International Journal of Scientific Research and Management (IJSRM)
||Volume||11||Issue||10||Pages||5249-5262||2023||
Website: https://ijsrm.net ISSN (e): 2321-3418
DOI: 10.18535/ijsrm/v11i10.em07

Customers Adaptation of E-banking services; extending TAM through Anthpmorphism in Saudi Arabia

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Abstract
This study aims to investigate influence of perceived anthropomorphism, perceived ease of use, perceived usefulness, privacy concerns, as well as attitude on intention to adopt AI banking services. The research follows a positivistic and deductive reasoning approach, utilizing experimental techniques in a cross-sectional design. Data of 210 responses collected through a questionnaire distributed via Google Docs were analyzed using Smart PLS3. The results indicate that intention to adopt AI banking services is influenced by perceived anthropomorphism, perceived ease of use, perceived usefulness, and privacy concerns through attitude. Strong correlations among all variables were observed, highlighting the significant and positive impact of artificial intelligence on encouraging acceptance of advanced technology in banking sector in Kingdom of Saudi Arabia. Future research is recommended to test various other variables using the same research model in different countries. Practical implications include the need for senior managers and policymakers in financial institutions to formulate relevant policies and marketing strategies aligned with customer needs. This research study's primary objective is to prospect and examine factors impelling consumer adoption intentions of artificial intelligence in banking sector in Kingdom of Saudi Arabia.

Key words: Perceived anthropomorphism (PA), Perceived ease of use (PEOU), Perceived usefulness (PU), Privacy concerns (PC), Attitude, and Intention to adopt AI banking services.

Introduction

Artificial intelligence has emerged from cognoscible technologies and has found its applications across various industries, as highlighted by Lombardi et al. (2020). This extensive adoption encompasses the financial sector, including banking industry. This advanced and attention seeking technology is transforming the physical, established, and standard banking system into virtual or e-banking system. AI comprises of financial robotic advisor that worked with the help of AI algorithms and assist the consumers in investment process without the collaboration of human beings (Northey et al., 2022). This kind of mechanized system comprises and assimilates AI in modifying the manufacturing business into service business (Agarwal et al., 2022). The banking industry advanced from banking 1.0 to banking 4.0 which transforms the traditional and standard banking system into new and advanced banking system which also includes the usage of AI services. As we know, ATMs are introduced in banking system 2.0 to assist consumers but now in banking system 4.0 the technology of AI is used to connect with consumers and perform financial services (Biswas et al, 2020).

Artificial intelligence helps the financial industry in cost cutting, competitive advantage and environment friendly process. The fast growth in this technology has caused rapid changes in banking services. There is a research study in which researchers analyze the banking system of Kingdom of Saudi Arabia (KSA) from 2015 to 2020 (Norah Aldowaih et al 2022). In this study, they analyze progress in 3 banking systems i.e. ATM, mobile banking and internet banking. From 2015 to 2020 there is 4% decrease in ATM based banking in Riyadh bank. There is report published by Raddon Company in 2017, it shows that 33% of the appellants use mobile banking rather than use the branch services. The report also shows that 67.3%, 37% of people use Apple pay and Stc pay respectively which indicates the positive attitudes towards adopt the mobile banking. STC is an electronic wallet introduced by Saudi Telecom Company to carry out direct and cost-free

transactions. In 2017 73% population of KSA ranked 3rd who used android phones. Therefore, it needs an hour to introduce more advanced online financial services. Additionally, There are several online mobile applications currently working in Saudi Arabia more efficiently such as Al-Rajhi Bank, AlInma Bank, and Al-Bilad Bank.

The domain of financial tradespersons many ways for the growth and development of innovative solutions that address the ever evolving financial and monetary demands and needs of the customer (Northey et al., 2022). Previous study reveals that AI can add significant value to the international banking system up to USD 1 trillion every year. After COVID 19 AI can put its substantial efforts for regaining and rearranging the standard position of banks, due to this, researchers assume that financial industry will reach at USD 28.529 trillion by 2025 to 2030 at a CAGR of 6% (Ross, S 2022).

The study conducted by Rosman in 2018 indicates that Bank of America introduced AI technology known as chatbot in its financial system to compensate and help customers with basic financial issues. Many earlier studies focus on the knowledge about the basic use of AI technology, use of internet and efficiency to operate the computer (Rahmman, Miing, Baiigh, & Sarkier, 2022). There is a study which highlights some negative aspects of new technologies and services, so due to this, it would be difficult for customers to adopt new financial robotic services (Chou et al. 2023). With the passage of time, it is necessary for the banking sector to understand the customer perspective about the advancements in financial technologies and specifically about the AI services in the banking industry. According to the advancement in banking services information, there is a deficiency of research on the perceived anthropomorphism (PA), PEOU, PU, and PC in intention to adopt AI Technology in banking system. Therefore, current exploratory research from market's point of view aims to understand impact of PA, PEOU, PU, and PC with mediation effect of attitude on intention to adopt AI in banking services.

Theoretical Background

An increasing amount of research studies predict that while AI technology very often exceeds the job performance of humans in significant tasks and authoritative settings, its supremacy in context of efficiency and skills does not inherently translate into customer recognition and adoption (Casteelo et al., 2019; Dietvorst et al., 2015; Longonii et al., 2019). There are many researches which highlight the factors to determine AI acceptance (e.g. Yu et al., 2023; Mustak et al., 2021). "Technology acceptance model (TAM)" is one theory which is more often used in many research studies that are related to advanced and informative systems and it also shed light on how consumers show positive concern about usage of technology (Yousafzai et al., 2007). Basically, this theory is used for non-intelligent technologies, so there are many limitations in the implementation of TAM in the growing arena of AI technology (Buttet al., 2021; Cabrrera-Sanchez et al., 2021).

Current research also uses TAM to recognize the consumer's behavior and attitude towards the use and acceptance of new mechanisms. The Technology Acceptance Model maintains and contends that the tendency to have a strong grip and hold on technology use, known as the propensity, to accept technology, can be gauged by evaluating a customer's behavior towards using that technology (Davis 1985). There are two main variables which have been predicted by previous researchers about the use of TAM are PU and PEOU (Davis 1989). The first variable PU explains an entity's trust that with technology one can enhance work performance, while the second delineates consumer's perception that technology usage requires minimal effort. Much recent research proposes that TAM can significantly explain the concept of use of advanced technology in different areas like technologies related to mobiles (Alsyouf, 2022) and in tele monitoring tools (Maskeliunas, 2019). As a consequence, we can extend TAM with new predictors to explain reasons behind intent to adopt AI banking services. This research included perceived anthropomorphism, PEOU, PU, PC, as well as attitudes to extend TAM.

Literature review

Anthropomorphism prevails to the extent to which an entity takes control of human-like characteristics, encompassing aspects like physical emergence, self-awareness, and emotional attributes (Kim & McGill, 2018). Perceived anthropomorphism is a crucial factor and variable for consumer attitude in department of artificial intelligence and financial robotic service (Lu et al., 2019; Van Dorn et al., 2017). Acquaintance

with human characteristics fosters a sense of comfort, ultimately resulting in favorable customer behavior and determination towards making purchases (Lu et al., 2019). Literature predicts that there are two classifications of customer's assumption of anthropomorphic assets and outcomes that are: "frontline service robots (FLE) and self-service technology (SST)." The online banking system is underlined in the second group; in this regard, there is narrow research on this topic. Literature suggests the significance of perceived anthropomorphism that is connected with the key features of SST as compared to the first category of FLE (Stock and Merkle, 2017). Perceived usefulness comprehends to level to which utilizing system will lead to improved working efficiency and performance (Amin Rehman et al, 2014; Thaker Amin, et al, 2019). There is much recent research which indicates that due to implementation of new and advanced technology banking system have become independent (Lok 2015; Suhartanto Dean et al, 2020). Perceived Ease of Use (PEU) of a system is determined by the simplicity and lack of complexity that a consumer imagines in system. Many earlier researches shows that PEU is a factor of developmental attitude to resort technologically connected with exploration (Dinh & Park, 2023). In the domain of mechanization, previous studies suggest that job performance and certainty are the most prominent factors in creating the concept of trust on robotic systems (Hancock et al., 2011). So far, when customers come across privacy matters in AI robotic services, the performance of banking system slows down due to uncertainty, impatience, uneasiness, doubt, and distrust. The research conducted by Vaan Slyke et al. (2006) demonstrates that confidentiality concerns have a negative influence on a customer's willingness to take risks and increase their level of unpredictability. There is a scarcity of research on the effects of privacy inhibitors in the financial industry (Hua & Huang 2021). Moreover, another study also indicates that privacy concerns and perceived risk are the main variables for determining the privacy inhibitors (Venkatesh et al. 2021). Attitude is a type of construct which comprises of feelings and emotions towards one's interest (Kaakeh Hassan, et al. 2019; Safari Almer, et al. 2020). Artificial intelligence is an inventive way to provide financial technology and aid to consumers. Safari (2020) reveals in his study that in UAE attitudes has powerful impact on intention to adopt AI banking services. In AI-driven financial services settings, effective integration of consumer particulars and the portrayal of banking services are essential to enhance objectives of adoption.

Hypothesis Development

Anthropomorphism is mentioned as an acknowledgement of human like skills, traits, and attitude to anthropoid bodies just like robots (Airenti, 2015). Perceived anthropomorphism is a crucial factor and variable for consumer attitude in subject of artificial intelligence and financial robotic services (Lu et al., 2019; Van Doorn et al., 2017). It impacts the consumer attitude and behavior more strongly and effectively (Kim & McGill, 2011; Puzakova et al., 2013). The phenomena of perceived anthropomorphism of online websites show that objects related to anthropomorphism enhance the attitude of consumers towards use of AI banking services (Burgoon et al., 2000). There is replacement theory of artificial intelligence which states that consumers can evaluate and analyze new and advanced technologies according to yield and production (Huang & Rust, 2018). Anthropomorphic characteristics may enhance the insight of struggle to use AI banking services. Consumer may perceive so; it can be concluded that customers are more inclined towards the adoption of AI banking services. That it would take great effort to connect with robotic services with a more positive attitude. So, it can be postulate that:

H1: Perceived anthropomorphism is positively associated with attitude.

An extent to which customers feel comfortable using new technology is stated as "perceived ease of use," defined by Davis in 1989. PEU of system is determined by how straightforward and straightforward a purchaser imagines the system to be. Previous studies indicate that PEOU is a factor of developmental attitude to resort technologically connected with exploration (Dinh & Park, 2023). The research on this application also highlights that perceived ease of use in exploration has no relevance with artificial intelligence network. (Mokmin & Ibrahim, 2021). In recent research, it's indicated that perceived ease of use is free from mental and real struggle. If a customer has trust in advanced technology that is simple, uncomplicated, and easy to use, then those consumers show positive attitude towards the adoption of it.

H2: Perceived ease of use is positively associated with attitude.

Concept of PU is that in which the customer trusts that indulging in a new system would boost his or her skills to perform a specific job or activity in an efficient and effective manner (Davis, 1989). There is a vast amount of research on the impact of perceived usefulness on following fields like research on business to

consumer airlines (Ragheb et al., 2022), application related to voyager (Iancu & Iancu, 2022), searching sites related to travelling (Ren, 2020), and self-booking for hotels via use of technology (Ragheb et al., 2022) all authenticate and certify that customers is affected by usefulness in artificial intelligence networking (Ragheb et al., 2022). Artificial intelligence includes the Chatbots that assists consumers in shopping and other online services. Technology adoption model (Davis 1989) predicates that perceived usefulness is one of the most important predictors to determine intent to accept (Venkatesh et al, 2000; Jeyaraj et al, 2006). Previous researches on perceived usefulness has confirmed its significance importance in the area of adoption phenomena (Cocosila & Archer 2012; Javier et al, 2019).

H3: Perceived usefulness is positively associated with attitude.

Venkatesh et al. (2021) defines "privacy concerns" consumers' concerns and interest towards potential harm of personal information in front of third unknown body. Artificial intelligence is a new technology that comprises of complicated algorithms that also assists customers in monetary services with help of the internet. One of researches indicates that if consumers have more questions, doubts and concerns about privacy then there is low adoption of AI banking services (Kansal, 2016; Raza et al, 2019). There is research which highlights the negative impact of privacy concerns on customer's perception and increased uncertainty and unpredictability (Van Slykie et al. 2006). Due to this reason customer are uncomfortable to share their personal data to any online websites. Privacy concern is the main factor in determining customer trust in discipline of e-commerce Wu et al. (2012). Hence, it can be inferred that there is reduced questioning and concern regarding privacy (Zhou, 2012; Van Slyke et al., 2006), which, in turn, strengthens their trust and belief (Malhotra et al., 2004; Van Dyke et al., 2007; Wu et al., 2012). By ensuing current stream of scholarly literature, one can hypothesize that:

H4: Privacy concerns are negatively associated with attitude.

Attitude is a type of construct which comprises of feelings and emotions toward one's interest (Kaakeh Hassan, et al. 2019; Safari Almer, et al. 2020). Artificial intelligence is an inventive way to provide financial technology and aid to consumers. Safari (2020) reveals in his study that in UAE attitudes have powerful impact on intention to adopt AI banking services. In AI-driven financial services settings, effective integration of consumer particulars and the portrayal of banking services are essential to enhance objectives of adoption. There are also many other fields in which attitudes positively correlate with the purchase or adopt intention like in organic food industry (Tendon et al, 2020) and e-waste recycling sector (Dhir et al, 2021). Some study reveals that consumer's intention to adopt new and advanced technology is positively influenced by attitudes of customers (Tandon, et al. 2020, Basha et al. 2019). So, following hypothesis is formulated:

H5: Consumer's attitude has significant impact on intention to adopt AI banking services.

Methodology

This research employed a quantitative methodology and collected data from sample size of 210 users of banking apps through primary sources. Data collection method involved use of a survey, which was distributed via Google Forms and consisted of 21 items. The study adopted a positivist approach and utilized the induction method, where hypotheses were formulated and subsequently tested.

For sampling, convenience sampling, a non-probability sampling technique, was utilized to gather responses from users of banking service applications. This approach yielded approximately 210 completed survey responses from individuals who voluntarily participated in the study. The collected data included demographic facts such as gender, age, and marital status.

The data for this study were obtained from individuals who were users of banking apps. Questionnaires were employed as the survey instrument to gather information from these app users. To enhance comprehensibility, the questionnaire was prepared in English. It was structured into two parts: the first part gathered demographic information, including age, gender, and marital status. The second part comprised 21 questions related to the model's constructs, all of which were based on prior research. The questionnaire was distributed electronically to households through various social media channels using Google Forms.

Measures

The scales were adapted from earlier studies, and validity as well as reliability of data were then examined. Scale of Perceived Anthropomorphism (PA) was taken from (Rajasshrie & Brijesh, 2020). The items of PE were adapted from (Oh et al., 2013; Davis, 1989; Kim et al., 2009), scale of Perceived usefulness was adapted from (Oh et al., 2013; Davis, 1989; Kauishik et al., 2015, Kim et al., 2009), Privacy concern (PC) scale was adapted from (Rasheed et al., 2023). The item of Attitude (AT) was adapted from (Davis & Wong, 2007; Park et al., 2021; Park et al., 2019) and Intention to adopt (IA) was adapted from (Rasheed et al., 2023). All constructs and their basis are mentioned in table 1.

Table 1: Measurement

Constructs	Items	Source
Perceived Anthropomorphism (PA)	4	(Rajasshrie & Brijesh, 2020)
Perceived Ease of Use (PE)	4	(Oh et al., 2013; Davis, 1989; Kim et al., 2009)
Perceived Usefulness (PU)	3	(Oh et al., 2013; Davis, 1989; Kaushik et al., 2015, Kim et al., 2009)
Privacy Concern (PC)	4	(Rasheed et al., 2023)
Attitude (A)	3	(Davis & Wong, 2007; S. Park et al., 2021; Park et al., 2019)
Intention to adopt (IA)	3	(Rasheed et al., 2023)

Geographical coverage

In total, 210 responses were gathered, with 55.2% of them from women and 44.8% from men. Responses were collected using the convenience sampling technique. 42% of those surveyed were under the age of 25, and 29% were between the ages of 26 and 30; 13% are between ages of 31 and 35; 11% are between 36 and 40 of ages; And 4% are above forty. There were 58.3% single people in the target demographic. In Table 2, a thorough illustration is given.

Table 2: Sample Demographics

Demographic	Frequency	Percentage
Gender		
Female	116	55.2%
Male	94	44.8%
Age		
Below 25	89	42.4%
26-30	61	28%
31-35	29	13.8%
36-40	23	11%
Above 40	8	3.8%
Marital Status		
Married	89	42.4%
Unmarried	121	57.6%

Procedure

Questionnaire was used to collect data, and participants responded to the online survey that was delivered by the researcher to check intent to adopt banking services. To guarantee accuracy of data and to preserve human rights, all ethical guidelines were followed, and participants' informed consent was obtained. Participants may fill out the survey at their convenience; confidentiality was preserved and there was no requirement for a specific date or time. The questionnaire may be completed without restriction after receiving permission, and participants were free to stop at any point if they changed their minds. They became aware of the importance of the study and that there was no threat involved. Data analysis in this study was conducted using Smart PLS 3.0, as described by Ringle et al. (2015) and Hair et al. (2011). Smart PLS 3.0 was employed to perform variance-based structural equation modeling (SEM-VB) on structural model, following a two-stage analytical approach. This approach was implemented after conducting descriptive statistics, which included assessments of the existing assessment model and the established structural frameworks, as outlined by Hair et al. (2016).

According to Hair et al. (2011), two-step technique is preferred over a one-step evaluation. In this approach, structural model assesses relationships between variables, while measurement model evaluates constructs themselves, as detailed by Hair et al. (2016). According to Barclay et al., (1995) Smart PLS 3.0 allows for simultaneous analysis, it is employed in the study to assess both the structural and measurement models.

Descriptive analysis

Table 3 displays the standard deviations and mean values for each variable. Responses were evaluated on Likert scale of 1 to 5, with 1 indicating strongly agrees and 5 strongly disagree. As per the data presented in Table 3, it can be observed that Perceived Usefulness had highest mean value, which amounted to 0.406, accompanied by a standard deviation of 1.136.

Measurement Model

Convergent and discriminant validity were employed to assess validity and reliability of measurement model. In context of measurement, reliability pertains to the degree of consistency, accuracy, and

dependability of the results obtained from the items included in the model. The reliability test was conducted, and the results indicated Cronbach's alpha values as follows: 0.753 for attitude, 0.724 for intention to adopt, 0.912 for PA, 0.860 for PC, 0.939 for PEOU, and 0.863 for PU. Fact that data falls within 0.7 and 1 suggests that it is reliable. The questionnaire is thought to be reliable for future studies. High loadings on the variables were seen, which demonstrates the indicator reliability as shown by the factor loadings. According to Kannan and Tan (2005), high factor loading is indicated by values more than 0.70. All of the study's items have higher factor loadings, as seen in Table 3. Convergent validity was evaluated in this research using average variance extracted (AVE). This analysis includes measurements that demonstrate a significant relationship between the measured items and alternative sets of identical measurement items. The recommended Average Variance Extracted (AVE) value is typically greater than 0.5, and in this case, every AVE value exceeded 0.5, confirming validity of measurement items. As seen in Table 3, AVE thus achieves the requirements for convergent validity. Additionally, it was discovered that the composite reliability for every variable was above 0.5, demonstrating reliability of measurement items.

Table 3: Measurement Model

Constructs	**Item**	**Loadings**	**M**	**SD**	**Cronbach's alpha**	**AVE**	**CR**
Attitude	A1	0.819	3.44	1.233	0.753	0.671	0.755
	A2	0.764	3.60	1.242			
	A3	0.871	3.30	1.358			
Intention to adopt	IA1	0.822	3.47	1.150	0.724	0.645	0.740
	IA2	0.853	3.12	1.309			
	IA3	0.729	3.24	1.195			
Perceived Anthropomorphism	PA1	0.873	3.91	1.197	0.912	0.790	0.915
	PA2	0.892	3.86	1.165			
	PA3	0.883	3.72	1.132			
	PA4	0.907	3.83	1.126			
Perceived Ease of Use	PE1	0.900	3.85	1.139	0.939	0.846	0.943
	PE2	0.929	4.00	1.122			
	PE3	0.931	3.97	1.093			
	PE4	0.918	3.92	1.062			
Perceived Usefulness	PU1	0.865	4.02	1.136	0.863	0.785	0.865
	PU2	0.915	4.06	1.040			
	PU3	0.879	3.85	1.133			
Privacy Concern	PC1	0.776	2.47	1.367	0.860	0.696	0.886
	PC2	0.855	3.17	1.459			
	PC3	0.864	3.19	1.464			
	PC4	0.838					

Cross-loadings and HTMT correlation ratios were used to access discriminant validity. Cross-loadings are first stage in determining discriminant validity of indicators, as shown in Table 4. In this study, it is perceived that requirement of outer loadings being greater than cross-loadings has been satisfied, indicating that discriminant validity has been established.

Table 4: Cross Loading

	A	IA	PA	PC	PE	PU
A1	0.819	0.448	0.434	0.135	0.473	0.396
A2	0.764	0.458	0.555	0.188	0.601	0.574
A3	0.871	0.592	0.466	0.110	0.417	0.398
IA1	0.505	0.822	0.396	0.223	0.426	0.418
IA2	0.545	0.853	0.226	0.185	0.218	0.306
IA3	0.418	0.729	0.470	0.097	0.509	0.545
PA1	0.505	0.395	0.873	0.244	0.747	0.574
PA2	0.488	0.368	0.892	0.235	0.703	0.561
PA3	0.573	0.402	0.883	0.191	0.626	0.551
PA4	0.548	0.391	0.907	0.234	0.684	0.570
PC1	0.185	0.266	0.080	0.775	0.030	0.137
PC2	0.102	0.159	0.372	0.855	0.394	0.336
PC3	0.101	0.141	0.323	0.864	0.390	0.312
PC4	0.160	0.108	0.181	0.838	0.281	0.245
PE1	0.513	0.351	0.651	0.203	0.900	0.596
PE2	0.559	0.417	0.777	0.258	0.929	0.689
PE3	0.559	0.448	0.705	0.301	0.931	0.748
PE4	0.609	0.471	0.710	0.290	0.918	0.725
PU1	0.471	0.373	0.635	0.258	0.741	0.865
PU2	0.503	0.525	0.580	0.233	0.668	0.915
PU3	0.520	0.457	0.480	0.275	0.598	0.879

The HTMT correlation relationship was used to assess constructs' discriminant validity. This method evaluates the correlation between the variables in order to evaluate the HTMT of the correlations. Given that it achieves the lowest specificity rates across all the simulated circumstances, HTMT is a useful criterion. Results from the HTMT that are close to 1 indicate that the test has no discriminant validity. It is compared to a predetermined threshold using the HTMT standard. A higher HTMT result indicates that discriminant validity is lacking. HTMT threshold that is suggested is 0.85. As indicated in Table 5, all of the Heterotrait Monotrait correlation ratio test values indicate that discriminant validity has been demonstrated, i.e., less than 0.85.

Table 5: HTMT

	A	IA	PA	PC	PE	PU
A						
IA	0.820					
PA	0.712	0.557				
PC	0.200	0.263	0.324			
PE	0.720	0.577	0.838	0.369		
PU	0.690	0.665	0.719	0.356	0.836	

Structural Model

The second step in Smart PLS involves the evaluation of the structural model using beta (β), R^2, and t-values, which are derived from 5,000 samples through the bootstrapping technique, as outlined by Hair et al. (2016). It is worth noting that Hair et al. emphasized the importance of the total effect size (F^2) because, unlike the p-value, which only confirms the presence of an impact without quantifying its magnitude, F^2 provides information about the size of the effect.

Both substantive significance (impact size) and statistical significance (p-value) play crucial roles in reporting and comprehending research findings. To assess effect sizes, the study followed Cohen's 1998 recommendations, where 0.02 small, 0.15 medium , and 0.35 largely effect. As indicated in Table 6, the results demonstrate the presence of substantial significance in the study.

Results

As depicted in Figures 2 and 3, the study employed "partial least square" (PLS) Smart PLS to test model's hypotheses, and outcomes were analyzed using the path model. The results revealed significant relationships as follows:

- A significant relationship was found between Perceived Anthropomorphism and attitude (β=0.284, t=3.219, p=0.001), providing support for **H1.**
- Relationship between PEOU and attitude was also found to be significant, with values of β=0.242, t=2.095, and p=0.036, supporting **H2.**
- Perceived Usefulness exhibited a significant link with attitude, as suggested by **H3**, with β=0.207, t=2.210, and p=0.027.
- Privacy Concern was found to have a direct association with attitude (β=-0.023, t=2.227, p=0.021), which is supporting for **H4.**
- Additionally, a positive significant impact of attitude on intention to adopt was observed, confirming support for **H5** (β=0.613, t=10.280, p=0.000).

Table 6: Summary of Hypothesis Testing

Hypothesis	Relationship	Path coefficient	F^2	T-value	P-value	Hypothesis Testing	VIF
H1	PA -> AT	0.284	0.056	3.219	0.001	Supported	2.534
H2	PE -> AT	0.242	0.029	2.095	0.036	Supported	3.504
H3	PU -> AT	0.207	0.032	2.210	0.027	Supported	2.370
H4	PC ->AT	-0.023	0.025	2.227	0.021	Supported	1.106
H5	AT -> IA	0.613	0.603	10.280	0.000	Supported	1.000

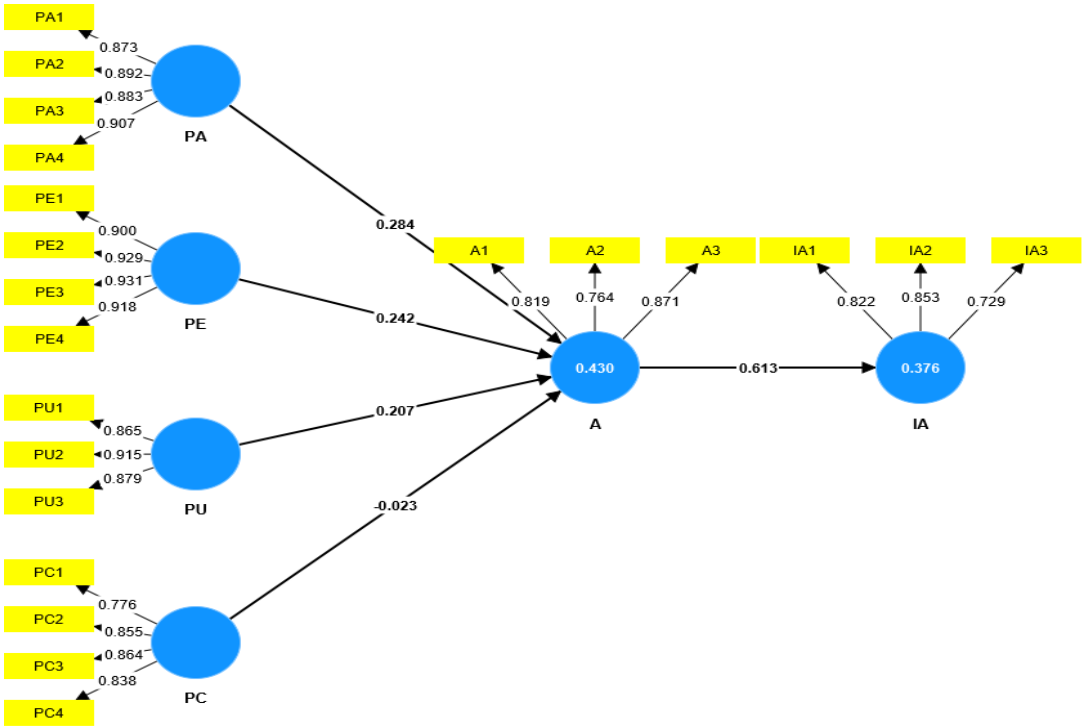

Figure 2: Measurement Model

Discussion:
This study is based in one Asia country i.e., Kingdom of Saudi Arabia in which researcher try to examine impact of PA, PEOU, PU, and PC and attitude on intent to adopt AI banking services according to consumer's perspective. AI has assumed a significant role in present modern world across various aspects of life. Many countries that are developed or in the phase of development are going to incorporate AI services in every industry and sector. Most importantly in banking sector. Given the rapid momentum of advancement in technology, AI plays a vital role for both humans and businesses, particularly within the banking sector where there exists a need to prevent transactions from fraud.

The first postulate of the present research is focused to analyze impact of perceived anthropomorphism on consumer's attitude towards intention to adopt AI banking services in kingdom of Saudi Arabia. Analytical results highlights (β=0.284, t=3.219, p=0.001) which depict that H1 is supported. Moreover, the current study explained that the residents of Saudi Arabia show more anthropomorphic attitudes towards AI adoption in banking sector. Second postulate of this research is aims to examine influence of PEOU on attitude towards AI adoption in banking sector in KSA. Following values of β=0.242, t=2.095, and p=0.036 shows that H2 is accepted. The results show that Saudi Arabian customers feel easy towards the use of AI technology because it is uncomplicated and straightforward.

The third hypothesis is also accepted because its statistical results β= 0.207, t= 2.210, p= 0.027, shows that PU has positive relation with attitude. Current research findings also highlight that Saudi Arabian consumers have trust to adopt a new system because they have believed that the new technology would enhance their skills in better way and beneficial for them. The fourth hypothesis indicates that privacy concerns also have a very strong influence on attitude as it results shows (β=-0.023, t=2.227, p=0.021) acceptance of H4. It shows that Saudi Arabian customers show less concern to reveal their personal information in front of 3rd body. The last hypothesis shows impact of attitude on AI adoption in banking industry. Results (β=0.613, t=10.280,p=0.000) proves that there is significant relation among attitude as well as AI intent to adopt banking services in KSA. They show that Saudi Arabian customers have positive approach towards AI adoption in banking sector because of its beneficial outcomes.

Furthermore, this study expands its assembling of research on performance of the AI in banks of KSA by undertaking the relevant predictor that are PA, PEOU, PU, PC and attitude. Following part of the discussion outlines the key findings of the research:

This research is conducted in Saudi Arabia because it is one of the most important country in which banking system becomes advanced with the passage of time. This research study uses TAM to comprehend customer's behavior and attitude towards use as well as acceptance of technology. The current study included the PA, PEOU, PU, PC and attitudes to extend TAM. In harmony with the earlier researches on subject of intention to adopt new technologies (Chen et al., 2023; Pillai & Sivathanu, 2020; Tehseen et al., 2017), this current research also concludes that there is a positive impact of PA, PEOU, PU and attitudes on intention to adopt AI services in banking system.

Practical implications:
Findings of this research study provide a variety of practical insights that can be significant for effectively planning, executing and promoting AI services within various sectors and industries. First, senior managers and policy makers of financial institutions should make relevant policies and marketing strategies so that the advanced financial services are aligned with the needs of the customers. Second, the current research also highlights the awareness and importance of perceived anthropomorphism, PEOU, PU, privacy concerns and attitude in intent to adopt AI banking services. Due to this the positive image of the banks would be created in the eyes of the consumers because of reliable and trustworthy services. This will boost the positive reputation of the banking services. Third, the higher management should be familiar with the strategy through which they can attract and convince many users to adopt AI technology by comprehending basic stage of adaptation. The ultimatum is that the main user will fully understand the all types of self-service technology. Banking sector should conduct online training to solve the problems related to self service.

Fourth, if technology is useful, EU and virtuous then it will have positive impact on intent to adopt AI services. Bank's manager could practice this postulate to change the method of online banking to virtual banking. Fifth, conventional banks are actively looking for cost-efficient methods to protect their market size by providing online services. This trend was especially noticeable during the era of COVID-19. Consequently, AI-driven banking services are unlikely to remain exclusive to branchless banks like virtual banks. Sixth, according to findings perceived anthropomorphism has positive impact on intent to adopt AI banking services. So, researchers as well asmanagers can implement the concept of anthropomorphism on AI based industries and businesses (Moussawi and Koufaris, 2019). Furthermore, the findings in the research predict the importance of customer's PU and PEOU when they adopt AI banking services. In result this finding can suggest managers and marketers to use this data to make more conspiring, appealing, convenient, and indisputable. This PEOU significantly influences the consumer's perspective to enhance adoption of AI banking services.

Limitations and Future research:

Although this research provides very significant understanding of PA, PEOU, PU, PC and attitudes on intention to adopt AI banking services but still there is a set of limitations which were discussed here. Firstly, to extend future research researchers have come across with many others variables, moderators and mediators that are not incorporated in current research and those variables are performance expectancy, effort expectancy, privacy enablers (trust, information richness), perceived level of AI intelligence, perceived enjoyment and complexity etc. Furthermore, this study is conducted in only one Asian country i.e. KSA. Researcher can also used this same model to carry out this research in other Asia countries like Pakistan, India, and Japan for attaining more generalize findings and results. Thirdly, the present study follows the cross sectional technique, but for the future research researcher can also implement longitudinal technique to investigate the variables in current research on intention to adopt AI banking services. Fourthly, this research analyzes consumer behavior through a questionnaire. For future studies, it would be beneficial to focus on real AI service users, specifically those who have adopted the technology. This approach has potential to enhance validity of results, making a substantial contribution to the advancement of AI service applications. Moreover, in present research, we exclusively focused on the banking sector. However, in future study, we plan to extend our scope to include other financial sectors for more comprehensive analysis. As AI technology becomes more widely integrated into the business prospect, it is possible that results of this current study may evolve with passage of time. Consequently, it becomes imperative to conduct further research aimed at examining the variations in customer intentions among early users and late users of AI within banking sector. Additionally, it's worth noting that cultural differences were not taken into consideration in this research. Therefore, conducting a comparative research study between developed and emerging countries would be a valuable addition to existing body of knowledge in banking field.

References:

1. Agarwal, P., Swami, S., & Malhotra, S. K. (2022). Artificial intelligence adoption in the post COVID-19 new-normal and role of smart technologies in transforming business: a review. Journal of Science and Technology Policy Management.
2. Airenti, G. (2015). The cognitive bases of anthropomorphism: from relatedness to empathy. International Journal of Social Robotics, 7, 117-127.
3. Alsyouf, A.; Masa'Deh, R.; Albugami, M.; Al-Bsheish, M.; Lutfi, A.; Alsubahi, N. Risk of Fear and Anxiety in Utilising Health App Surveillance Due to COVID-19: Gender Differences Analysis. Risks 2021, 9, 179.
4. Amin, H.; Rahman, A.R.A.; Razak, D.A. Consumer acceptance of Islamic home financing. Int. J. Hous. Mark. Anal. 2014, 7, 307–332.
5. Barclay, D., Higgins, C. and Thompson, R. (1995), "The partial least squares (PLS) approach to causal modelling: personal computer adoption and use as an illustration, technology studies", Special Issue on Research Methodology, Vol. 2 No. 2, pp. 285-309.
6. Biswas, A.; Bhattacharjee, U.; Chakrabarti, A.K.; Tewari, D.N.; Banu, H.; Dutta, S. Emergence of Novel Coronavirus and COVID-19: Whether to stay or die out? Crit. Rev. Microbiol. 2020, 46, 182–193.

7. Burgoon, J. K., Bonito, J. A., Bengtsson, B., Cederberg, C., Lundeberg, M., & Allspach, L. (2000). Interactivity in human–computer interaction: A study of credibility, understanding, and influence. Computers in Human Behavior, 16(6), 553-574
8. Butt, A.H., Ahmad, H., Goraya, M.A.S., Akram, M.S. and Shafique, M.N. (2021), "Let's play: me and my AI-powered avatar as one team", Psychology & Marketing, Vol. 38 No. 6, pp. 1014-1025, doi: 10.1002/ mar.21487
9. Castelo, N., Bos, M.W. and Lehmann, D.R. (2019), "Task-dependent algorithm aversion", Journal of Marketing Research, Vol. 56 No. 5, pp. 809-825, doi: 10.1177/0022243719851788.
10. Chou, S. Y., Lin, C. W., Chen, Y. C., & Chiou, J. S. (2023). The complementary effects of bank intangible value binding in customer robo-advisory adoption. International Journal of Bank Marketing.
11. Consultants, M. Benefits of Artificial Intelligence in the Banking Sector; Millinium Consultants: Kuala Lumpur, Malaysia, 2022; Available online: https://www.millenniumci.com/benefits-of-artificial-intelligence-in-the-banking-sector (accessed on 11 September 2022).
12. Davis, F.D. (1989), "Perceived usefulness, perceived ease of use, and user acceptance of information technology", MIS Quarterly, Vol. 13 No. 3, p. 319
13. Davis, F.D. A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results. Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA, USA, 1985. 88.
14. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989, 13, 319–340
15. Davis, R., & Wong, D. (2007). Conceptualizing and measuring the optimal experience of the eLearning environment. *Decision Sciences Journal of Innovative Education*, *5*(1), 97-126.
16. Dietvorst, B.J., Simmons, J.P. and Massey, C. (2015), "Algorithm aversion: people erroneously avoid algorithms after seeing them err", Journal of Experimental Psychology: General, Vol. 144 No. 1, pp. 114-126, doi: 10.1037/xge0000033.
17. Dinh, C. M., & Park, S. (2023). How to Increase Consumer Intention to Use Chatbots? An Empirical Analysis of Hedonic and Utilitarian Motivations on Social Presence and the Moderating Effects of Fear across Generations. Electronic Commerce Research. H. Alboqami DOI: 10.4236/ajibm.2023.134014 210
18. Hair, J.F. Jr, Hult, G.T.M., Ringle, C. and Sarstedt, M. (2016), A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM), Sage Publications, Thousand Oaks, CA.
19. Hair, J.F., Ringle, C.M. and Sarstedt, M. (2011), "PLS-SEM: indeed a silver bullet", Journal of Marketing Theory and Practice, Vol. 19, pp. 139-152.
20. Hancock, P. A., Billings, D. R., & Schaefer, K. E. (2011). Can you trust your robot? Ergonomics in Design: The Quarterly of Human Factors Applications, 19(3), 24–29. https://doi.org/10.1177/106480461 1415045
21. Hua, X., Huang, Y., 2021. Understanding China's fintech sector: development, impacts and risks. Eur. J. Financ. 27 (4–5), 321–333.
22. Huang, M. H., & Rust, R. T. (2018). Artificial intelligence in service. Journal of Service Research, 21(2), 155-172
23. Iancu, I., & Iancu, B. (2022). Interacting with Chatbots Later in Life: A Technology Acceptance Perspective in COVID-19 Pandemic Situation. Frontiers in Psychology, 13, Article ID: 1111003. https://doi.org/10.3389/fpsyg.2022.1111003
24. Kaakeh, A.; Hassan, M.K.; Almazor, S.F.V.H. Factors affecting customers' attitude towards Islamic banking in UAE. Int. J. Emerg. Mark. 2019, 14, 668–688.
25. Kannan, V.R. and Tan, K.C. (2005), "Just in time, total quality management, and supply chain management: understanding their linkages and impact on business performance", Omega, Vol. 33, pp.
26. Kaushik, A.K., Agrawal, A.K. and Rahman, Z. (2015), "Tourist behaviour towards self-service hotel technology adoption: trust and subjective norm as key antecedents", Tourism Management Perspectives, Vol. 16, pp. 278-289
27. Kim, H. Y., & McGill, A. L. (2018). Minions for the rich? Financial status changes how consumers see products with anthropomorphic features. Journal of Consumer Research, 45(2), 429-450.

28. Kim, H., Kim, T. and Shin, S.W. (2009), "Modeling roles of subjective norms and eTrust in customers'
acceptance of airline B2C eCommerce websites", Tourism Management, Vol. 30 No. 2, pp. 266-277
29. Kim, S., & McGill, A. L. (2011). Gaming with Mr. Slot or gaming the slot machine? Power, anthropomorphism, and risk perception. Journal of Consumer Research, 38(1), 94-107.
30. Lok, C.K. Adoption of smart card-based e-payment system for retailing in Hong Kong using an extended technology acceptance model. In E-Services Adoption: Processes by Firms in Developing Nations; Emerald Group Publishing Limited: Bingley, UK, 2015; Volume 23B, pp. 255–466.
31. Lombardi, R., Paoloni, P., Belyaeva, Z., & Shams, S. R. (2020). Guest editorial: Smart technologies for sustainable business model: Adaptation challenges and prospects in economic and cultural drift. Management Decision, 58(8), 1517-1524
32. Longoni, C., Bonezzi, A. and Morewedge, C.K. (2019), "Resistance to medical artificial intelligence", Journal of Consumer Research, Vol. 46 No. 4, pp. 629-650, doi: 10.1093/jcr/ucz013.
33. Lu, L., Cai, R., & Gursoy, D. (2019). Developing and validating a service robot integration willingness scale. International Journal of Hospitality Management, 80, 36-51.
34. Malhotra, N. K., Kim, S. S., & Agarwal, J. (2004). Internet users' information privacy concerns (IUIPC): The construct, the scale, and a causal model. Information Systems Research, 15(4), 336–355. https://doi.org/10.1287/isre.1040.0032
35. Maskeliunas, R.; Damaševi˘cius, R.; Segal, S. A review of internet of things technologies for ambient assisted living environments. ¯ Futur. Internet 2019, 11, 259
36. Mokmin, N. A. M., & Ibrahim, N. A. (2021). The Evaluation of Chatbot as a Tool for Health Literacy Education among Undergraduate Students. Education and Information Technologies, 26, 6033-6049. https://doi.org/10.1007/s10639-021-10542-y
37. Moussawi, S., &Koufaris, M. (2019). Perceived Intelligence and Perceived Anthropomorphism of Personal Intelligent Agents: Scale Development and Validation.
38. Mustak, M., Salminen, J., Ple, L. and Wirtz, J. (2021), "Artificial intelligence in marketing: topic modeling, scientometric analysis, and research agenda", Journal of Business Research, Vol. 124, pp. 389-404, doi: 10.1016/j.jbusres.2020.10.044.
39. Northey, G., Hunter, V., Mulcahy, R., Choong, K., & Mehmet, M. (2022). Man vs machine: how artificial intelligence in banking influences consumer belief in financial advice. International Journal of Bank Marketing, (ahead-of-print).
40. Oh, H., Jeong, M. and Baloglu, S. (2013), "Tourists' adoption of self-service technologies at resort hotels",
Journal of Business Research, Vol. 66 No. 6, pp. 692-699
41. Park, B., Chang, H., & Park, S. S. (2019). Adoption of digital devices for children education: Korean case. *Telematics and Informatics*, *38*, 247-256.
42. Park, S. S., Tung, C. D., & Lee, H. (2021). The adoption of AI service robots: A comparison between credence and experience service settings. *Psychology & Marketing*, *38*(4), 691-703.
43. Pillai, R., & Sivathanu, B. (2020). Adoption of AI-based chatbots for hospitality and tourism. *International Journal of Contemporary Hospitality Management*, *32*(10), 3199-3226.
44. Ragheb, M. A., Tantawi, P., Farouk, N., & Hatata, A. (2022). Investigating the Acceptance of Applying Chat-Bot (Artificial Intelligence) Technology among Higher Education Students in Egypt. International Journal of Higher Education Management, 8, 1-13. https://doi.org/10.24052/IJHEM/V08N02/ART-1
45. Rahman, M.; Ming, T.H.; Baigh, T.A.; Sarker, M. Adoption of artificial intelligence in banking services: An empirical analysis. Int. J. Emerg. Mark. 2022; ahead-of-print.
46. Rasheed, H. M. W., Chen, Y., Khizar, H. M. U., & Safeer, A. A. (2023). Understanding the factors affecting AI services adoption in hospitality: The role of behavioral reasons and emotional intelligence. *Heliyon*.
47. Ren, X. (2020). Artificial Intelligence and Depression: How AI Powered Chatbots in Virtual Reality Games May Reduce Anxiety and Depression Levels. Journal of Artificial Intelligence Practice, 3, 48-58. (In Chinese)
48. Ringle, C.M., Wende, S. and Becker, J.M. (2015), SmartPLS 3. SmartPLS GmbH, Boenningstedt.

49. Rosman, C. (2018). Mad about Erica: Why a million people use bank of America9s chatbot. American Banker, New York, NY. www. americanbanker. com/news/mad-about-erica-why-amillion-peopleuse-bank-of-americas-chatbot
50. Ross, S. What percentage of the global economy is comprised of the financial services sector. Investopedia 2015, 5, 2015. Available online: https://www.investopedia.com/ask/answers/030515/what-percentage-global-economy-comprised-financial-servicessector.asp (accessed on 11 September 2022).
51. Safari, K.; Bisimwa, A.; Armel, M.B. Attitudes and intentions toward internet banking in an under developed financial sector. PSU Res. Rev. 2020, 6, 39–58.
52. Stock, R. M., & Merkle, M. (2017, March). A service robot acceptance model: User acceptance of humanoid robots during service encounters. In 2017 IEEE international conference on pervasive computing and communications workshops (PerCom Workshops) (pp. 339-344). IEEE.
53. Suhartanto, D.; Dean, D.; Ismail, T.A.T.; Sundari, R. Mobile banking adoption in Islamic banks: Integrating TAM model and religiosity-intention model. J. Islam. Mark. 2020, 11, 1405–1418.
54. Thaker, M.A.B.M.T.; Pitchay, A.B.A.; Thaker, H.B.M.T.; Amin, M.F.B. Factors influencing consumers' adoption of Islamic mobile banking services in Malaysia: An approach of partial least squares (PLS). J. Islam. Mark. 2019, 10, 1037–1056.
55. Van Dyke, T., Midha, V., & Nemati, H. (2007). The effect of consumer privacy empowerment on trust and privacy concerns in e- commerce. Electronic Markets, 17(1), 68–81. https://doi.org/10.1080/10196780601136997
56. Van Slyke, C., Shim, J. T., Johnson, R., & Jiang, J. (2006). Concern for information privacy and online consumer purchasing. Journal of the Association for Information Systems, 7(6), 415–444. https://doi.org/10. 17705/1jais.00092
57. Van Slyke, C., Shim, J. T., Johnson, R., & Jiang, J. (2006). Concern for information privacy and online consumer purchasing. Journal of the Association for Information Systems, 7(6), 415–444. https://doi.org/10. 17705/1jais.00092
58. Venkatesh, V., Hoehle, H., Aloysius, J.A., Nikkhah, H.R., 2021. Being at the cutting edge of online shopping: Role of recommendations and discounts on privacy perceptions. Comput. Hum. Behav. 121, 106785.
59. Yousafzai, S.Y., Foxall, G.R. and Pallister, J.G. (2007), "Technology acceptance: a meta-analysis of the TAM: part 1", Journal of Modelling in Management, Vol. 2 No. 3, pp. 251-280, doi: 10.1108/17465660710834453.
60. Yu, X., Xu, S. and Ashton, M. (2023), "Antecedents and outcomes of artificial intelligence adoption and application in the workplace: the socio-technical system theory perspective", Information Technology & People, Vol. 36 No. 1, pp. 454-474, doi: 10.1108/ITP-04-2021-0254