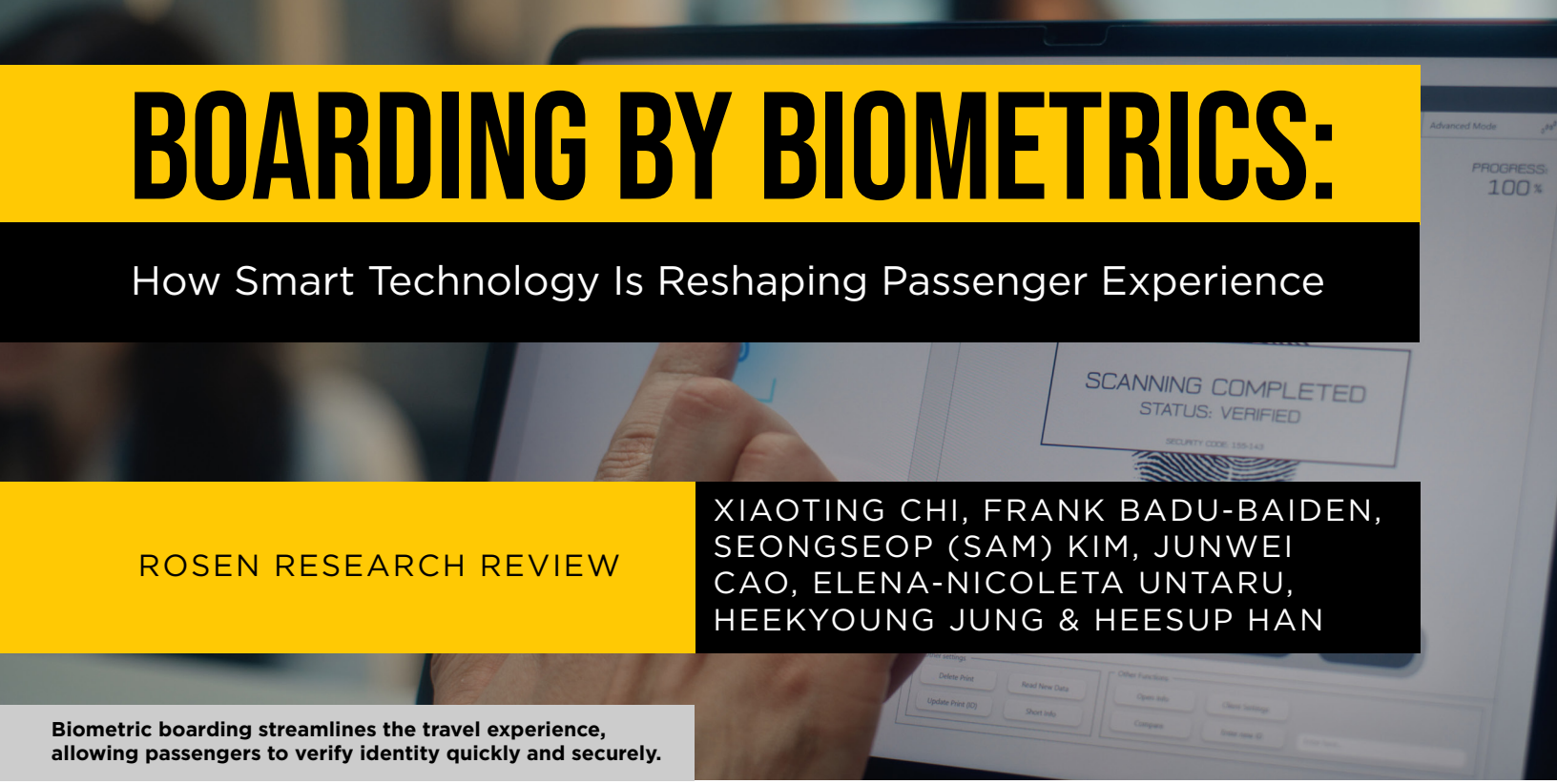
BOARDING BY BIOMETRICS:

How Smart Technology Is Reshaping Passenger Experience



ROSEN RESEARCH REVIEW

XIAOTING CHI, FRANK BADU-BAIDEN, SEONGSEOP (SAM) KIM, JUNWEI CAO, ELENA-NICOLETA UNTARU, HEEKYOUNG JUNG & HEESUP HAN

Biometric boarding streamlines the travel experience, allowing passengers to verify identity quickly and securely.

The research by Chi, Badu-Baiden, Kim, Cao, Untaru, Jung, and Han explores how biometric boarding transforms airline travel. Using technology acceptance, agenda setting, and behavioral reasoning theories, the study reveals how ease of use, usefulness, media exposure, and attitudes shape adoption. Findings stress convenience, engagement, and targeted communication, with age and gender influencing responses. For airport managers and designers, the research offers practical strategies for secure, efficient, and passenger-centered boarding systems.

WHEN YOUR FACE IS YOUR TICKET: THE RISE OF BIOMETRIC BOARDING

The global aviation industry is undergoing a transformation, with smart technologies revolutionizing the way people travel and connect. The COVID-19 pandemic accelerated the adoption of digital solutions, making travelers more interested in seamless, contactless experiences. Among these innovations, biometric boarding technology stands out as a game changer, promising to streamline airport processes and strengthen security. By using unique physiological traits such as facial recognition, fingerprints, or iris scans, biometric boarding verifies passenger identity quickly and accurately, reducing bottlenecks and minimizing fraud.

Airlines and airports are integrating biometric systems to enhance efficiency and reliability, aiming to create a smoother journey for passengers. The potential benefits extend beyond operational improvements, offering new opportunities for value co-creation among airlines, employees, and travelers. Biometric boarding can reshape expectations, revolutionize interactions with airport systems, and set new standards for convenience and safety.

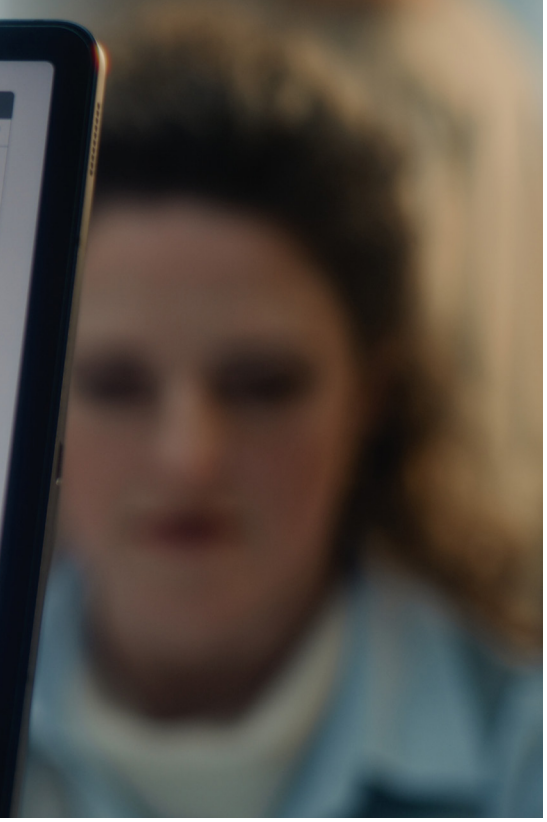
Despite its promise, the adoption of biometric boarding technology faces challenges. Previous research has often relied on single theoretical models, overlooking the complex interplay of psychological, social, and environmental factors that influence acceptance.

The present study addresses this gap by combining the technology acceptance model, agenda setting theory, and behavioral reasoning theory to analyze how passengers perceive and respond to biometric boarding. The research explores the roles of ease of use, usefulness, media exposure, engagement, attitude, and behavioral intentions, while also considering the impact of age and gender. By focusing on the Korean marketplace, the study provides a holistic understanding of the factors that drive or hinder adoption, offering valuable insights for airports and airlines seeking to enhance the smart travel experience.

FROM THEORY TO TAKEOFF: UNDERSTANDING PASSENGER ADOPTION

Biometric boarding technology represents a convergence of innovation and practicality in the aviation industry. Its roots trace back to the nineteenth century, when physical measurements were first used for identification. Today, biometrics rely on both physiological and behavioral traits, offering universality, distinctiveness, permanence, and collectability. Airports and airlines see biometric systems as a way to improve security, expedite boarding, and enhance passenger satisfaction.

To understand how passengers adopt biometric boarding, the study integrates three key theories. The technology acceptance model focuses on perceived ease of use and usefulness, which are known to shape



attitudes and engagement. If passengers find biometric boarding easy and beneficial, they are more likely to develop positive attitudes and engage with the technology. Engagement, in turn, leads to stronger behavioral intentions and sustained use.

Agenda setting theory highlights the role of media exposure in shaping awareness and engagement. Media coverage can inform passengers about the features, security measures, and convenience of biometric boarding, encouraging them to participate in trials and share their experiences. Awareness alone, however, may not be enough to change attitudes; active engagement is often required to overcome concerns about privacy and security.

Behavioral reasoning theory adds another layer, examining how innovativeness, convenience, insecurity, and anxiety influence attitudes and intentions. Passengers weigh the benefits and drawbacks, considering whether biometric boarding simplifies tasks or raises concerns about data protection. Innovativeness and convenience tend to promote adoption, while insecurity and anxiety can create resistance.

The study also explores the moderating effects of age and gender. Younger passengers and males are more influenced by engagement and convenience, while females and older travelers are more sensitive to awareness, insecurity, and anxiety. These insights reveal the complexity of passenger decision-making, emphasizing the need for targeted communication and design strategies. By combining multiple theories, the research offers a comprehensive framework for understanding how passengers embrace or resist biometric boarding technology.

SURVEYING THE SMART TRAVELER: HOW THE STUDY WAS DONE

The research team conducted a web-based survey in South Korea, targeting individuals with domestic or international travel experience who had used biometric boarding technology within the past two years. The survey was distributed by a leading market research company, reaching over twelve thousand potential respondents. After rigorous screening for eligibility and data quality, 331 valid cases were retained for analysis.

The survey measured media exposure, perceived ease of use, perceived usefulness, awareness, attitude, engagement, innovativeness, convenience, insecurity, anxiety, and behavioral intentions. Established scales from previous studies were used to ensure reliability and validity. Data analysis employed partial least squares structural equation modeling, which is well-suited for complex models and non-normal data. The sample included a balanced mix of genders, a wide age range, and diverse travel frequencies, providing a robust foundation for understanding passenger behaviors and attitudes toward biometric boarding.

WHO BOARDED THE STUDY? THE PASSENGER PROFILE

The final sample consisted of 331 airline passengers from South Korea, with nearly equal representation of males and females. Most participants were between thirty and fifty-nine years old, and the majority held university degrees. About sixty percent were married, and income levels varied widely. Most respondents traveled one to two times per year, and nearly half had used biometric boarding technology one or two times, with a significant portion using it three or four times. This diverse group reflects the evolving demographics of air travelers, ensuring that the study's findings are relevant to a broad spectrum of passengers and travel experiences.

WHAT DRIVES ADOPTION? INSIGHTS FROM THE BOARDING GATE

> "THIS RESEARCH SHOWS ENGAGEMENT, CONVENIENCE, AND COMMUNICATION DRIVE BIOMETRIC ADOPTION, WHILE AGE AND GENDER SHAPE PASSENGER REACTIONS TO TECHNOLOGY AND SECURITY CONCERNS."

The study found that perceived ease of use and usefulness significantly influence engagement with biometric boarding technology, but their direct impact on attitude is limited. Engagement emerges as a key mediator, shaping positive attitudes and driving behavioral intentions to use biometric boarding. Media exposure plays a crucial role in increasing awareness and engagement, but awareness alone does not strongly affect attitudes. Innovativeness and convenience are powerful motivators, positively influencing both attitudes and intentions, while anxiety negatively impacts behavioral intentions. Interestingly, insecurity and anxiety do not significantly affect attitudes, suggesting that passengers may trust the technology or accept certain risks. Age and gender moderate these relationships, with younger passengers and males more

Convenience and efficiency make biometric boarding appealing for travelers of all ages and backgrounds.

> "TO BUILD TRUST AND LOYALTY, AIRPORTS MUST DESIGN SECURE, USER-FRIENDLY BIOMETRIC SYSTEMS AND USE INCLUSIVE MESSAGING TO ADDRESS EMOTIONAL NEEDS ACROSS DIVERSE PASSENGER GROUPS."

influenced by engagement and convenience, and females and older travelers more sensitive to awareness and emotional concerns. These findings highlight the importance of designing user-friendly, convenient systems and communicating benefits effectively to diverse passenger groups.

BEYOND THE SCAN: RETHINKING PASSENGER EXPERIENCE AND TRUST

According to Chi and colleagues, the adoption of biometric boarding technology is shaped by a complex interplay of cognitive, emotional, and social factors. While traditional models emphasize ease of use and usefulness, the study reveals that engagement is the real engine driving positive attitudes and intentions. Passengers who actively interact with biometric systems are more likely to develop favorable perceptions and continue using the technology. Media exposure amplifies this effect, raising awareness and encouraging participation, but awareness alone is not enough to overcome concerns or build trust.

Innovativeness and convenience stand out as decisive factors, motivating passengers to embrace biometric boarding for its novelty and practical benefits. However, emotional barriers such as anxiety can still hinder adoption, especially among female and older travelers. The limited impact of insecurity on attitudes suggests a growing acceptance of technology-driven environments, where passengers may prioritize convenience over privacy concerns.

The study's moderation analysis underscores the need for tailored communication and design strategies. Younger passengers respond to engagement and convenience, while older travelers require reassurance about security and privacy. Gender differences highlight the importance of awareness and emotional support for female passengers. These insights challenge airports and airlines to move beyond one-size-fits-all solutions, creating boarding experiences that are not only efficient but also emotionally supportive and inclusive. By integrating multiple theoretical perspectives, the research provides a roadmap for understanding and enhancing passenger adoption of biometric boarding technology.

DESIGNING THE FUTURE GATE: STRATEGIES FOR SMART BOARDING

Airport managers, airlines, and tech developers can boost biometric boarding adoption through strategic media exposure. Social media, TV, and endorsements by celebrities or experts help highlight its convenience and innovation. System design must focus on ease of use and practical benefits. Regular updates and user feedback improve the experience, while clear communication about privacy and security—especially for older and female passengers—builds trust.

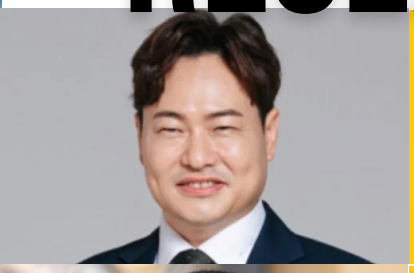
Inclusive messaging is key. Featuring older travelers and emphasizing safety and convenience for women can foster acceptance. By addressing both cognitive and emotional factors, airports can encourage positive behavioral intentions. These insights also apply to other industries adopting new tech, underscoring the need to understand user concerns in service design.

NEXT BOARDING CALL: EXPANDING RESEARCH AND PRACTICE

This study offers valuable insights but also opens paths for future research. Testing the framework across countries can reveal cultural differences in tech acceptance. Integrating credibility theory and comparative analysis may deepen understanding of trust and expertise. Future research should examine outcomes like word-of-mouth, willingness to pay, and satisfaction with alternatives. Exploring emotional and psychological adoption processes can refine promotion strategies.

The combined use of technology acceptance, agenda setting, and behavioral reasoning theories creates a flexible model for analyzing user behavior. Applying it to healthcare, smart cities, and finance can reveal what drives engagement and trust, ensuring new technologies meet diverse user needs.

RESEARCHERS IN FOCUS



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AUTHORS' RESPONSE

How did you ensure that the survey captured authentic passenger experiences with biometric boarding technology?

"We focused on recruiting participants who had actual experience using biometric boarding technology within the past two years, ensuring that responses reflected real-world interactions rather than hypothetical scenarios. The survey included clear definitions and examples of biometric systems, helping respondents accurately recall and evaluate their experiences. Rigorous screening and data cleaning processes were used to maintain data quality, and established measurement scales from previous research ensured reliability and validity. By targeting a diverse sample of travelers with varying frequencies of biometric boarding use, we aimed to capture a comprehensive picture of passenger attitudes and behaviors.

What surprised you most about the role of engagement and emotional factors in technology adoption?

"One of the most striking findings was the central role of engagement in shaping attitudes and behavioral intentions. While ease of use and usefulness are important, it is active involvement with biometric boarding that truly drives positive perceptions and continued use. Emotional factors, particularly anxiety, emerged as significant barriers for certain groups, highlighting the need for supportive communication and design. The limited impact of insecurity on attitudes suggests that passengers may be increasingly willing to accept technology-driven environments, prioritizing convenience over privacy concerns. These insights challenge traditional models and underscore the importance of addressing both cognitive and emotional needs in technology adoption.