to the range [0, 1] [34], using the following expression (1):

$$\bar{x}_i = \frac{\bar{v}_i - 1}{4} \quad (1)$$

In the context of neural networks, the activation function plays a crucial role, and among the available options, the sigmoid function was selected to activate neurons in both the hidden and output layers [34, 52, 53]. Renowned for its ability to introduce non-linearity, the sigmoid function transforms input values into a binary space. Its distinctive advantage lies in the maximal derivative when x is close to 0, facilitating effective training towards the extremities of the range [0, 1]. In the output layer, the sigmoid function proves to be an apt choice, particularly in binary classification problems. Its capacity to generate values within the range [0, 1] allows for the interpretation of these values as probabilities. This characteristic is particularly useful when assessing the likelihood of a given instance belonging or not belonging to a specific class. The strategic application of the sigmoid function contributes to the model's efficacy in handling binary classification scenarios [34].

In the supervised learning process of the ANN model, outputs play a crucial role during the training phase, facilitated by a gradient descent optimisation algorithm. This technique minimises functions iteratively by moving in the direction of steepest descent, as indicated by the negative gradient—a common approach in updating model parameters in machine learning [34]. For prediction and classification purposes, the feedforward propagation back-propagation (FFBP) algorithm was employed. This method, akin to advanced multiple regression analysis (MRA), excels in handling intricate and non-linear relationships. Activation of both the hidden and output layers was achieved using the sigmoid curve function, adept at modelling non-linear behaviours with values between 0 (representing non-activation) and 1 (representing activation). To gauge the model's accuracy, the Root Mean Square Error (RMSE) was employed, calculated using the following expressions (2), and (3). The RMSE serves as a robust metric for assessing the model's predictive performance. The small RMSE values suggest that the models can provide highly accurate predictions, with values around 0.10 indicating a very accurate prediction [34, 52, 53].

$$SSE = \sum_{t=1}^{n} (Q_t | \overline{Q_t})^2 \quad (2)$$

$$RMSE = \sqrt{\frac{SSE}{n}} \quad (3)$$

4. RESULTS ANALYSIS

4.1 Respondents' Profile

In the current study, there was close to equal representation of males and females. Most respondents were 25–35 years old and represented Malaysian society's ethnic diversity, including Malay, Chinese, and Indian. The majority of respondents hold a bachelor's degree, prefer mobile and online banking, and earn between 4001-6000 MYR per month. Finally, all respondents included in the analysis have computer literacy, know about digital-only banks, and do not own a digital-only bank account.

4.2 EFA Output

Our results revealed a statistically significant result of Bartlett's Test of Sphericity (x2(n = 403) = 8261.61, p < 0.001), indicating that the correlation matrix was appropriate for factor analysis. Our analysis revealed a KMO value of 0.858, which is considered excellent, as values above 0.800 are generally considered suitable for factor analysis [49, 50].

In this analysis, a minimum factor loading criterion of 0.50 was applied to identify meaningful associations between variables and factors. Importantly, all communalities in our study exceeded the minimum threshold of 0.50, demonstrating that each item shared a substantial portion of its variance with the identified factors, with exception for two items (i.e., PV5, and FR5) with a slightly less than 0.50, but these two items should not be deleted since they are loading perfectly on their respective variables [49, 50].

The total variance explained result has provided empirical support for the validity of the factor structure and suggest that the selected variables share common underlying constructs. The factor analysis yielded a ten-factor solution that accounted for 63.1% of the variance in the data. Overall, our findings suggest that the factor structure is robust and provides a meaningful representation of the data. Additionally, the reproduce correlations analysis was conducted to assess the model fit. Out of the total number of correlations examined, 101 (9%) were found to be nonredundant and had an absolute value greater than 0.05. This suggests that the model demonstrates good fit, as the proportion of significant correlations (0.09) is less than the threshold of 0.50 commonly used in model evaluation [49, 50].

The pivotal outcome of the factor analysis lies in the rotated component matrix (Table 1), a critical component in understanding the research's theoretical foundations. The Exploratory Factor Analysis (EFA) identified ten factors aligning with the study's theoretical propositions. The identification of these ten variables adheres to the conceptual framework, supported by a reliability analysis using Cronbach's Alpha. High internal consistency, as indicated by Cronbach's alpha (ranging from 0.779 to 0.860), underscores the reliability of the constructs, affirming a simple structure for subsequent analysis [50, 54].

Table 1: EFA Rotation matrix and Cronbach's α

Rotated Component Matrix[a]											
	Component										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Cronbach's α**
INT1			.745								0.86
INT2			.724								
INT3			.684								
INT4			.672								
INT5			.614								
PV1				.753							0.825
PV2				.748							
PV3				.787							
PV4				.641							
PV5				.530							
CONV 1							.736				0.84
CONV 2							.785				
CONV 3							.802				
CONV 4							.765				
ECE1										.752	0.805
ECE2										.800	
ECE3										.803	
ECE4										.759	
FR1					.779						0.808
FR2					.823						
FR3					.676						

FR4					.749						
FR5					.677						
SR1		.801									0.842
SR2		.807									
SR3		.773									
SR4		.764									
SR5		.735									
CM1						.731					0.779
CM2						.701					
CM3						.734					
CM4						.700					
CM5						.707					
NS1								.800			0.826
NS2								.864			
NS3								.837			
NS4								.703			
TR1	.612										0.83
TR2	.831										
TR3	.614										
TR4	.783										
TR5	.756										
ENC1									.652		0.828
ENC2									.782		
ENC3									.713		
ENC4									.754		
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.											
a. Rotation converged in 6 iterations.											

Source: SPSS data analysis

Key: INT: Intention to adopt digital-only banks; PV: Perceived Value; CONV: Convenience; ECE: Economic Efficiency; FR: Functional Risk; SR: Security Risk; CM: Critical Mass; NS: Number of Services; TR: Trust; ENC: Environmental Concern.

4.3 Artificial Neural Networks (ANN)

To assess model performance, a ten-fold cross-validation approach was implemented, addressing potential overfitting by using 10% of the data for testing and 90% for training the neural networks [53, 55]. The sigmoid function was chosen for both hidden and output layers, as illustrated in Fig. 2 depicting the ANN model for intention to adopt digital-only banks [53].

Regarding ANN model fit, Table 2 indicates small RMSE mean values for training (0.116) and testing (0.113), confirming the excellent fit of the ANN models to the dataset [53, 55]. The low RMSE values suggest that the network models effectively capture the numerical relationships between the predictors and the output variable, underscoring their reliability. Therefore, the small RMSE values imply that the models can offer highly accurate predictions as values around 0.10 indicate a very high level of accuracy in predictions [34]. In Figure 2, the results validate the predictive significance of the weight resistances, as each input neuron establishes connections with the seven hidden neurons through non-zero synaptic weights [34].

Similar to Wong, et al. [53], Leong, et al. [55], Phillips, et al. [56], we computed the R^2 for ANN and compare it with output obtained in regression analysis. The coefficient of multiple determination R^2 was 0.4630; therefore, 46.30% of the variation in adoption intention is explained by the nine input variables in our multiple regression model. However, when utilising ANN, the root mean square error (RMSE) was 0.116 for training, and 0.113 testing, and the coefficient of multiple determination, R^2, reached a higher value of 0.640. This implies that 64% of the variation in adoption intention can be attributed to the nine input variables within our ANN model. These results indicate that the ANN model strongly outperforms the multiple regression analysis, demonstrating its superior predictive capabilities for adoption intention [57].

Predictor importance measures the extent to which the predicted value of the network model changes for different values of the predictor variables [34]. For predictor importance, normalised values were computed, revealing that, for intention to adopt digital-only banks, environmental concern holds the highest importance, followed by trust, perceived value, convenience, critical mass, security risk, number of services, economic efficiency, and functional risk, as outlined in Table 3.

Table 2:RMSE values.

TRAINING			**TESTING**			
N	**SSE**	**RMSE**	**N**	**SSE**	**RMSE**	**Total Samples**
359	4.750	0.115	44	0.598	0.117	403
363	4.73	0.114	40	0.7	0.132	403
361	5.21	0.120	42	0.4	0.098	403
354	4.71	0.115	49	0.61	0.112	403
351	4.46	0.113	52	0.89	0.131	403
364	4.77	0.114	39	0.43	0.105	403
358	4.9	0.117	45	0.437	0.099	403
363	5.18	0.119	40	0.346	0.093	403
356	4.93	0.118	47	0.943	0.142	403
364	4.9	0.116	39	0.419	0.104	403
Mean	4.854	0.116	**MEAN**	0.577	0.113	
STANDARD DEVIATION	0.213	0.002243	**Sd**	0.199	0.016	

Note: SSE = Sum square of errors, RMSE = Root mean square of errors, N = sample size.

Table 3: Sensitivity analysis

Neural network (NN)	**PV**	**CONV**	**ECE**	**FR**	**SR**	**CM**	**NS**	**TR**	**ENC**
NN (i)	0.99	0.57	0.34	0.38	0.54	0.33	0.37	0.88	1.00
NN (ii)	0.79	0.54	0.24	0.54	0.17	0.29	0.24	0.72	1.00
NN (iii)	0.66	0.90	0.39	0.10	0.30	0.47	0.18	0.93	1.00
NN (ix)	0.67	0.85	0.21	0.42	0.43	0.33	0.48	0.72	1.00

NN (v)	0.70	0.51	0.32	0.16	0.23	0.15	0.33	0.60	1.00
NN (vi)	0.63	0.66	0.23	0.10	0.15	0.28	0.35	0.64	1.00
NN (vii)	0.74	0.84	0.41	0.52	0.52	0.43	0.43	0.88	1.00
NN (viii)	0.82	0.93	0.23	0.30	0.32	0.65	0.18	1.00	0.75
NN (ix)	1.00	0.87	0.34	0.08	0.31	0.07	0.31	0.70	0.77
NN (x)	0.67	0.87	0.40	0.36	0.27	0.56	0.34	1.00	0.85
Average importance	0.77	0.75	0.31	0.30	0.32	0.36	0.32	0.81	0.94
Normalized Importance (%)	82%	80%	33%	32%	35%	38%	34%	86%	100%
Ranking	3	4	8	9	6	5	7	2	1

Key: PV: Perceived Value; CONV: Convenience; ECE: Economic Efficiency; FR: Functional Risk; SR: Security Risk; CM: Critical Mass; NS: Number of Services; TR: Trust; ENC: Environmental Concern.

5. DISCUSSION

The Artificial Neural Networks effectively captured both simple and complex relationships among environmental concern, trust, perceived value, convenience, critical mass, security risk, number of services, economic efficiency, and functional risk, predicting the intention to adopt digital-only banks. The predictive importance of these factors is highlighted, with environmental concern being the most crucial (94%), followed by trust (86%), perceived value (82%), convenience (80%), critical mass (38%), security risk (35%), number of services (34%), economic efficiency (33%), and functional risk (32%). This discussion will now delve into these vital factors, offering practical insights for professionals in the field.

This research provides evidence of the importance of environmental concern in predicting the intention to adopt digital-only banks. Findings are consistent with previous studies in the literature [42, 58, 59], which suggest that individuals with environmentally conscious attitudes tend to engage in environmentally friendly behaviours [60-67]. This is in line with the notion that a positive perception towards sustainability and ease of adoption of sustainable banking services would encourage customers to adopt sustainable practices in the banking context [42, 58, 59].

Trust plays a crucial role in customers' adoption of internet-based financial services [1]. As digital-only banks provide financial services only through a virtual interface, without face-to-face interaction, trust in these banks becomes a crucial factor in customers' decision to accept their services [2]. Both initial and ongoing trust are important in shaping customers' intention to adopt digital-only banks [2, 7]. To establish sustainable and lasting relationships with customers, it is crucial to enhance trust between digital-only banks and their customers throughout the innovation diffusion process [2]. This is particularly important in the financial market where trust plays a significant role in relationships over the long run [68]. The current study found that trust was the second most important factor in predicting the intention to adopt digital-only banks. According to previous studies, the business model of digital-only banks was believed to entail certain uncertainties and risks [2, 18, 21, 23]. Trust was considered a crucial aspect in forming a relationship between customers and digital-only banks, as it could help to mitigate uncertainty [21].

Digital-only banks' perceived value is a critical factor in the adoption of these banks, which recorded as the third highest important factor in predicting the adoption intention. This is due to cost-effectiveness, superior user experience, innovative features, and positive brand image. Digital-only banks offer a cost-effective alternative with attractive rates, easy-to-use digital platforms, and unique features. Their positive brand image, associated with innovation and modernity, appeals to younger generations in Malaysia, making perceived value a critical factor in adoption [2, 18, 69, 70]. The concept of perceived value is an essential aspect of customer behaviour, which includes the assessment of benefits in terms of money, time, effort, and risk [41]. The integration of smart technologies as part of Industry 4.0 can provide customers with numerous benefits, including low-cost transaction fees and effective solutions. As a result, fintech perceived value has become a driving force in encouraging customers to adopt technology-based financial services [71].

This research provides evidence of the importance of convenience in predicting the intention to adopt digital-only banks. Essentially, the advent of the internet and IT solutions have revolutionised the practices and behaviours of customers in the banking industry. Customers are looking for more convenient solutions to manage their financial services using reliable and direct channels that allow 24/7 remote access to financial services. Nowadays, customers prefer conducting banking transactions electronically instead of visiting physical bank branches [2, 17, 18, 72].

5.1 Contributions And Implications

This research contributes to the literature by diverging from the prevalent focus on linear relationships in digital-only bank adoption studies. The incorporation of Artificial Neural Networks (ANN) in this study provides a more comprehensive exploration, delving into non-linear and non-compensatory relationships in the adoption process. This approach enhances the understanding of the complex dynamics involved in customers' decisions to adopt digital-only banks, offering a more nuanced perspective than traditional linear models. While earlier literature relies on linear models, a simple regression model, ANNs introduce an additional component allowing for the processing of nonlinear aggregation of weighted data. This nonlinear mathematical function, situated in a hidden layer, enhances the model's capacity to estimate values based on the weighted inputs. ANNs present notable advantages over linear prediction/classification models, as they are adaptive and do not assume specific relationships between input and output variables. In contrast, multiple linear regression models necessitate assumptions of normality and linearity [33]. Additionally, in a linear compensatory model, a decrease in one predictor can be balanced out by an increase in another, but this assumption may not hold, particularly in the realm of digital-only bank adoption. For instance, a decline in trust cannot be offset by an increase in convenience or perceived value. These constructs are distinct in terms of their definitions and conceptualisations, making them non-interchangeable. This non-compensatory nature of the model aligns with the reality of digital-only bank adoption, where certain factors cannot be substituted or balanced against others in a linear manner. By employing a non-compensatory Artificial Neural Network (ANN) model, we have effectively addressed the limitations of linear models, making a unique theoretical contribution to the current literature. The acknowledgment of non-compensatory relationships adds depth to the understanding of the complexities involved in predicting the intention to adopt digital-only banks, providing a more accurate representation of real-world complexities.

From practical perspective, the results of the current study indicate that environmental concern has a significant impact on the intention to adopt digital-only banks. As such, digital-only bank managers and policy makers are encouraged to implement initiatives aimed at addressing climate change and its effects. This can be accomplished by promoting environmentally conscious practices, such as promoting paperless financial activities and utilising renewable energy, as well as organising campaigns and events that raise environmental awareness and promote pro-environmental behaviour.

The establishment of trust in the relationship between digital-only bank practitioners and their customers is crucial for promoting the adoption of these banks among non-users. In online environments, clients frequently rely on the information available on a website to make decisions [72]. The evaluation of digital-only banks by their potential customers is limited to the design of their website and their interaction with a virtual advisor, which emphasises the importance of designing the website to include the appropriate information that can aid in the development of initial trust among potential customers [21, 72]. Thus, the design of the digital-only bank's website should be carefully considered to increase the adoption rate of non-users.

The study found that perceived value is an important factor in predicting the intention to adopt digital-only banks. Practitioners can enhance perceived value by promoting pleasure value through the use of AI technologies. Additionally, the number of services offered, including both main and complementary services, is also a factor that affects adoption intention. To increase perceived value and adoption rates, digital-only banks can offer a wider range of complementary services, such as financial education, shopping, media, games, and messaging. To enhance customer experience and emotional connection, digital-only banks should engage more with their customers and create an enjoyable and impressive experiences.

The results of the study emphasise the importance of convenience in fostering customer adoption of digital-only banks. It is recommended that practitioners in this industry emphasise the convenience provided by their products and services, and actively communicate information about the financial benefits available to customers, such as fee-free services, competitive pricing, and future innovations [2].

The study suggests that policy makers should develop strategies to enhance the adoption of digital-only banks by addressing key customer considerations such as environmental concern, trust, perceived value, and convenience. It is imperative to update regulations to accommodate the needs of digital-based financial services, as current policies are primarily aimed at traditional banks.

6. CONCLUSION

This study explores digital-only bank adoption intentions, particularly among non-users, utilising Artificial Neural Networks (ANN) to unveil nuanced relationships. Environmental concern emerged as the dominant adoption driver, alongside conventional factors like trust, perceived value and convenience. Despite inherent limitations and unexplored variables like regional disparities and individual psychology, this research provides valuable insights. These findings also resonate with the United Nations' Sustainable Development Goal, emphasising sustainability through environmental concern. The study informs organisations seeking to engage new digital-only bank customers, aiding them in adapting to this evolving landscape.

STATEMENT

During the preparation of this work the authors used ChatGPT in order to improve readability and language. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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