

Trust in Avatars for Financial Transactions

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SUMMARY

As ATMs evolve beyond cash dispensing, AI-driven avatars are being explored to support complex self-service transactions. These interactions are high-stakes and trust-dependent, yet little empirical evidence exists on how users respond to avatar-mediated financial interfaces during real tasks. We report a human-factors study with 30 participants using an avatar-enhanced ATM prototype across routine and complex financial scenarios. Results show that users were comfortable engaging with the avatar for procedural stages of transactions but preferred human involvement at points requiring interpretation, reassurance, or accountability. Our findings show that trust in avatar systems is not binary; trust boundaries shift within a transaction depending on task demands. We identify design principles for transparency, accountability, and human fallback essential for integrating AI avatars into financial self-service systems.

KEYWORDS

Avatars; Trust; Transparency; Artificial Intelligence; Financial Services

Introduction

As financial institutions accelerate digital transformation, a misalignment has emerged between legacy service points and evolving customer expectations. Nowhere is this more visible than in the role of the ATM. Initially designed for cash dispensing, the ATM is increasingly being repositioned as a self-service portal for tasks traditionally handled by human tellers, including resolving issues, handling account queries, and guiding complex transactions. However, most current ATM interfaces remain rooted in transactional simplicity and lack the conversational and relational affordances required for this expanded role. Simply adding AI to these interfaces is not sufficient. Financial services are high-stakes, emotionally charged, and trust-dependent, and users must feel confident delegating sensitive tasks to automated systems in situations characterised by uncertainty and vulnerability (Lee & See, 2004; Mayer et al., 1995). Prior research in digital banking consistently demonstrates that perceived security, reliability, and transparency are central to trust formation and subsequent adoption of new financial technologies (Geebren et al., 2021). This challenge becomes even more pronounced when automated agents take on human-like characteristics, as anthropomorphic systems introduce new affective and social dimensions of trust that go beyond traditional usability or performance considerations (Chi & Yu, 2023; Nass et al., 1994).

Avatars are becoming increasingly prominent across customer-facing sectors as proxies for human interaction (Nass et al., 1994; Guo et al., 2023). In financial services, they offer the potential to provide conversational guidance, reassurance, and real-time support during self-service transactions. However, their success depends on how design, transparency, and human fallback mechanisms influence users' willingness to engage (Law et al., 2022; Liu et al., 2021). Our work investigates how AI-driven avatars can be responsibly integrated into ATM interfaces by

understanding where users are comfortable delegating control, where trust breaks down, and how transitions to human support must be designed to sustain confidence.

We evaluated a working avatar-integrated ATM prototype with 30 participants using a structured series of pre-study questionnaires, card-sorting activities, task-based transaction walkthroughs, and qualitative interviews. Participants considered autonomous avatar interactions across a spectrum of low- to high-stakes financial scenarios, including cash withdrawal, reporting fraud, setting up standing orders, and handling unsuccessful loan applications. This methodology allowed us to examine how trust formation, emotional response, and interaction preferences shift at different stages within financial tasks.

This paper provides an evidence base for how avatar technologies can be integrated into high-stakes financial self-service systems. Our findings show that users do not make a binary decision about trusting avatars; instead, trust boundaries shift within a transaction depending on perceived risk, emotional load, and the need for accountability. We identify human-factors design principles relating to transparency, auditability, avatar realism, accessibility, and human fallback that are essential for moving avatar-based ATMs from technological novelty to trusted service platforms.

Related Work

Traditional models of technology acceptance, such as TAM and UTAUT, explain general adoption behaviour but do not adequately account for the vulnerability and perceived risk inherent in financial systems (Davis, 1989; Venkatesh et al., 2003). Consequently, many studies extend these models with trust as an additional factor, demonstrating that trust strongly influences behavioural intention to use online banking (Alalwan et al., 2017; Chong et al., 2010; Kumar et al., 2023). Importantly, this work also shows that trust in finance is not purely cognitive. Affective factors such as comfort, emotional reassurance, and familiarity significantly shape adoption, particularly when users feel anxious, uncertain, or exposed to risk (Ampaw et al., 2022; Rajaobelina et al., 2018).

With the introduction of AI into banking through chatbots and conversational agents, additional dimensions of trust become relevant (Ng et al., 2020; Chi & Hoang Vu, 2023). Research shows that communication quality, personalisation, empathy response, and system repair following breakdowns influence trust in financial chatbots (Chi & Hoang Vu, 2023; Dekkal et al., 2024; Law et al., 2022). Human-likeness alone does not guarantee trust; in some cases, users prefer systems that are clearly automated when handling sensitive financial data (Ng et al., 2020; Lappeman et al., 2023). Prior trust in the banking brand and positive previous experience with chatbots also significantly influence initial trust in AI systems (Lappeman et al., 2023; Law et al., 2023; Schreibelmayer et al., 2023). However, most of this work relies on survey-based modelling rather than observation of users interacting with AI systems during real financial tasks.

Trust in Avatars, Cognitive Load, and Human Handover

A substantial body of research has examined trust in avatars, virtual agents, and embodied conversational systems across retail, healthcare, and education (Pan & Steed, 2016; Guo et al., 2023). Findings are mixed regarding realism. While highly realistic avatars can increase perceived trustworthiness, they can also elicit discomfort through the “uncanny valley” effect when realism is imperfect (McDonnell et al., 2012; Song & Shin, 2024; Ciechanowski et al., 2019). Users consistently value clarity, responsiveness, and coherence over photorealistic design (Craig et al., 2019; Cherif & Lemoine, 2019).

Cognitive load further shapes how users interpret and trust automated systems. Research shows that as task complexity increases, users rely less on visual or social cues and more on emotional heuristics (Peña & Yoo, 2014). Under cognitive strain, people find it harder to evaluate the

reliability of automated systems and are more likely to seek reassurance or human intervention (Gupta et al., 2019; Mainali & Weber, 2025). While avatars can reduce cognitive demand in simple tasks by guiding attention and supporting working memory, they may become distracting or ineffective when tasks become complex or emotionally charged (Steed et al., 2016; Chang et al., 2022; Rettinger et al., 2022).

Closely related to this is literature on human fallback in AI-assisted systems. Research consistently shows that user trust and satisfaction depend on designing effective, transparent handovers between automated and human support. Poorly managed transitions lead to confusion, frustration, and loss of confidence, particularly in high-stakes environments. Effective systems treat automation as a triage mechanism that supports, rather than replaces, human involvement (Liu et al., 2021; Følstad et al., 2018).

Gap in the Literature and Research Direction

Taken together, existing research demonstrates that trust is fundamental in digital banking, that AI introduces new dimensions of trust, and that avatar design, cognitive load, and human handover all influence user perceptions (Alalwan et al., 2017; Chi & Hoang Vu, 2023). However, these strands of work remain largely separate. Trust in banking is typically studied through surveys and adoption models (Chong et al., 2010; Bashir & Madhavaiah, 2015; Kumar et al., 2023). Avatar research is conducted primarily in low-risk domains (Craig et al., 2019; McDonnell et al., 2012; Gao et al., 2025). Human fallback is explored in chatbot architectures rather than embodied financial interfaces (Liu et al., 2021).

Very little empirical evidence examines how these factors interact in real financial transactions in self-service environments such as ATMs, where users must make decisions under varying emotional load, perceived risk, and accountability. In particular, no prior work examines how trust shifts at different stages within a single financial task when mediated by an avatar. This gap motivates our research question: How do design, transparency, and human handover influence user trust and acceptance of AI-driven ATMs during real financial tasks?

Method

We conducted a qualitative human-factors study to answer our research questions. This consisted of five sequential stages: (1) a pre-session questionnaire capturing demographics, banking habits, and comfort with digital transactions; (2) a card-sorting activity where participants categorised common financial tasks according to whether they preferred human, digital, or either interaction; (3) a demonstration of an avatar-enhanced ATM interface; (4) an activity-based transaction walkthrough where participants indicated interaction preferences at specific stages of four realistic financial scenarios; and (5) open-ended interview questions exploring trust, comfort, and transparency.

Participants

Thirty participants were recruited through mailing lists and social networks using a snowball approach. Participants were aged between 18 and over 65 (18–24: 6; 25–34: 9; 35–44: 6; 45–54: 3; 55–64: 1; 65+: 5). Fourteen identified as female, fifteen as male, and one as non-binary/other. Participants represented a range of educational backgrounds from high school to doctorate level and a mixture of employment statuses, including students, full and part-time employees, and retirees. All participants engaged in regular banking activity and reported frequent use of online banking.

Apparatus

A custom Vue.js application was developed to simulate an ATM interface enhanced with AI avatar support. The application was hosted locally and displayed on a large touch-enabled commercial

display to replicate the physical scale and interaction style of an ATM. Participants could complete standard ATM functions including card presentation, PIN entry, balance checks, and cash withdrawal. At any stage, an AI avatar could be invoked via a “Call a Teller” function, providing step-by-step conversational guidance through the transaction.

Procedure and Analysis Technique

Participants first completed the pre-session questionnaire before engaging in the initial card-sort task, categorising financial activities under ‘human’, ‘digital’, or ‘either’, while thinking aloud. They then observed a two-part demonstration of the ATM interface: first completing a transaction without avatar assistance, followed by a transaction guided by the avatar. Following the demonstration, participants revisited the card-sort and were invited to change any placements in light of the avatar interaction.

Participants then engaged with a paper-based flow-chart activity representing four financial transaction scenarios selected to represent varying levels of perceived risk and emotional complexity: withdrawing cash, setting up a standing order (including resolving an issue), reporting a stolen card, and responding to an unsuccessful loan application. At each stage of these flows, participants indicated whether they preferred a human, the avatar, or no preference, explaining their reasoning aloud and via annotations. The session concluded with open-ended questions exploring trust, comfort, efficiency, and perceptions of transparency in avatar-mediated financial transactions.

All sessions were audio-recorded and transcribed. A thematic analysis approach was used to identify patterns of meaning across the dataset. Researchers first familiarised themselves with the transcripts before generating initial codes capturing key ideas related to trust, transparency, and comfort. In total, 178 codes were generated. These were grouped into broader patterns and refined through iterative review, resulting in four overarching themes and thirteen sub-themes grounded in participant accounts. Exemplar excerpts were selected to support reporting of each theme.

Behavioural Results

This section reports participants’ recorded interaction preferences during the questionnaire, card-sorting activities, and transaction flow task. These measures capture how preferences for human and digital interaction varied across transaction types and at different stages within transactions.

Baseline Comfort with Online and Branch Banking

Participants reported substantially higher comfort completing most financial tasks online compared to in a physical bank branch. Transactions such as checking account balances, sending or moving funds, and paying bills were almost universally rated as comfortable online. In contrast, tasks associated with problem resolution or higher perceived risk were rated as more comfortable in branch settings. These included resolving fraud or identity theft issues, fixing technical problems, withdrawing cash, and requesting loans or mortgages.

Pre- and Post-Demonstration Card Sort Preferences

In the initial card sort, routine transactions (checking balances, moving funds, paying bills, withdrawing cash, applying for a credit card) were predominantly placed in the ‘digital’ category. Transactions perceived as less frequent or higher-stakes (identity theft issues, loans and mortgages, technical issues, and debt issues) were predominantly placed in the ‘human’ category. Following the avatar ATM demonstration, participants were invited to revisit these placements. A number of transactions originally placed in the ‘human’ category were moved to either ‘digital’ or ‘either’.

Preferences Across Transaction Stages

The most detailed behavioural data emerged from the flow-chart activity, where participants indicated their preferred mode of interaction at specific stages of four transaction scenarios: cash withdrawal, setting up a standing order (including resolving a setup issue), reporting a stolen card, and responding to an unsuccessful loan application.

For cash withdrawal, nearly all participants indicated a preference for avatar-led or self-led digital interaction at every stage of the transaction. A similar pattern was observed for setting up a standing order, including resolving issues during setup. For reporting a stolen card, most participants indicated a preference for digital interaction when initiating the report. However, when reviewing suspicious account activity following the report, 12 of the 30 participants (40%) indicated a preference for human involvement.

The most pronounced shift occurred in the loan application scenario. While participants indicated comfort using the ATM or avatar to submit the application, 19 of the 30 participants (over 60%) indicated a preference for human interaction when presented with a rejected loan outcome. Similarly, 20 of the 30 participants (66%) indicated a preference for human involvement when understanding the next steps following rejection.

Qualitative Findings

Our analysis generated 178 initial codes which were refined into four overarching themes and thirteen sub-themes. These themes explain the behavioural shifts reported in the previous section, particularly focusing on movement from digital to human preference at specific transaction stages.

Theme 1: Perceived Accuracy and Accountability Determine Willingness to Engage

Across all participants, accuracy was described as a baseline requirement for trusting an avatar-mediated system. Participants expected the system to perform transactions flawlessly and to provide visible confirmation of each step. Concerns were frequently raised about AI systems producing incorrect outputs, particularly where participants associated the avatar with large language models.

“I would not expect errors. I’d expect it to be accurate.” (P09)

“If it hallucinates... gives you a different address from what you entered... that’s worrying.” (P19)

“What I don’t trust yet is the underlying technology and the accuracy of it.” (P13)

Participants contrasted this with human accountability. Humans were perceived as less likely to make mistakes because they could be held responsible, with P7 stating that *“A person can be held accountable. A system can’t”*. This concern explains why participants were comfortable with the avatar for routine stages but preferred human involvement when outcomes required explanation or correction, such as reviewing suspicious transactions or responding to loan rejection. Participants also described the need for visible audit trails, confirmations, and receipts as mechanisms that would increase confidence.

“If it showed me exactly what it’s done, I’d trust it more.” (P21)

Theme 2: Visual Realism Does Not Build Trust and Can Reduce Comfort

Participants consistently rejected the idea that a more human-like avatar would increase trust. Highly realistic avatars were described as uncomfortable, distracting, or ‘uncanny’. Instead, participants preferred a stylised, professional appearance that clearly communicated the system’s artificial nature.

“If it looks too real, I don’t like it. It feels strange.” (P14)

“I don’t want it pretending to be a person.” (P22)

Trust was instead linked to clarity, coherence, and consistency between appearance, voice, and behaviour. P18 highlighted this, by stating that *“As long as it’s consistent and clear, that’s what matters”*.

Theme 3: Transparency About AI Operation Is Required for Acceptance

Participants repeatedly expressed a desire to understand when AI was active, what data were being processed, and how the system operated. Even where participants reported trust in their bank, they wanted reassurance about the avatar’s operation.

“I’d want to know what it’s doing with my data.” (P05)

“If it tells me what it’s doing, I’d feel better about it.” (P17)

“Is this running locally or sending my data somewhere?” (P08)

Participants described visible explanations, system feedback, and data handling cues as mechanisms that would improve trust. Observing the avatar demonstration increased participants’ comfort because it made system behaviour visible and understandable.

Theme 4: Human Involvement Is Expected at Points of Emotional or Interpretive Demand

Participants did not view human fallback as a failure of the system. Instead, they described it as an essential component of how such systems should operate. Human involvement was expected when transactions required interpretation, explanation, or emotional reassurance.

“If something goes wrong, I want a person immediately.” (P03)

“When it’s emotional or complicated, that’s when you want a human.” (P26)

This directly explains the behavioural pattern observed in the flow-chart task, where participants were comfortable with avatar support during routine stages but shifted to human preference when reviewing suspicious activity or receiving negative financial outcomes. Participants described this as a need for reassurance and explanation during moments of uncertainty.

How Trust Shifts Within a Financial Transaction

The behavioural and qualitative findings together show that participants did not make a binary judgement about whether they trusted the avatar system. Instead, trust boundaries shifted at specific points within transactions depending on perceived risk, emotional load, and the need for accountability. Participants were comfortable engaging with the avatar for routine, procedural stages of transactions such as entering a PIN, checking balances, withdrawing cash, or initiating a standing order. These stages were characterised by clear goals and minimal emotional demand.

However, this comfort changed at stages requiring interpretation, explanation, or emotional processing. When participants were asked to review suspicious account activity, respond to a rejected loan application, or understand the consequences of an unexpected outcome, preferences shifted toward human involvement. These stages were described as moments where reassurance, accountability, and explanation were more important than procedural guidance. This shift was driven by the nature of the task and the cognitive and emotional demands placed on the user at that point in the transaction. Participants did not require the avatar to appear more human to trust it; they required it to be accurate, and supported by visible pathways to human assistance when needed.

These findings suggest that trust in avatar-mediated financial systems is dynamic and task-dependent. Users evaluate not whether the system is trustworthy overall, but whether it is appropriate for the specific stage of the task they are currently performing. As a result, designing

avatar-based financial systems requires understanding where in a transaction users are willing to delegate control and where they expect human support to be available. This reframes the problem of “trust in avatars” as one of designing for shifting trust boundaries within complex tasks, rather than attempting to increase overall trust through anthropomorphism or interface design alone.

Design Implications for AI-Driven Financial Interfaces

Our findings highlight several design principles that are necessary if avatar-mediated systems are to be successfully integrated into high-stakes financial environments such as ATMs. These principles arise directly from how participants described trust, comfort, and accountability during the study.

1. Make System Actions Visible and Traceable - Participants repeatedly emphasised the importance of seeing what the system was doing at each step of a transaction. Visible confirmations, on-screen receipts, and clear feedback were described as mechanisms that would increase confidence in the system’s accuracy. Participants associated trust with being able to verify and retrace the system’s actions, rather than with how human the avatar appeared. Interfaces should therefore prioritise explicit confirmations, audit trails, and visual evidence of transaction steps to reinforce perceived reliability and accountability.

2. Avoid Over-Humanisation of Avatars - Greater visual realism did not increase trust and in many cases reduced comfort. Participants preferred stylised, professional representations that were clearly artificial but coherent in appearance, voice, and behaviour. This suggests that designers should avoid pursuing photorealism and instead focus on clarity, consistency, and usability. Attempts to make avatars appear “too human” risk introducing discomfort.

3. Explicitly Communicate AI Involvement and Data Handling - Participants expressed a strong desire to understand when AI was active, what data were being processed, and how the system operated. Even where baseline trust in the banking institution existed, participants sought reassurance through visible explanations of system processes. Interfaces should include clear indicators of AI activity, data handling practices, and system limitations to maintain transparency.

4. Design Human Escalation as a Normal Part of the Workflow - Human fallback was not viewed as a failure of the system but as an expected component of interaction. Participants anticipated the need for human involvement during emotionally charged or complex stages of transactions. Systems should therefore make escalation to human support straightforward, visible, and presented as a normal continuation of service rather than an exception. This supports continuity of trust across automated and human-mediated stages.

5. Introduce Avatars Gradually in Familiar Contexts - Participants suggested that initial hesitation toward avatar systems would reduce with exposure, particularly if such systems were introduced first in familiar digital environments such as online banking. Providing customisation options and accessible interface design was also seen as important for ensuring comfort across diverse user groups. Gradual introduction within trusted contexts can support adoption and reduce resistance to new interaction models.

Discussion

This study asked: *How do design, transparency, and human handover influence user trust and acceptance of AI-driven ATMs during real financial tasks?* Our findings show that these factors do not influence trust uniformly. Instead, they determine where within a transaction users are willing to engage with an avatar and where they prefer human involvement.

Design influenced comfort through clarity, coherence, and avoidance of over-humanisation rather than through realism. Transparency influenced acceptance by making system actions and data

handling visible, which increased participants' willingness to consider digital interaction for tasks they had previously associated with human support. Human handover was not perceived as a failure mode but as an essential component of interaction at stages involving interpretation, emotional processing, or perceived risk. Together, these results indicate that trust in avatar-mediated financial systems is dynamic and task-dependent. Participants did not evaluate whether they trusted the system overall; they evaluated whether it was appropriate for the task stage being performed.

This work was motivated by a practical shift occurring within the financial sector. ATMs are increasingly positioned as self-service access points for tasks traditionally handled by human tellers, including reporting fraud, managing standing orders, resolving technical issues, and handling loan applications. These changes are driven by operational cost, resilience, and customer convenience. However, these are precisely the interactions where perceived risk, emotional load, and the need for accountability are highest. The findings show that introducing avatar interfaces into these environments without understanding how users interpret trust within tasks risks undermining confidence in both the technology and the institution deploying it.

As financial institutions continue to digitise customer interactions and reduce reliance on physical branches, understanding where automation is accepted and where human presence remains essential becomes increasingly important. Avatar-mediated ATMs represent an early example of this transition, but similar patterns are likely to emerge across AI-mediated customer service platforms.

Designing such systems requires moving beyond questions of whether users trust AI and toward understanding where within complex tasks users are comfortable engaging with automated agents. The insights from this study provide guidance for integrating AI avatars into financial systems in ways that align with users' expectations for transparency, accountability, and human support.

Conclusion

This paper examined how users perceive and engage with AI-driven avatars within ATM interfaces during realistic financial tasks. Through a structured human-factors study combining behavioural measures and qualitative analysis, we showed that trust in avatar-mediated systems is not a binary judgement but a dynamic, task-dependent process.

Participants were comfortable using the avatar for routine, procedural stages of transactions but preferred human involvement at points requiring interpretation, emotional reassurance, or perceived accountability. These shifts were driven not by the avatar's realism or anthropomorphic qualities, but by the nature of the task, the clarity of system behaviour, and the availability of visible pathways to human support.

For financial institutions, ATM manufacturers, and designers of AI-mediated service systems, these insights highlight the importance of transparency, traceability, appropriate avatar design, and seamless human fallback. As customer-facing AI continues to expand across the financial sector, recognising where automation is accepted and where human presence remains essential will be critical to maintaining user confidence.

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