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Overcoming Barriers to Green Banking Adoption: Insights from Innovation Resistance Theory

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ABSTRACT

Many companies utilize buildings and banknotes, impacting environmental concerns. Green banking technology, which facilitates online transactions to minimize environmental impact, has not been universally adopted. This study investigates resistance among green banking technology users. Online questionnaires were distributed to 225 users in Indonesia. The data were analyzed using the partial least squares with descriptive analysis regarding the functional and psychological barriers. Functional barriers show obstacles that arise when the function of green banking does not meet the user's ideal expectations. Meanwhile, psychological barriers refer to psychological and practical barriers such as tradition, image, values, and risks. The results show that green banking users have a lower functional barrier role than psychological barriers. Users see from the value side GBT compared to the psychological side, such as images and habits. Users prioritize features and functions over habitual factors. Thus, the findings of this study contribute to our understanding of the factors influencing the adoption of green business practices through green banking technology. This study also recommends that banks optimize their features and functions to encourage users to adopt banking products that support green businesses.

1. INTRODUCTION

Greenhouse gas (GHG) emissions have caused significant climate change. Almost all countries in the world contribute to the increase in GHG. One of the most significant contributors to GHG is Indonesia, which reached 2.71% or 1,074.19 million in 2018 [1]. This results in climate change, which can threaten the sustainability of the environment, including humans [2, 3]. These conditions lead to the threat of various kinds of environmental disasters, such as disease, decreased water quality, global warming, and other disasters. Therefore, it is necessary to make efforts from all parties, including profit and non-profit organizations, to reduce the use of operations that can significantly increase climate change [4, 5]. The role of banking in realizing green business is related to finance through economic support to reduce environmental pollution [6]. So that both banks and other organizations can implement a 'Go-Green' strategy for their own companies and support other organizations investing to do the same thing so that an integrated ecosystem is created [7].

Green banking has a vital role in increasing the sustainability of a country through climate issues and economic development [8]. Eco-friendly banking tends to avoid using paper and tries to make the banking transaction process online so that companies and the public are accustomed to supporting environmentally friendly activities [6]. Blockchain technology can trigger technological innovation for sustainability [9]. Green banking technology (GBT) implements banking technology to conduct banking activities online without going through a branch office. GBT can open accounts and apply for loans, credit cards, deposits, and investments without going through a branch office. GBT can also carry out banking transactions such as transferring accounts, paying electricity and water, and other forms of payment. So, almost everything in banking is in GBT. This can reduce the use of paper money, waste of energy, and excessive building construction.

Through studies from Wordbank, Indonesia has committed to strengthening the environment and sustainable development [10]. Green banking technology is one way to achieve Indonesia's goal of advancing a sustainable economy. In addition, previous studies have shown that green banking is an essential topic in banking sustainability in Indonesia [11-13]. Then, through climate policy initiative research, the majority of the private sector in Indonesia has mobilized green businesses compared to state-owned banks [14]. Based on the total Environmental, Social, and Governance (ESG) portfolio, state-owned banks allocate 23% less green business activities than private banks at 41% [14]. Apart from that, other studies also show that banks in Indonesia have adopted green technology. One is the implementation of rural credit without branches, which has implemented a green economy in encouraging economic achievement during the COVID-19 pandemic [15].

The survey proved that banking branch offices in Indonesia had begun to close and decreased in February 2023 by 3,468

units from last year's data, reaching 28,539 [16]. This is due to the adoption of GBT technology, which allows users to make transactions without the need to go to a physical office. In addition, online transactions can also increase banking efficiency. Operational costs can be lower due to an online payment system [17]. However, the existence of technology also does not mean without problems. Lockbit ransomware group has announced that they stole 1.5 terabytes of personal and financial information from Indonesia's largest Islamic bank, creating a wrong impression on the public [18]. In addition, according to the National Cyber and Crypto Agency (NCCA), 44,776,891 traffic anomalies occurred in Indonesia in August 2022 [19]. The traffic anomaly shows that cyber-attacks attack various platforms [20]. Another case in Indonesia in 2021, as reported by the Cyber security independent resilience team (CISRT), experienced by the social security administering body (BPJS), has lost 279 million participant data and has lost as much as 600 trillion IDR [21]. The vulnerability of this technology security seems to be a snowball that can reduce the mentality of users in adopting technology [22-25]. This case strengthens the barrier for the community not to make transactions online.

Another concern is that users still need confirmation and proof in paper documents as a formal symbol of legality. The need to facilitate physical branch offices is still relatively high. Thus blocking the massive adoption of GBT. Previous research has identified reasons for someone's reluctance to use digital banking because security is the main barrier to acceptance of technology adoption [17]. In addition, user adoption of technological advances such as online banking also requires technical progress, which requires learning and mastery of the technology [26]. IRT has been researched in various fields to evaluate user resistance to technologies such as mobile banking [27-29], virtual shopping [30, 31], and mobile commerce [32-34]. Based on this explanation, this study aims to explore the functional and psychological barriers experienced by users of green banking technology through the innovation resistance theory approach.

2. LITERATURE REVIEW

2.1 Innovation resistance theory (IRT)

Resistance to innovation tends to reject and postpone new innovative products or services [35]. In addition, IRT states that a person may refuse to use technology because it has functional and psychological barriers [36]. IRT's purpose is to discover users' challenges in adopting technology. At the same time, Ma and Lee [37] reveal that an approach to the acceptance and use of technological innovation can prevent a status quo debate with current conditions. So, the possibility of failure in technological implementation is relatively large [38, 39]. IRT can help explore factors that affect user resistance, especially in using technology [39]. Based on Heidenreich and Handrich [40], user resistance is divided into active resistance, represented by functional barriers, and passive resistance, represented by psychological barriers.

2.2 Usage barrier (UB)

In the IRT concept, the usage barrier has the most impact on the functional barrier. UB refers to the difficulty level of use, which becomes a barrier to accepting innovation [38]. So, a significant UB level will hinder the innovation process [41]. These barriers exist due to previous usage practices that become obstacles and destroy one's status quo [26]. An example of an obstacle from UB when practicing new products and services is the need for time to learn and practice the new system. In research conducted by Naveed et al. [42], it was found that users experienced a usage barrier in adopting green banking when they found it challenging to use the technology. Besides that, it also needs adjustments and changes from old habits so that it has the potential to hinder adoption [27, 28].

2.3 Value barrier (VB)

VB shows a person's resistance due to inconsistency with the values and benefits of technology, especially concerning the price paid to enjoy the technology with benefits that can be felt [41, 43]. The value barrier in the context of GBT refers to user inconsistencies in viewing the value that can be offered by GBT, namely the use of digital banking transactions and support of the green business. Previous literature discussed the impact of negative value barriers on mobile banking adoption [27]. So, a significant value barrier prevents someone from using technology continuously. The problem with adopting green banking is that the costs incurred need to be commensurate with the benefits obtained by users [42]. On the other hand, some previous literature also stated that value barriers positively impacted increasing technology adoption [29]. This becomes a significant variation in results.

2.4 Risk barrier (RB)

Every technology has inherent risks [35, 44]. These risks can cause a significant threat to the user. One of the essential components of the functional barrier is RB [45]. Therefore, the existence of RB refers to skepticism and concern about innovation, including technology [38]. Risk barriers can also influence users' intentions to use green banking services [42]. The high risk can also cause users to lose interest in adopting technology [17, 46]. Green banking technology, the existence of high risks such as transfer failure, loss of money, data theft, and misuse of functions can interfere with user adoption of green banking technology.

2.5 Tradition barriers (TB)

TB can be defined as user reluctance to change in innovation in a product or service that affects their daily habits [38]. Tradition barriers occur due to differences in products and services offered with habits or traditions in everyday life, so there is a possibility of rejection of these innovations [47]. Users view this new technology as a function breaker and unnecessary habit, so users have to adapt again in every routine or work [48, 49]. Users with a traditional barrier or a strong identity will tend to find it more challenging to adopt green banking-based services [50]. So, when social norms are disrupted due to new products or services, it can prevent someone from adopting the technology [38].

2.6 Image barrier (IB)

IB refers to one's inhibitions regarding a negative image as a result of a significant change in the nature or image of the company [31, 39]. The IB context in GBT refers to the user's negative image of the use of banking technology due to

changes in service and negative perspectives from banking institutions that affect technological aspects. In addition, IB is considered a barrier between behavior and attitudes to realize quite diverse digitalization [39] to reduce consistent, continuous use [51].

3. RESEARCH METHODS

3.1 Design study

This study uses a quantitative approach, analyzed using the innovation resistance theory approach. Questionnaires were distributed online with the help of Google Forms. The target respondents for this research are users of green banking technology in Indonesia who use online paperless technology such as digital, mobile, and Internet banking. Researchers used a random sampling by distributing it to users of green banking technology in several places. Questionnaires were distributed via social media randomly to obtain a total of 252 questionnaires that filled out the questionnaire. However, after the researchers conducted a further evaluation regarding the completeness of the questionnaires, 225 questionnaires were obtained that met the criteria and were complete. So, 27 questionnaires were omitted, or 10.7%. Respondents will be asked to fill in 2 types of voluntary questions. First, respondents filled in personal data regarding gender, type of work, education, age, income, and frequency of use of GBT. After that, users will fill in closed questions to answer their perceptions of GBT.

3.2 Measurement

The research instrument consisted of 16 questions derived from 5 constructs. Researchers adopt questions in innovation resistance theory from various studies [27, 41], as shown in Table 1 below.

Table 1. Construct an item

Construct	Item	Question	References
Usage barrier (UB)	UB1	I feel comfortable using GBT because it can be used on smartphones (R)	[27, 41]
	UB2	I feel comfortable using GBT because it can be used anytime without going to a branch office (R)	
	UB3	I feel comfortable using GBT because I can trade in any situation (R)	
	UB4	I feel comfortable using GBT because it has not complicated (R)	
Value Barrier (VB)	VB1	GBT provides many advantages to complete my work while supporting green business compared to other methods (R)	[27, 41]
	VB2	Using GBT can improve my ability to manage my finances more efficiently (R)	
Risk Barrier (RB)	RB1	I'm afraid I will make a mistake when I enter the nominal when I use GBT	[27, 41]
	RB2	When using GBT, there is a possibility of paying more money	
	RB3	When I made a transaction with GBT, I was worried about paying the wrong person	
	RB4	I am worried that other people will use my data when I use GBT	
Tradition Barrier (TB)	TB1	I find it difficult to reach customer service when using GBT compared to coming directly to the banking office	[27, 41]
	TB2	Getting information about GBT features and facilities is intricate without visiting the branch office	
	TB3	I need help solving my problem by using GBT	
	TB4	The service offered in GBT could be more pleasant	
Image Barrier (IB)	IB1	GBT is too complex to be useless for me	[27, 41]
	IB2	I have many concerns about GBT that it is difficult to use GBT	

Notes: R: Reverse

3.3 Measurement

This study uses a quantitative approach by explaining the research results that the respondents have filled out. Improving the validation and reliability of data is done with the help of Smartpls 4.0. Data analysis using PLS can be done by testing validity through outer loading (outer loading> 0.7) and AVE (AVE > 0.5) [52, 53]. At the same time, data reliability is done by calculating CR and CA with the minimum value required to be greater than 0.7. Then, the data will be tested for discriminant validity using the Fornell-Warcker screening to show that each construct is significant and different from the others [52]. Then, the researchers also measured discriminant validity, which was more robust and sticky, namely with HTMT (Heterotrait-Monotrait Ratio of Correlations). HTMT ensures that each construct measures a different concept [52].

4. RESULT

The outer loading value shows the level of validity in each item. Hair (2022) states that the recommended outer loading value is > 0.7. Based on Table 2 below, the outer loading value for all items with the lowest value is 0.712 on the UB3 item. At the same time, the most considerable outer loading value in this study is 0.929 in item IB2. So, if it is concluded, outer loading in this study has a range of values between 0.712 – 0.929 to fulfill each item's validity. Apart from measuring through outer loading, another way is to evaluate the AVE. The limit of the smallest AVE value is 0.5. If the AVE value is less than 0.5, then it can be ascertained that the construct is invalid. Meanwhile, based on Table 2 below, all AVE values are above 0.5, so all constructs are valid.

Then, evaluating the reliability of each item can be seen from CA and CR (in Table 2) with a recommendation value above 0.7 [52]. The highest CA value in this study came from the TB construct (CA = 0.843), and the lowest CA value was from the UB construct (CA = 0.730). In contrast, the enormous CR construct is 0.920 in the IB construct. At the same time, the smallest value is in the UB construct (CR = 0.83), so this explanation concludes that this research has valid and reliable constructs and items.

Table 2. Validity and reliability

Construct	Item	Outer Loading	CA	CR	AVE
Usage barrier (UB)	UB1	0.723	0.741	0.837	0.563
	UB2	0.786			
	UB3	0.712			
	UB4	0.778			
Value Barrier (UB)	VB1	0.761	0.730	0.830	0.550
	VB2	0.756			
Risk Barrier (RB)	RB1	0.744	0.786	0.862	0.610
	RB2	0.817			
	RB3	0.807			
	RB4	0.753			
Tradition Barrier (TB)	TB1	0.803	0.843	0.895	0.682
	TB2	0.879			
	TB3	0.864			
	TB4	0.750			
Image Barrier (IB)	IB1	0.929	0.826	0.920	0.851
	IB2	0.916			

HTMT is used to ensure the research construct is free from collinearity. HTMT is calculated based on the highest value in each construct, not more excellent. Based on Table 3, The IB construct to RB (0.786) has a more excellent value than the IB to other constructs such as TB (0.719), UB (0.450), and VB (0.540). RB with TB (0.736) has the highest value compared to UB (0.587) and VB (0.522). Then, TB with UB (0.536) has a higher value than TB with VB (0.430). So, this construct has no collinearity.

Table 3. Discriminant validity (HTMT)

	IB	RB	TB
Risk Barrier (RB)	**0.786**		
Tradition Barrier (TB)	0.719	**0.736**	
Usage Barrier (UB)	0.450	0.587	**0.536**
Value Barrier (VB)	0.540	0.522	0.430

Table 4. Discriminant validity (Fornell-Larcker)

	IB	RB	TB	UB	VB
Image Barrier (IB)	0.823				
Risk Barrier (RB)	0.640	0.781			
Tradition Barrier (TB)	0.643	0.605	0.726		
Usage Barrier (UB)	0.355	0.529	0.350	0.750	
Value Barrier (VB)	0.508	0.633	0.506	0.600	0.742

Table 5. Functional and psychological barriers

		Construct	Mean Construct	Name	Mean	Innovation Resistance Index
Functional barrier	4.23	Usage barrier	4.3	UB1	4.326	4.1
				UB2	4.246	
				UB3	4.348	
				UB4	4.263	
		Value barrier	4.18	VB1	4.21	
				VB2	4.147	
		Risk barrier	4.23	RB1	4.295	
				RB2	4.21	
				RB3	4.214	
				RB4	4.196	
Psychological barrier	3.89	Tradition barrier	3.84	TB1	3.692	
				TB2	3.902	
				TB3	3.795	
				TB4	3.969	
		Image barrier	3.94	IB1	3.996	
				IB2	3.951	

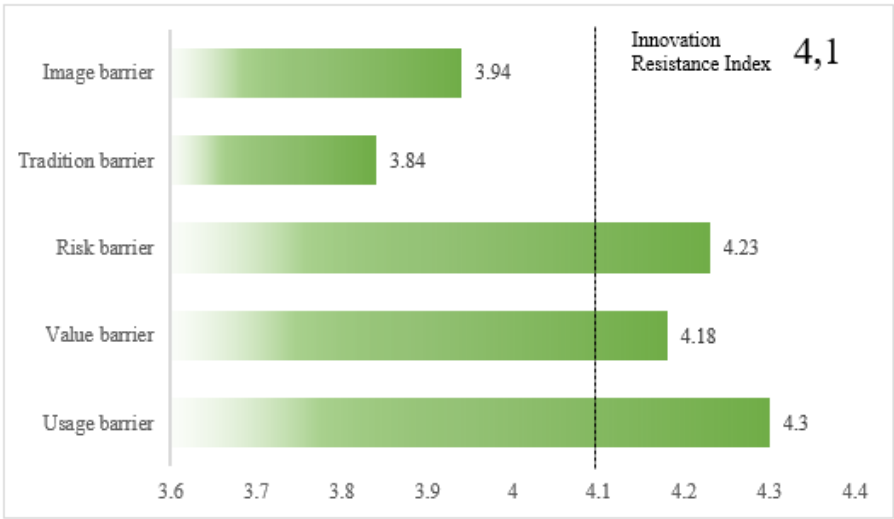

Figure 1. Innovation resistance barrier index

In addition to ensuring that the constructs and items are valid and reliable, Next is to ensure that all items are free from collinearity. One of them is through Fornell-Larcker by comparing constructs with other constructs. Based on Table 4, The IB construct with IB (0.823) has a more excellent value than the IB with RB (0.640), TB (0.643), UB (0.355), and VB (0.508). Then, the RB construct with RB (0.781) has a more excellent value than RB with other constructs such as TB (0.605), UB (0.529), and VB (0.633). TB with TB (0.726) has a more excellent value than the constructs between TB and UB (0.350) and VB (0.506). While the UB construct with UB (0.750) has a more excellent value than the UB construct with VB (0.600). All constructs exceed the original constructs, so this study does not have collinearity.

In the innovation resistance framework, barrier functionality is vital in increasing technology adoption. Based on Figure 1 and Table 5, the usage barrier has the highest value among the other dimensions, with a value of 4.3. This shows that most GBT users strongly agree that functionality in the usability aspect is critical to note. The highest score from the aspect of usage barrier is in the UB3 item regarding the convenience of using GBT because it can transact in any situation with an average answer of 4,348. The other most prominent aspect of functionality comes from the risk barrier, with an average score of 4.23. The answer with the highest average regarding the fear of making a mistake is inputting the nominal I use GBT, located on RB1. Then, it was followed by a barrier value with an average of 4.18. In addition to the functionality aspect, the psychological aspect has an average value of 3.89, indicating various answers from the respondents. The traditional barrier has the smallest average value compared to the image barrier, which is 3.94. The smallest value in the tradition barrier lies in the TD1 item, which is only 3,692. In comparison, the smallest value of the image barrier lies in item IB2, with a value of 3,951.

The IPMA evaluation aims to identify precursors with better interests but with low performance or vice-versa. IPMA evaluation to identify the amount of performance and importance of each construct in the innovation resistance framework. IPMA performance is determined by the average lift in latent constructs, so the performance and importance values are obtained in Table 6, based on evaluation using IPMA. The usage barrier construct has the highest performance value (76.473), with the importance scale at the bottom second rank (0.217). The construct with the minor performance is the image barrier of 69.929, which has the slightest importance value of 0.184. In the value barrier aspect, even though it has a moderate importance level of 0.248, it has a performance that is in the second lowest rank (70.556).

Table 6. Importance performance map (importance vs performance)

	Performance	Importance
Image Barrier (IB)	69.929	0.184
Risk Barrier (RB)	75.953	0.296
Tradition Barrier (TB)	71.040	0.306
Usage Barrier (UB)	76.473	0.217
Value Barrier (VB)	70.556	0.248

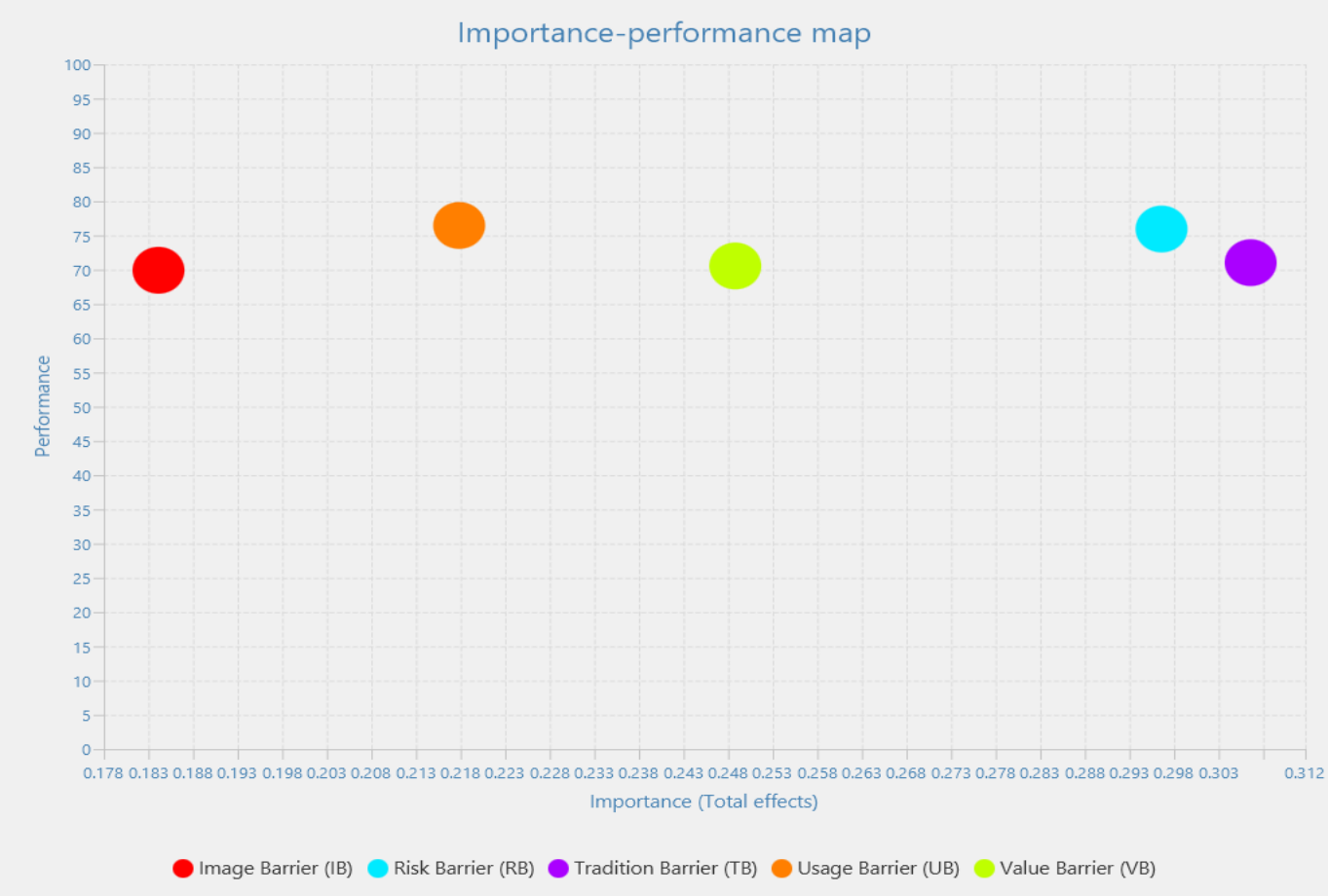

Figure 2. Importance performance map (construct)

Figure 2 above also shows a graph between performance which is depicted horizontally, and importance, which is described vertically. The tradition barrier aspect has the most outstanding importance value (0.306) and has an extensive performance value of 71.040. So, this traditional barrier construct needs to get serious attention to increase the more significant impact on user acceptance of the adoption of green banking technology. The banking industry and green bank technology service providers must be able to map and educate green businesses according to the habits that exist in Indonesia. So, using green concept-based products specifically for green banking is a tradition inherent in society. In addition, another exciting construct is the risk barrier, with the second largest importance and performance values. So that these components need to be considered considering the balance that becomes a pillar for the balance of user resistance to accepting green banking technology.

5. DISCUSSION

Based on the results of distributing the questionnaires, the functional barrier has a more excellent value than the psychological barrier. This shows that most GBT users are concerned about features rather than psychological issues such as difficulty and complexity. Previous research revealed that users tend to choose technology that has features and benefits that are suitable for their needs [22, 54, 55]. In addition, Ilia et al. [36] also highlighted functional innovation resistance, which has a very significant role in user resistance to specific technologies, mainly on trust and risk factors. So, it is essential to maintain the quality of the features and benefits of technology.

Research by Jinru et al. [56] found a direct link between green financing and business continuity. Companies that implement green business optimally will undoubtedly be increasingly trusted by users so that their business performance and sustainability are better. Kuisma et al. [57] revealed that the usage barrier has a reasonably sizeable fair share of Internet banking adoption in Finland because it has a technical literacy gap with computers compared to using an ATM when making transactions. So, users tend to be reluctant to use Internet banking and are more comfortable using ATMs. Laukanane and Cruz [58] reveal that the UB is the most crucial element in the conceptual framework of IRT, so this fact follows the results of this study, where UB is the most substantial in adopting green banking technology. The more comfortable a person is when using technology, the more barriers to use so that the use of technology will be more intense [59]. Usage barriers can act as hurdles in the success of innovation transformations that make using technology products easy or challenging [41]. Several previous studies revealed that UB is the main factor that can cause users to use green banking [15, 60]. Therefore, banking institutions can overcome UB by providing technology that has been used and provides clear benefits according to user needs. Apart from that, intrusion also builds user trust by increasing transparency and accountability in banking business practices.

The most significant factor in the value barrier is that GBT provides many advantages in completing work while supporting green business compared to other methods. The existence of green business practices also makes users more aware. So that users can be interested in using green banking technology. Verma et al. [39] found that value barriers positively impact users' emotions and feelings. Meanwhile, other barriers have a negative impact. Thus, green banking technology has a higher value than other technologies. Other research also supports that value can increase awareness to try the technology [61-63]. So, to increase the use of green banking, education about the positive impact of using green technology in banking is crucial [6]. For example, by using GBT, users can contribute to reducing carbon emissions and saving energy costs.

The risk barrier in this study has the second highest result in performance and importance. I especially worried that my users encountered an error inputting the nominal when using GBT. The risk of incorrect input resulting in transfer errors or nominal errors that harms the user himself. Other researchers also revealed that security is a high concern in making users use technology [64-67]. So that the risk that the user gets is reduced. Previous research revealed that the high perception of risk attached to users could increase other, more specific risks, such as financial risk [68], security risk, psychological risk [69], and social risk. Green banking technology can provide a sense of security and worry by providing legal proof of transactions such as confirmation emails [53, 70].

While the results of this study on the psychological barrier aspect have a lower score than the functional barrier, the psychological aspect has a reasonably weak impact, especially on the traditional barrier aspect, which has the lowest score, especially regarding user difficulty in contacting customer service when using GBT compared to coming directly to a banking office. Quite a lot of users still come to branch offices when they receive problems in their banking transactions, such as opening an account or when there are problems in the banking transaction process. Gurendrwati et al.'s research [17] also revealed that many banking customers still use branch offices or ATMs to make transactions. So that if these problems occur, banks inevitably facilitate user needs, thereby reducing green banking practices consistently. So, it is necessary to have strong efforts from banks to improve services digitally and sustainably improve green banking practices. The research of Kaur et al. [41] revealed a significant relationship between traditional barriers and a person's adoption rate. Meanwhile, Chen et al. [71] revealed that traditional barriers are the first factor to pay attention to in increasing technology adoption.

However, the obstacle of tradition does not mean it becomes a barrier. Wolor et al. [72] prove that village communities can use technology without losing the norms and customs that apply. Precisely these habits become advantages that can be added value. The biggest factor in the image barrier is GBT, which needs to be simplified and valuable. In addition, there is still a need for physical proof of transactions, so users are still considering transactions through physical offices or ATMs. As stated by Gurendrawati et al. [17] regarding concerns over large transaction evidence. When the technology used is familiar to the users, the resistance psychology for any innovations made may not negatively impact the users [36, 44].

6. CONCLUSION

This study uses the innovation resistance theory approach to measure the resistance of GBT users. The results show that the majority of GBT users have lower functional barriers than psychological barriers. users tend to see from the value side

that there is GBT compared to the psychological side, such as images and habits that occurred before. So, strengthening features is very important, especially in ensuring user needs when problems occur during the use process. The psychological factor of concern is the traditional barrier which refers to the user's habits in using GBT. Feelings of worry about old habits, such as requiring proof of transactions on certain needs. This is because the environment of the user requires evidence. So, managers need to facilitate proof of transactions that can be received validly. Based on the IPMA score, the traditional barrier has a reasonably large score on the aspect of importance. So, it needs to be a serious consideration for business actors to provide performance that suits user needs, especially regarding services following user traditions. Education about the positive impact of using green technology in banking is crucial to do, for example, by using GBT, users can contribute to reducing carbon emissions and saving energy costs. Another factor that needs to be considered is the risk value with the same good performance and importance. Users are very concerned about risk factors in using green banking technology. So, service providers must be able to ensure that users can reduce and control inherent risks to increase technology adoption.

Further research can strengthen the innovation resistance theory, especially in exploring green banking technology users on functional barrier factors such as increasing features according to user needs. Risk factors such as security are the primary concern of users, so it is essential to strengthen security and minimize risks. For service providers, using GBT is very important to pay attention to inherent risks such as input errors. So, it is necessary to have functionality from GBT that can facilitate users to avoid the risk of these errors. Apart from that, it is also essential to provide digital customer service to help and ensure that users are not worried when facing problems in their banking transactions. This research only examines the factors in the innovation resistance framework. So, it is crucial for future research to test other theories related to the technology adoption concept, such as the innovation diffusion theory or UTAUT. In addition, other researchers can also identify technology readiness factors along with IRT to produce appropriate technology acceptance outcomes.

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