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In-depth exploration of the factors influencing trust in chatbot integration: an exhaustive investigation within the banking sector

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ABSTRACT

The evolution and adoption of chatbots pose a challenge, especially in emerging markets unfamiliar with AI. Technological advancements have improved the accuracy and interaction of chatbots, but studies have primarily examined these technologies from the perspective of organizations, neglecting that of customers. This research explores the acceptance of chatbots in the Moroccan banking sector, based on Mayer, Davis, and Schoorman trust model. The results, based on an empirical study of 370 clients using the structural equations method, show that the security variables "perceived trust, perceived confidentiality, and perceived security" are significantly related to each other. The research contribution not only offers a new perspective to identify important factors influencing customer trust in virtual agent acceptance but also assists Moroccan banks in examining these factors when planning the development of human-machine interaction.

Keywords: Chatbots, Adoption, Trust model, Banking, SEM, Customer.

1. INTRODUCTION

Enhancing performance through innovative technologies has a positive effect on the social progress of humankind [1]. These advancements are now widely utilized across the globe, prompting governments to actively promote technological

growth[2].Technological improvements are those that convey changes to firms through the introduction of technical alterations[3].Technological progress can manifest in numerous ways, notably through the creation of new products, enhancements in production methods, and the utilization of current information and communication technologies[4].Artificial intelligence is one of these models that is experiencing a resurgence after a period of dormancy.

AI integration has undergone a drastic transformation, in a short time, these technologies that were once expensive and reserved for specialists are now widespread [5]. Indeed, automation is no longer a thing of the future. More and more companies are using AI either for automation[6]or to enable their employees to achieve more complex goals [7]. According to the Fortune Business Insights report the value of the global AI market is predicted to be around $267 billion by 2027[8]. Examples of AI becoming increasingly prevalent among businesses and individuals include virtual agents.

Chatbots, commonly called conversational robots, are computer systems designed to communicate with users via instant messaging interfaces, such as instant messaging applications, social media platforms, websites, or mobile apps [9]. The use of digital agents continues to grow worldwide, particularly in the point-of-sale, financial services, healthcare, and hospitality[10]. Many sectors, particularly banking, view AI as a key element in the transformation of digital operations [11].The integration of AI-powered Chatbot technology is a significant and influential advancement in the financial sector[12]. Chatbots or interactive agents based on messaging systems can be interesting for banks, as they simplify the purchasing process into a single[13]. There is no need for a platform, as they use existing messaging infrastructure [14].

Despite the scarcity of studies on chatbot adoption in banking in emerging countries like Morocco, research on this topic remains essential[15]. Indeed, since 2019, some Moroccan banks have implemented these technology-driven services through instant messaging (e.g., WhatsApp and Face book Messenger) or official websites[16]. Although we have made progress in understanding the effects of online banking, knowledge of how Moroccans interact with banking chatbot usage continues to be constrained. It is crucial to investigate customers' attitudes and opinions on the acceptance of this technology. In the case of our research, we opted for a model. The trust model developed by [17]is a theory that aims to explain how individuals decide to trust another person or organization.

This model comprises key elements: competence, benevolence, and integrity. These three elements combine to form trust. If one person perceives another as competent, honest, and caring, they will be more inclined to trust[18]. On the other hand, if one to that characteristics is lacking, trust may be called questioned[19]. In addition, our model incorporates several security variables deemed useful in the banking context, notably perceived confidentiality and perceived security. Indeed, chatbots are known to be reliable, especially when it comes to banking and related services[20]. The risk of exposing confidential customer information is minimal in these cases, as banks have implemented a system that ensures secure data transfer[21,22]. So, for the second variable, Grewal et al. [23] point out that customers still strive to make the right online purchases, but concerns about the security of merchants' websites hinder this enthusiasm.

In the context of this research, our objective focuses on the decision phase relating to the adoption of chatbots by individuals with a view to its use. Our problem is answering the following question: To what extent can knowledge of chatbot adoption factors promote its use? This research aims to determine the Security variables that affect the acceptance of this form of artificial intelligence in banking.

The present research is structured around an in-depth literature review of the relationship between chatbots and safety variables, highlighting previous work that has examined this complex dynamic. Drawing on the principles outlined in Mayer et al.[17] model of trust,we have been developing the conceptual framework of this study to explore the different dimensions of trust in the context of chatbot interactions. This approach provides a sound analytical framework for understanding how users perceive and evaluate trust, security, and perceived privacy in their interactions with these automated conversational entities. The research design is then detailed, specifying the methods and instruments used to collect the data required for the analysis.The analysis of the results examines the implications of these findings and provides practical suggestions for enhancing the design and implementation of chatbots to maximize user trust. In conclusion, we identify the research limitation, then provide a critical perspective on potential shortcomings, and finally, synthesize the significantfindings while highlighting their importance in the emerging field of human-machine interaction.

2. LITERATURE REVIEW

2.1 Chatbots

The concept of chatbots lacks a strong consensus among researchers in the literature. Inaddition, academics have formulated many interchangeable terms [24]. This variety of concepts can be found in both artificial intelligence and marketing [25], For example, in the marketing field, Ben Mimoun et al.[26]Consider that there are multiple nominations: "conversational agent, virtual agent, virtual salesperson, interface agent, embodied and disembodied conversational agent, synthetic agent, animated agent, recommendation agent, and avatar".Then, in the literature relating to artificial intelligence and information systems, research conducted byCherif and Lemoine[27], introduced the following terms: electronic agent, intelligent agent.

We have finally classified the definitions in the following table, in the order of their introduction date.

Table1. Chatbotconcepts

Authors	Nominations	Definitions
[28]	Embodied conversational agents	"Graphic characters designed on a computer and capable of face-to-face dialogue with a user".
[29]	Avatar	"Computer technology personifies general graphic representations." (P.20)
[29]	Virtual character	"Human-like chatbots that act as interactive online information providers" (p. 60)
[30]	Intelligent agent	"Software showing autonomous communication and behavior that enables it to learn and adapt its responses to changes in its environment, to achieve the users predefined objective."
[31]	Customer service agent	"computer-generated characters capable of interacting with customers and simulating the behavior of the company's human representatives thanks to artificial intelligence." (p. 530)
[32]	Conversational agent	"a system that mimics human-to-human communication using natural language processing, machine learning and, or artificial intelligence." (p. 94)
[33]	Chatbots	"Computer programmers that can simulate a conversation between humans." (p. 712)

Authors	Nominations	Definitions
[34]	Chatbots	"Is to set up a customer service to provide information and carry out financial transactions."

Sources: Compiled by the authors

This table demonstrates how users can customize chatbots for various settings and contexts. According to Nowak and Fox [35], this ambiguity surrounding the definition makes it a complex task for researchers to analyze and compare empirical results. To make scientific knowledge advance, it is necessary to develop a definition that delimits the boundaries of the concept. Finding consensus on a standard definition isn't exactly straightforward, as it depends on the prospects for research developments in the field. Hwang and Chang[36], as well as Cherif[37], reviewed the literature and proposed possible terminology. According to these authors, the diversity of concepts is based on two essential criteria: functional and representational characteristics that enable better interaction with users. For functional characteristics, Complexity requires the emergence of data, especially in volume, allowing more complex interactions to be undertaken[38]. In essence, chatbots need to fulfill six functionalities to respond appropriately to users. These include learning ability, flexibility, autonomy, temporal continuity, purpose, and communication[39,40].However, this form of artificial intelligence requires continuous improvement, especially regarding interaction. According to Cherif[37],designers continually integrate new features such as ubiquity, availability, animation, conversation, and collaboration.Miao et al.[41]argue that anthropomorphism is an essential component of definition. As Han[42]explains, this concept involves attributing human qualities and characteristics to something that is not a person. As a result, connected machines such as chatbots can mimic human capabilities in terms of speech recognition, gestures, and vocalization[43]. Researchers have explored this concept in various fields, including marketing, psychology, and computer science[44].

2.2 Trust

Researchers consider trust to be a concept that spans various fields, including psychology, technology, marketing, and finance [45]. Fernandez-Gago et al.[46]argue that the notion of trust is not universal; instead, it depends on its context and application. One can perceive it as a multifaceted and varied idea. For example, in psychology, trust is conceptualized as the need for reliability after an exchange between two people or groups of people [47]. In the technological context, success depends on various factors, including

its potential benefits and the user's expectations when using it [48]. For instance, trust plays a crucial role in the marketing sector. Customers often need to share personal information, which raises concerns about who has access to it [49]. In the financial context, trust is particularly crucial due to the significance of financial data [50,51].The digitization of this data through e-commerce has increased the importance of trust in the interactive environment, as customers need to trust not only the company but also the transaction systems [52]. With various trust concepts, we must determine the most suitable for our situation. With this in mind, we have selected those mentioned by Dekkal[53].

Table2. The different concepts of trust

Author	Definitions	Contexts
[54]	Confidence refers to our belief in the reliability and credibility of the new technology's use.	Information Systems (IS)
[55]	Confidence is the extent to which we believe that the use of new technology will be reliable and credible.	Online shopping
[56]	Trust forms a foundational element that molds a customer's belief system, ensuring that online sellers do not act opportunistically	Online shopping
[57]	Trust involves consumers' subjective belief that an online retailer will fulfill a transaction according to their expectations.	Online shopping
[58]	We consider trust as interpersonal trust between a consumer and a company involved in e-commerce transactions or online relationships.	Online financial services
[59]	Confidence is the extent to which we can determine a Chabot’s reliability in using natural language and indirectly prove its ability to think in similarly to a human being.	Chatbots
[60]	In the context of consumers interacting with chatbots, trust is defined as their subjective belief that these chatbots possess knowledge, expertise, goodwill, and honesty.	Chatbots

Sources: by **Dekkal**[53]

However, Scherer and Wimmer [61]are critical of the whole concept. For him, trust is presented incorrectly, as it is often confused with positive or negative attitudes towards an individual or group of individuals. It presents the issue of trust as a result of vulnerability. In contrast, three research theories can be identified about, concerning the trust paradigm [62]: personality theory, economic theory, and psychosocial theory. According to personality theory, trust is a personal phenomenon that influences a person's character, a kind of faith and understanding cultivated through experience[63]. However, proponents of economic theory argue that exchange processes are continuously open to question because of market volatility[64]. Additionally, psychosocial theory emphasizes the desire to uphold a bond where both parties strive for exchanges with minimal risk[65]. In the context of our research, the latter approach aligns best with all the concepts mentioned above. For multidimensional purposes, this theory is an appropriate and suitable response to building trust in digital and virtual commerce[66].

2.3 The Mayer, Davis, and Schoorman model of trust

The model by Mayer et al.[17,p.712]defines trust as " The readiness of one party to be vulnerable to the actions of another, relying on the expectation that the otherwill perform a particular action that is important to the confidant, regardless of the ability to monitor or control that other party."

Seitz et al. [67]Have developed a unified definition of trust based on the ideas of previous researchers. This definition emphasizes the interaction between two parties, one of whom, the trusting person, relies on emotions and feelings to trust the other.One according to Mayer et al., this role is referred to as the giver of trust. The second part addresses the question of whom we trust, often referred to as the trustee. Rousseau et al. [68]suggest that the trustee is an essential element of trust, and that it is therefore necessary to assess his or her qualifications and expertise to ensure that he or she is trustworthy.The same authors assert that two aspects shape the bond between the trustor and the trustee: a cognitive component, encompassing rational thinking, and an affective aspect linked to emotions. Trust is a relationship between two parties that can be affected by the risks involved. According to Mayer et al.[17], trust is an interpersonal concept that consists of a combination of individual elements, mainly associated with what the trusting individual believes. The researchers analyze these beliefs using three components: competence, benevolence, and integrity.

❖ **Trust factors:**

The model comprises of three factors: "competence, voluntariness or benevolence and integrity".

Competence:

We can define competence as faith in a person's ability to honor a commitment[69].It indicates an individual or entity's ability, mastery, and know-how in a specific field, according to the same source. For to several researchers[70,71,72], competence is strongly associated with confidence. For example, in the technological field, the human-machine trust relationship is materialized by the reliability of the data offered to consumers, who present the "trust" only if the "trustee" machine is competent when it comes to data protection [73].

Benevolence:

Mayer et al. [17] define benevolence as a positive sentiment characterized by goodwill and altruism, which drive individuals to perform actions beneficial to others. Notions of opportunism and self-interest have no place in this relationship of trust; mutual aid and cooperation are its fundamental components, according to these researchers. In our case, voluntarism is the ability of a machine to conserve consumers' interests to the detriment of its profit, the aim is to reduce uncertainty and lack of trust when it comes to opportunistic acts[74,75].

Integrity:

Beldad et al. [76]consider integrity as actions performed reliably and honestly. Related to this is trust, as it implies the acceptance of specific laws and regulations by the trusting person[77].Gras Gentiletti et al.[78]emphasize that it is essential for the trusted person to follow these norms if their behavior is to be accepted. The person of faith puts their trust in the integrity of the trusted person, demonstrating good behavior and following these rules without fail[79,80]. To better understand the principle of integrity, Mayer et al.[17] propose McFall's [81] advancements, suggesting that "an agent demonstrates integrity when they adhere to a consistent set of principles or commitments and continue to regard them as relevant in the face of temptation or pressure". This researcher classifies integrity into two distinct categories. The first is personal, the relational indicator that determines who judges us regarding trust. The second type of integrity rests on moral principles,

encompassing all of society's values and beliefs. In today's context, integrity is of societal importance, as attitudes and beliefs are vital to establishing trust between consumers and a virtual machine[82].

3. HYPOTHESES DEVELOPMENT AND RESEARCH MODEL

Three variables can be distinguished: perceived confidentiality, perceived security, and perceived overall trust.

3.1 Perceived Security

The concept of "perceived security" has evolved over the years because of its significance. For example, before the digital age,Parasuraman et al. [83]suggested that it involved companies making better use of customers' personal information. Subsequently, with the emergence of web interfaces and related legislation, "perceived security" has become a priority for companies and consumers[84].

This is a recurring problem, which concerns not only the secrecy of digital transactions, but also trust in the world [85]. This is why some researchers have established a correlation between the security concept in the online domain and thedanger. For example, Kalakota and Whinston[86] described "perceived security" as something that can lead to financial harm through the destruction or disclosure of data or network resources, etc. Later research linked fear of security to the concept of vulnerability[87]. For these scientists, weakness must first be assessed by the organization, as it is the individual who ultimately experiences this insecurity [88]. Lowry et al. [89]have identified several factors that make individuals the most sensitive component of a security system, including the lack of customer involvement in decision-making. For this reason, organizations need to implement an organizational security strategy better to protect these individuals' data[90].

Customer practices research in the financial sector has revealed that security is the main obstacle to overcome when using an online service[91]. Consequently, customer acceptance of all banking services via a platform is one of the main factors influencing their behavior[92,93]. In our research, we found that chatbots and financial services offering instant assistance store information about magnetic cards and personal spending records, which can lead to consumer mistrust[94]. This apprehension intensifies when

voice is used to carry out an online transaction[95].

Despite these opinions, several researchers[96,97] highlight that financial institutions are making long-term investments in artificial intelligence, especially in security measures to safeguard their services. For example, MasterCard communicates with its customers via various messaging platforms, such as Face book Messenger Chatbots,which enable them to securely track customers' purchase and spending histories[98].

In the same vein, the impact of security on the acceptance of these banking bots is well present in the advanced study of Nordhaim et al.[99]. According to them, banks have a benevolent control system for the services offered by these virtual agents, enabling greater confidentiality and reliability of the data transmitted. Several research studies[100,101]demonstrate a significant effect of security on privacy in the banking domain. Hence the hypothesis:

H1: Perceived security has a positive impact on perceived confidentiality.

Moreover, as long as cyber-consumers protect their personal information, they are ready to engage in e-commerce[102]. According to several researchers[100,101], the more secure and private a bank's digital services are, the more likely customers will use them. Consequently, we can hypothesize that:

H2: "Perceived security" positively impacts "intention to use" Chatbots in banking.

3.2 Perceived Overall Trust

In technology, we measure trust by the level of use of the system [103]. These researchers also suggest that system review is a crucial success factor. For them, this analysis can take place at three levels:

First, when it comes to interacting with user’ssystem security is essential. Secondly, confidentiality must be maintained, especially when protecting private data. Finally, the system's reputation is a significant factor in encouraging and attracting those who have never used the technology. Similarly, Alalwan et al.[104]argue that investigating trust is crucial for understanding customer perspectives and their willingness to adopt a technology.

For Hyken[105], two constraints prevent people from trusting interactions with these bots.The first point is that these virtual agents should no longer be viewed simply as tools

for facilitating services. Instead,people should see them as having the same social capabilities as humans[106].As a result, trust in these bots should be approached similarly to trust in other individuals[107]. The second point uses a distinct approach that incorporates the concept of human-machine cooperation as an answer. Drawing on activity theory,the consumer believes that technology can significantly enhance his productivity and, consequently, his faith in this interaction[108]. As determined byFølstad et al.[109],We can only establish this interaction if we understand the factors that impact trust in chatbots.

Chatbots can significantly influence the willingness of online shoppers to use a specific website [110].This social characteristic can generate trust in bots comparable to an individual's[111].These researchers define trust as 'individual beliefs in one's credibility, integrity, and benevolence. Mayer et al. [17] have already shown that trust relies on credibility, integrity and benevolence.Lemoine and Cherif[112]further validated this notion when they examined these components as precursors to consumer trust in Chatbots. Both researchers recognized that each of these precursors had distinct characteristics. Two particular characteristics are associated with the credibility of these bots. The first is a technical characteristic, such as adaptability to multiple language contexts and rapid responses. The second aspect relates to anthropomorphism, including characteristics such as voice, facial expressions, gestures, and so forth.

For antecedent integrity,we believe that customers can understand the commitments made by chatbots through what they say online. For benevolence, these agents are associated with their technical characteristics such as the quality of their interaction with users, their ability to recognize users in future conversations, etc.

In our research on Chatbots, we consider the trust that Moroccan customers have in the banking sector as an essential factor in advancing their use of this technology. However, several studies have shown that these virtual agents can benefit customers and be appealing, which strengthens the relationship between trust and intention to use[113,114]. We therefore propose the following hypotheses:

H3: Perceived overall trust has a positive impact on intention to use.

3.3 Perceived confidentiality

The French dictionary "le Petit Robert" states that confidentiality is the preservation of

secret information in an organization or computer system, which the public must not reveal, and whose use must not be excessive. It should be noted that this concept has had legal implications since the 19th century[115].

The idea of legitimizing the right to privacy has made its way into many fields, leading researchers from various disciplines, such as law, politics, social sciences, information systems, and marketing[116]. Stevens[117] paid particular attention to this subject. Thus, in the field of marketing, in particular, privacy has been defined as an individual's ability to manage their own personal or private data and keep it confidential.

As digital technology advances, particularly with the development of Web 3.0 and 4.0, individuals have become a significant source of data[118]. Many researchers argue for a more balanced link between privacy, and customer relationships. Goldfarb and Tucker [119]suggest that transparency, sharing and protection of personal data should be part of this relationship.

Researchers are particularly concerned about how artificial intelligence (AI) can affect consumer privacy due to the opaque nature of algorithms and the lack of ethical considerations on the part of designers [120]. Recently, artificial intelligence has undergone considerable progress, notably with the emergence of "machine learning" and "deep learning"[121].This revolution has had a significant impact on people's lives, especially with the development of chatbots[122]. Sunder et al.[123]state that these bots are capable of engaging in conversations and facilitating online transactions, which may involve obtaining information about people, including financial data. This presents a huge concern for these customers. Human-machine interaction leads to certain doubts, especially regarding to personal privacy [124]. Several researchers[125,126]who have done more advanced studies on the recognition of new technologies, such as mobile commerce, conversational commerce, and mobile financial services, confirm the risk to privacy. The possibility of users' information leaking can lead to adverse reactions from them when interacting with chatbots[127]. Ischen et al.[128];argue that concerns about personal data might make people more hesitant to share information with intelligent machines, thereby potentially altering the social atmosphere for everyone. Similarly, Bailey and Almusharraf[129]believe that violating people's comfort zones can be a prime obstacle to any use of virtual machines. Trust is an essential element in the financial sector for creating a positive attitude for customers [130]. This implies a mutual relationship

built on trust, which in turn will ensure the safeguarding of all financial information. Research byYousafzai et al.[131] and El Haddad[132] has shown that customers prioritize confidentiality when dealing with banks. For these researchers,when establishing trust in online banking interactions, addressing the "confidentiality" of data is the main element. Hence the hypothesis:

H4: Perceived confidentiality has a positive impact on overall perceived trust.

If people are convinced that their data is protected, they are more willing to interact with virtual entities[133]. Numerous studies, suchby Przegalinska et al.[52] research on trust in human-Chatbot interaction, emphasize the importance of "perceived privacy" in the AI field. According to the same source, "security and privacy" fundamentally link to the financial context, especially online, and directly or indirectly affect the "intention to use" artificial intelligence such as chatbots. Hence, we propose the following hypothesis.

H5: Perceived confidentiality positively influences the intention to use.

3.4 The relationship between intention to use and current use of chatbots in banking

Intention to use technology is an individual's enthusiasm or determination to employ and use a particular technology [134]. These researchers consider this an incredibly crucial element, as it influences the actual use of technology.Mulyono and Sfenrianto[103] propose that the intention to use reflects the level of confidence a user has in using an application.

Research by Nguyen et al.[20]revealed that the level of adoption intention has a substantial impact on the use and acceptance of chatbots in the banking sector. Specifically, they found that customers who have strongly intend to adopt bot technology are more likely to employ it for mundane banking operations such as reviewing their accounts and transferring money. Consequently, the authors suggest that banks should strive to increase their customers' adoption intent to encourage greater use. Mogaji et al. [15] discovered that the intention to use a chatbot has a significant impact on its current utilization in banking. Their study showed that people with a favorable outlook toward virtual agents are more apt to employ them for banking purposes. These results motivate us to examine this association in our research and postulate the following hypothesis:

H6: The intention to use chatbots positively influences their current usage in banking.

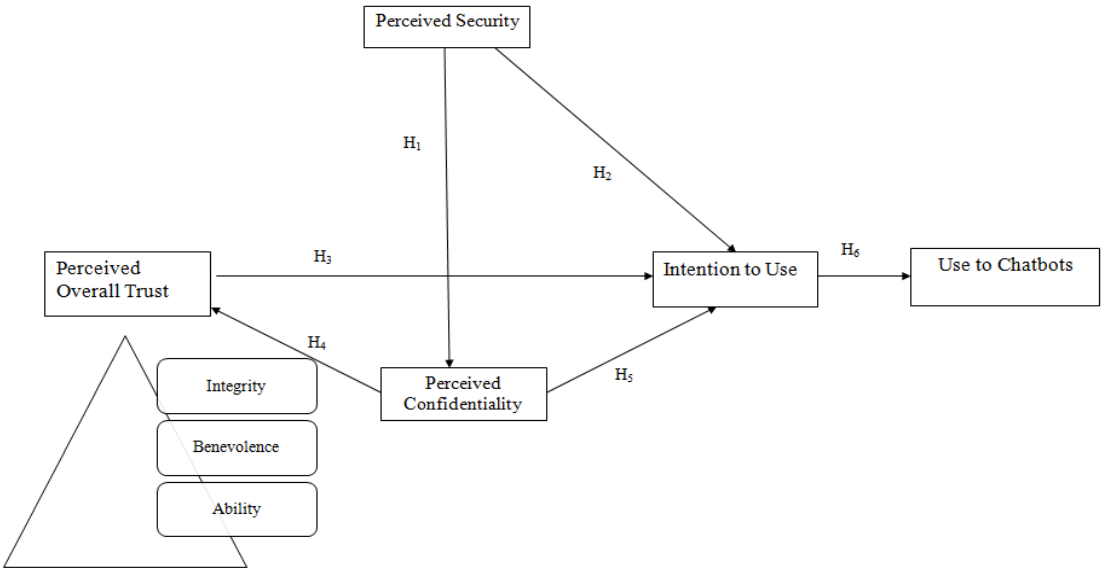

Figure1. The conceptual framework of the research

4. METHODOLOGY

4.1. Measuring instruments

Developing a questionnaire for research purposes is a reasonably linguistic procedure until the finished version meets all the expected objectives[135]. Building a questionnaire requires an organized approach to ensure that the tool obtains the data needed to answer the queries[136]. Ensuring the accuracy and consistency of a research questionnaire is crucial to guarantee that it effectively measures its intended purpose [137]. We followed Churchill's [138] eight-step procedure to increase the reliability and accuracy of our measurement scales. We used pre-existing scales from previous research.Content validity was initially assessed by consulting two experts, who were researchers and English writing instructors. They assessed the suitability of the questions for the survey objectives, any ambiguities of expression or comprehension, and the clarity of the instructions. The modified questions were assessed using five-point Likert scales, ranging from "strongly "disagree to "agree strongly"[139]. Table 3 shows the finals, the confirmed measurement items, and the survey questionnaire.

Table3. Measurement elements and survey questionnaire

Constructs	Measurement Items	Sources
Perceived Security		
Security_ 1	-.The data I provide to Chatbots will not get lost.	
Security_ 2	- I find online banking secure when paying for my transactions with Chatbot.	[140]; [141]
Security_ 3	-The system ofsecuritysystem provides a secure environment when using Chatbots	
Perceived Confidentiality		
Confidentiality_1	- I worry that my personal information might be improperly shared while using banking chatbots.	[142]
Confidentiality_2	- I fear that banking chatbots could intercept my personal data.	
Confidentiality_3	- I could have my privacy invaded when using banking chatbots	
	Perceived Overall trust	
	Ability	
Trust_Ability1	-The banking Chatbot is competent in its service.	[143]; [144]
Trust_Ability2	-The Chatbot fulfills its customer service role very effectively	
	Benevolence	
Trust_Benev1	- In my interaction with the Chatbot, I sensed it would strive to assist me.	[79]; [36]
Trust_Benev2	- Chatbots are open and receptive to my needs	
	Integrity	
Trust_Integ1	-I would characterize the relationship with Chatbots as sincere.	[143]; [144]
Trust_Integ2	- The Chatbot seems sincere and genuine.	
Trust_Integ3	- Chatbots generally seem trustworthy.	

Constructs	Measurement Items	Sources
Intention touse		
Intent_use1	- If I get the chance, I'll use the banking Chatbot.	[103];
Intent_use2	-I am inclined to use the banking chatbot soon.	[145]; [134]
Intent_use3	- I intend to request information on the bank's platform via the Chatbot.	

4.2. Data collection

To test our model, we conducted a quantitative survey in three stages. The first involved a qualitative pre-test of our questionnaire with 30 individuals. Based on the feedback received, we examined content validity. Consequently, several significant modifications were made, including the removal of irrelevant items and the grouping of related statements.

The second questionnaire was administered online between May 15 and July 15, 2023, as part of a preliminary assessment conducted with a hundred clients of financial institutions in Morocco, using chatbots on various platforms such as WhatsApp, Facebook Messenger, and their websites. The analysis was performed using Principal Component Analysis (PCA) with the SPSS software. This survey aimed to evaluate the adequacy and relevance of the selected elements.

This second pre-test was conducted to introduce a final online questionnaire between September 15 and November 15, 2023, aiming to broaden the sample for a more accurate representation of the population. After adjustments, the final questionnaire was administered to the same target group, resulting in 370 valid responses.

Given the inherent difficulty in obtaining comprehensive data on Moroccan bank clients, a convenience sampling approach was adopted for this study. Our sampling involved selecting these clients based on their accessibility and willingness to participate, rather than using random selection methods. In this context, participants were chosen because they were readily available and accessible online, facilitating the data collection process within the study's timeline and resources. Additionally, the Structural Equation Modeling (SEM) technique, particularly "Partial Least Squares Structural Equation Modeling (PLS-SEM) ", was employed to analyze the collected data. The analysis was conducted using

Smart PLS 4 software, a widely used tool for implementing PLS-SEM models due to its user-friendly interface and comprehensive analytical capabilities[146].

4.3. Population and Sample

We chose several attributes to question our target "Gender, Age". The results are as follows:

Table4. Respondents' personal description of the use of Chatbots in banking

Respondent Characteristics	**Frequency (n=370)**	**Percentages**
SEX		
Men	200	54%
Women	170	46%
Total	370	
Age		
25and under	30	8%
26-35	111	30%
36-45	129	35%
46-55	78	21%
55 and over	22	6%
Total	370	

The table below presents data on the use of Chatbots in the banking sector, focusing on the personal descriptions of respondents. Indeed, 54% of respondents are male, while 46% are female. This indicates a relatively balanced gender distribution among users of this form of AI in the banking sector. Among respondents, the most represented age groups are 36-45 (35%), followed by 26-35 (30 %) and 46-55 (21%). The under-25s represent the smallest proportion (8%). Respondents aged 56 and over represent 6% of the sample. These results indicate that bot users in the banking sector come from a diverse age range, with relatively strong representation from professionally active age groups (26-55).

5. RESULTS

This section aims to present the results of our explanatory analyses to test our research hypotheses. To accomplish this, we initiate the process by verifying and estimating the measurement model using PLS. We will then evaluate the structural model, showing the results of our hypothesis testing.

5.1. Evaluating the measurement model

Smart PLS software uses the PLS method to evaluate the measurement model.This entails employing the PLS algorithm to ascertain the connection between latent variables and their observable counterparts, as well as determining the weights between the constructs used in training and their respective indicators.To do this, we mobilize the set of indicators linked to the measurement model, namely: construct reliability and convergent and discriminant validity.

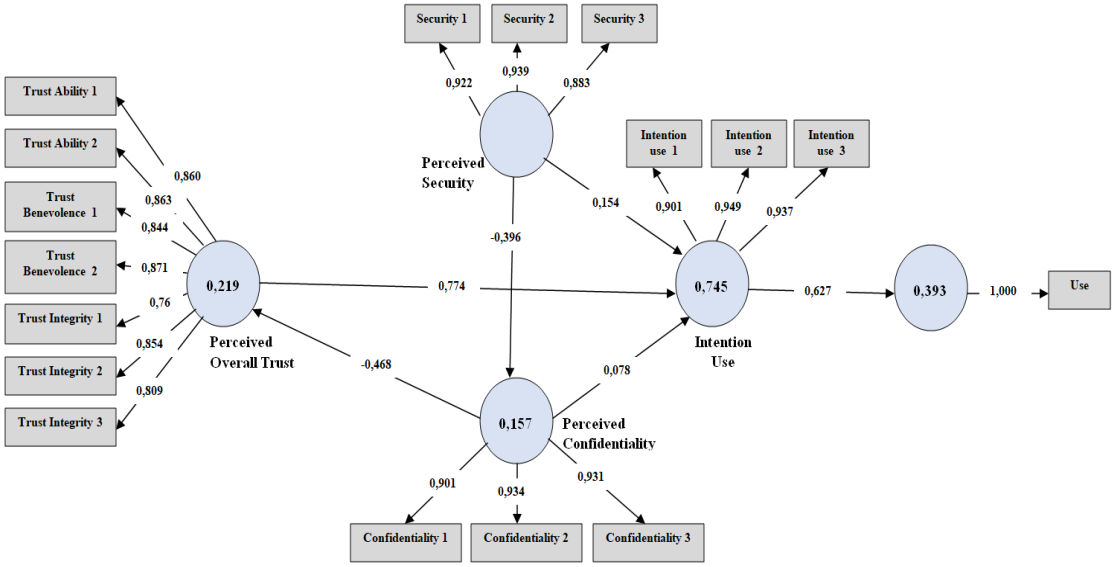

Figure2. The "adoption" model in Smart PLS 4.0 software.

5.1.1. Reliable construction

To ensure the reliability of our model, we must assess the construction's reliability by checking the Cronbach's alpha and composite reliability. If either of these measures is less than 0.7, we should consider revising our indicators or adding others to increase the model's reliability [147].

Table 5. Construct reliability

	Cronbach's alpha	**Composite reliability**
Perceived Security	0,902	0,903
Perceived Confidentiality	0,912	0,914
Perceived Overall Trust	0,929	0,931
Intention to use	0,920	0,921

The table illustrates that most concepts have a Cronbach's alpha above 0.901, indicating high reliability. In addition, the composite reliability for each concept is also high, with values above 0.902 for most concepts. These results indicate that the indicators reliably measure the various concepts in the measurement model.

5.1.2. Convergent and loading validity

To determine the accuracy of the model components[148], we will assess their validity in two steps[147]:

- ✓ First, we will refine the parameters by retaining only those factors whose correlation is superior than 0.7;
- ✓ Secondly, we will study (AVE), which should generally be greater than 0.5.

Table6. Convergent validity of measurement scales

The built-ins	**Items**	**Loading**	**AVE**
Use	1	1	
Perceived Security	Security_1	0.922	0.837
	Security_2	0.939	
	Security_3	0.883	
Perceived Confidentiality	Confidentiality_1	0.901	0.850
	Confidentiality_2	0.934	
	Confidentiality_3	0.931	

The built-ins	Items	Loading	AVE
Perceived Overall Trust	Trust_Ability1	0.860	0.702
	Trust_Ability2	0.863	
	Trust_Benev1	0.844	
	Trust_Benev2	0.871	
	Trust_Integ1	0.761	
	Trust_Integ2	0.854	
	Trust_Integ3	0.809	
Intention to use	Intent_use 1	0.922	0.837
	Intent_use 2	0.939	
	Intent_use 3	0.883	

Table 6 shows the criteria required to ensure "Convergent validity," generated by the PLS algorithm. It demonstrates that "Convergent validity" is well-established, as all elements have correlations greater than 0.7 and an average shared variance (AVE) greater than 0.5 (ranging from 0.702 to 0.863).

5.1.3. Discriminant validity of constructs

To ensure that variables measured by a single indicator are not closely associated with other variables in the model, we must ensure that the variance shared between a construct and all other constructs is less than the variance shared between the construct and its indicators (AVE)[149]. If this is the case, discriminant validity can be acceptable [150].

Table 7. Correlations between constructs and the square root of AVE

	Use	Perceived Confidentiality	Intention to use	Perceived security	Perceived trust
Use	1				
Perceived confidentiality	0,365	**0,922**			
Intention to use	0,653	0,376	**0,929**		
Perceived security	0,608	0,436	0,784	**0,898**	
Perceived trust	0,668	0,507	0,822	0,834	**0,837**

Table 7 reveals that the "square root of AVE" amounts are higher than the construct correlations with the other constructs. This implies that each measure generates results distinct from the different constructs, thus guaranteeing its discriminant validity. The

results confirm that we meet allthe conditions for hypothesis testing, the consistency of hypothesis consistency is satisfactory and convergent and discriminant validity are reasonable.

5.2. Assessment of Structural Model and Hypotheses Testing

5.2.1. R-square

To confirm the accuracy of the results, we examine the coefficient of determination (R^2) for each dependent variable.

Table8. R-square and adjusted R-square

	R-square	**R-squareadjusted**
Perceived Confidentiality	0,157	0,153
Perceived Overall Trust	0,219	0,216
Intention to use	0,745	0,742
Use	0,393	0,391

The results show that the factors incorporated in the model explain most of the variance in 'intention to use' ($R^2 = 0.754$), use ($R^2 = 0.393$), and perceived confidence ($R^2 = 0.219$). However, confidentiality has a relatively low R^2 of 0.157 and an adjusted R^2 of 0.153, indicating that the independent determinants of the model have only a limited influence on the variance of perceived confidentiality. Furthermore, we consider our sample size to be medium, and all four R^2 values exceed the 0.13 threshold [151]. This is a very satisfactory result, which confirms that the integrating model is reliable.

5.2.2. $Q^2$by stone Geisser

The evaluation indicates the adequacy of each structural equation, generally determined by Blindfolding. If Q^2 is positive, the model has validity in its predictive capabilities [152].

Table 9. Stone-GeisserQ2coefficient

	Q^2predict
Perceived Confidentiality	0,148
Perceived Overall Trust	0,246
Intention to use	0,302
Use	0,161

The findings from the table show that the Q^2 measures are positive and non-zero for all

the determinants studied. These findings mean that the model has predictive power.

5.2.3. The Assumptions

To properly evaluate our hypotheses, there are two PLS approaches with two distinct strategies: Jackknife and Bootstrapping. Bootstrapping emerged as the most suitable method for our purposes. We present our data below in tabular form:

Table. 10 Status of hypothesis validation using the Bootstrap method

	T statistics (|O/STDEV|)	**P values**	**VIF**
H1: Perceived Security_->Perceived Confidentiality	2,229	0,026	1,286
H2:Perceived Security->Intention to use	7,839	0,000	1
H3: Perceived Overall Trust->Intention to use	11,778	0,000	1
H4: Perceived Confidentiality _->Perceived Overall Trust	6,264	0,000	1
H5: Perceived Confidentiality_>Intention to use	2,133	0,033	2,422
H6:Intention to use-_>Use	11,476	0,000	2,616

Table 10 shows the status of hypothesis validation using the Bootstrap method. The Bootstrap method is a statistical technique thatinvolve sampling with replacement from available data to estimate the distribution of a statistic of interest[153]. In this context, the results we present as T-statistics (|O/STDEV|) and P-values. According to the table, the results of the Bootstrap method indicate significant relationships between the variables examined, thus supporting the hypotheses underlying the study. Indeed, the relationship between perceived security and confidentiality is substantial, since the T statistic of 6.264 suggests a significant relationship between security and confidentiality, with a P value of 0.000, which reinforces this conclusion. For the relationship between security and intention to use, the T-statistic of 2.133 is significant, and the P-value of 0.033 indicates a statistically significant relationship between security and intention to use, however it is less significant than the other relationships. As expected, there is a strong relationship

between confidentiality and trust with a T (7.839) and a very low P-value (0.000). A similarly significant relationship between confidentiality and intention to use with a statistical T of (2.229) and P-value (0.026) indicates statistical significance at a given confidence level.Note that there is a strong relationship between trust and intention to use, indicated by T (11.476) and P (0.000). The same applies to the relationship between intention and using chatbots T (11.778) and P (0.000). In addition, all the relationships display VIF values of less than 5, indicating the absence of multicollinearity problems in the structural model.

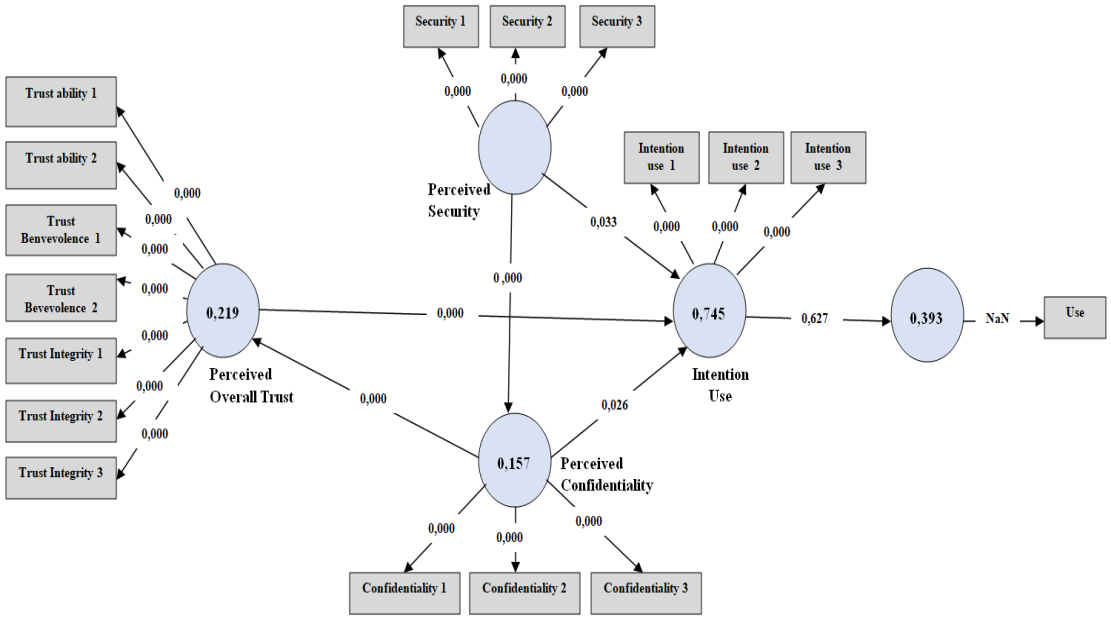

Figure3. The model using the Bootstrap method

6. DISCUSSION

Our research confirms that 'perceived security' has a significant impact on 'perceived privacy' (T=6.254>1.96, P=0.001<0.005), as well as a substantial effect on intention to use (T=2.133 and P=0.033). This conclusion is in line with the findings of[101,154], who indicate a significant relationship between perceived security and confidentiality. For these researchers, the determining factor is security, since the context is sensitive to any financial transaction. Every time the customer faces a problem with an electronic financial service, mistrust sets in as a first constraint, at the risk of suffering financial loss or fraud [155]. Studies concerning consumer behavior in the financial sector demonstrate that security is the main privacy factor[156].Our findings suggest that Moroccan consumers

perceive security positively impacting their intention to use chatbots. Furthermore, the results highlight the importance of confidentiality for Moroccan consumers, especially in a sensitive domain such as banking. In our study, financial services employing bots that prioritize speed and availability must handle confidential and personal information, including credit card details and spending history. This management of sensitive data has led to consumer skepticism[94].This apprehension amplifies when people use voice for making online purchases[95].The results of our privacy research suggest that 33% of Moroccan bank customers are split between those who "disagree" and those who "strongly disagree" about the privacy of banking websites and apps. Most people feel that their privacy is threatened, not least because of the popularity of instant messaging. On the other hand, a majority believes that confidentiality can be compromised by using these sites, with 55.43% of participants strongly agreeing.The high rate mentioned serves to elucidate the concern regarding data confidentiality stemming from the sharing of personal information with banking sites and apps. Goldfarb et Tucker [119] propose a privacy policy that emphasizes credibility and collaboration, making safeguarding customer data a fundamental aspect of the customer-company relationship. Researchers have expressed concern about artificial intelligence [120]. According to them, this concern mainly stems from a lack of understanding of algorithms and ethical foresight on the part of creators. Consumers exhibit considerable concerns about privacy, especially regarding services utilizing new technologies such as m-payment [157].

In a 2018 study conducted by the Statista research department, the impact of chatbots on financial privacy in France was analyzed[158]. This survey proved that the majority (55%) of individuals questioned believe that artificial intelligence represents a risk to privacy, while 45% saw it as a an excellent opportunity to secure personal data. Regarding Moroccans willingness to use this form of AI, our research supports the idea that perceived privacy has a significant effect on both overall perceived trust and 'intention to use.

Our research findings confirm Hypothesis H3, which posits that people's perception of trust directly impacts their intention to use. As per Mayer et al.[17], trust perception comprises three components: competence, benevolence, and integrity.

The research results show that overall perceived trust plays a significant role in intention to use, thanks to the three elements that make it up. This corroborates existing studies that

indicate that trust is an essential factor in determining an individual's intention to use virtual agents[159]. According to several researchers, such as Janani et al. [160], there is a close association between competence and trust. For example, in the technological domain, trust between humans and machines manifests itself in the reliability of the data presented to users[161]. The machine can establish trust only if it can protect personal information[73].The survey results show that 65.80% of Moroccan consumers strongly or somewhat agree that integrity and honesty significantly impact their intention to use. These factors should not be considered separately from the three aspects of overall trust. The integrity sub-dimension scored the lowest on the trust scale, representing 15.70%. Despite this, it is clear that Moroccan consumers attach great importance to integrity, which explains why they are reluctant to exchange information with chatbots and offer their consent.

The trusting individual's positive perception of benevolence reflects a sincere desire to act altruistically for the benefit of others [162]. In our case, benevolence is the ability of a machine to prioritize the benefits sought by consumers over theirgains, the aim being to reduce uncertainty and lack of trust when it comes toopportunistic acts [163]. The sub-dimension Ability is best placed to examine the confidence of Moroccan consumers, accounting for 28% of the global confidence scale. This suggests that individuals are more inclined to trust companies that demonstrate the ability to fulfill their promises[69]. Consequently, in the realm of online banking customer service, customer trust hinges on the bank's capacity to deliver timely[164].

7. IMPLICATIONS

The study of banking chatbots in the context of their adoption by individuals is of interest to theorists and managers alike. The work presents a new interactive model based on technology and self-help. Due to the originality of the phenomena studied, this research is truly unique, offering mostly unpublished results.The Mayer et al. [17] model of trust comprises three key elements: competence, integrity, and benevolence. Competence refers to a person's skills and expertise in a specific area, while integrity refers to the perception that the person is honest and respects moral and ethical standards. Benevolence refers to the perception that the person intends to help or protect individuals rather than harm them.In accordance with this model, the presence of all three elements increases the

likelihood that individuals will trust another person.In addition, when individuals grant trust and the results are positive, this reinforces future trust. On the other hand, when someone betrays trust or when outcomes are negative, future trust is diminished.This model is essentialfor organizations because it helps to understand the relationships between employees, managers and customers. By identifying the elements that contribute to confidentiality and security, organizations can take steps to strengthen trust to improve interpersonal relations and customer satisfaction.

This research is among the few that have applied Mayer's model in the context of individuals, integrating security variables such as perceived security and perceived confidentiality, in contrast, most research has opted for adoption in the context of organizations.

In managerial terms, the results of this research are an essential contribution for banks wishing to invest massively in artificial intelligence. Our results highlight the key determinants necessary for customers to accept and use one of the most important AI tools, namely chatbots. Banks should take steps to improve the perception of privacy when using banking chatbots. It may be essential to implement clear privacy policies, apply strict security standards, and provide accurate and prompt answers to questions asked by customers.

8. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Our study has multiple limitations.Firstly, the trust model did not assess any construct that could directly impact the use of virtual agent. On the contrary, we assessed all variables to examine their influence on the intention to use them. Secondly, the model lacks some variables that may improve understanding of the purpose of using chatbots in this area, such as perceived risk, which could act as a mediating or moderating factor. Thirdly, the survey method we employed may also be restrictive in other respects. We focused on using chatbots by Moroccan bank customers, which made it challenging to acquire data through online channels. Furthermore, we have considered trust as an important factor in our research during the pre-adoption phase, and it can therefore be included in the post-adoption phase, as we consider it to be a determining factor in satisfaction with artificial intelligence.As far as confidentiality and security are concerned,

they can serve as mediating factors likely to affect the desire to use chatbots in the banking sector for future research.This initiative marks the first attempt in Morocco to investigate the adoption of chatbots in financial services, particularly banking. Future studies are suggested to extend their scope to other areas such as insurance, hospitality, or any other field already benefiting from this type of artificial intelligence.

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