A CONCEPTUAL MODEL OF TENNIS FANS' ADOPTION OF AI-ENABLED EXPERIENCES: INSIGHTS FOR SPORT TOURISM

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Abstract

Purpose – This paper develops a conceptual framework to explain how tennis fans may adopt AI-enabled experiences. It addresses the limited understanding of fan-side AI adoption in tennis by repositioning AI from a purely technical or operational tool to a consumer-facing phenomenon that shapes spectators' engagement, interpretation, and overall experience of the sport. The framework is developed within a sport tourism perspective, recognizing that major tennis tournaments constitute significant tourist destinations and that the AI-mediated fan experience increasingly shapes the attractiveness and quality of these events as tourism products.
Methodology/Design/Approach – The paper is conceptual in nature and draws on the Technology Acceptance Model (TAM) as its theoretical foundation. It extends TAM by integrating trust in AI and perceived enjoyment alongside perceived usefulness and perceived ease of use. The framework also proposes the moderating roles of technology exposure, demographic characteristics, and fan experience in shaping the relationship between attitude and behavioral intention.
Findings – The paper proposes that perceived usefulness, perceived ease of use, trust in AI, and perceived enjoyment positively influence fans' attitudes toward AI-enabled tennis applications, which in turn shape behavioral intention to adopt them. It further suggests that adoption is contingent on differences in fan characteristics and prior technology exposure.
Originality of the research – The study offers a tennis-specific, fan-centered conceptualization of AI adoption and bridges the AI-in-sport and technology acceptance literatures by incorporating both cognitive and experiential drivers
Keywords Artificial intelligence; Tennis fans; Technology Acceptance Model (TAM); Fan engagement; Sport tourism

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INTRODUCTION

Artificial intelligence is becoming structurally embedded in professional tennis. What began as a set of technical tools for officiating and performance analysis now increasingly shapes the fan experience through AI-powered commentary, real-time analytics, animated viewing formats, and digital memorabilia platforms. In tennis, these applications do more than improve information processing. They alter how spectators follow matches, interpret performance, and engage with the sport in digitally mediated environments. Their practical relevance is already evident. AI-driven officiating systems have improved line-call accuracy and reduced human error, reinforcing fairness and confidence in match decisions (Liu et al., 2022). At the same time, AI-enabled analytics have expanded access to performance insights and made tennis more engaging for both casual and highly involved audiences (Schaefer, 2024).

This transformation also carries important implications for sport tourism. Major tennis tournaments, including the four Grand Slam events at Wimbledon, Roland Garros, the Australian Open, and the US Open, are among the most significant sporting spectacles in the world, attracting millions of on-site visitors and generating substantial tourism flows for their host destinations each year (Gibson, 1998; Hinch & Higham, 2011). The fans who attend these events are not merely sport spectators; they are also tourists whose experiences are shaped by the full range of services, environments, and technologies they encounter during their visit. As AI becomes embedded in the live tournament experience (through smart officiating systems, AI-powered analytics displays, immersive digital broadcasting, and enhanced wayfinding tools), it increasingly forms part of the value proposition that tennis destinations offer to visiting fans. Understanding how fans adopt and evaluate AI-enabled experiences is therefore not only a sport management question; it is also a tourism question, relevant to destination managers, tournament organizers, and policymakers seeking to leverage AI as a lever for enhancing visitor satisfaction and destination competitiveness.

Yet the growing diffusion of AI in tennis exposes a central problem that remains theoretically underdeveloped. Although AI tools are increasingly visible at the fan interface, existing research does not yet offer a sufficiently precise explanation of how fans come to accept, value, or resist them. This omission matters because the future of AI in tennis will not be determined by technical capability alone; it will also depend on whether spectators perceive these technologies as meaningful, intuitive, and beneficial within the consumption experience. As AI moves from backstage support systems to front-stage fan engagement, understanding adoption becomes essential to determining whether these tools can achieve legitimacy and sustained use in the sport (El-Maghrabi & Sharif, 2022; Glebova et al., 2024).

The literature has responded to this broader issue in two main ways. One stream has documented the growing role of AI in tennis and other sports, showing that such technologies can enhance officiating quality, information delivery, and audience interaction

(Liu et al., 2022; Schaefer, 2024). A second stream has relied on the Technology Acceptance Model to explain why individuals adopt new technologies, primarily through perceived usefulness and perceived ease of use (Wicaksono & Maharani, 2020). This framework offers a valuable point of departure for examining AI adoption because it captures two mechanisms that are likely to matter when audiences encounter digital tools in sport settings. At the same time, prior work suggests that sport-related technology adoption cannot be reduced to instrumental evaluations alone, as emotional and experiential factors such as enjoyment and engagement may also shape responses, especially in high-involvement consumption contexts (Capasa et al., 2022).

However, these bodies of work remain insufficient for the tennis context, and this insufficiency is theoretical as much as empirical. Research on AI in tennis has concentrated mainly on player-side analytics, officiating accuracy, and operational efficiency, leaving the fan side of AI largely underexamined (Sampaio et al., 2024; Takahashi, 2022). Moreover, TAM has been widely used as a general theory of technology acceptance, but its application to AI-driven fan engagement in tennis remains limited (Chatterjee, 2024). More importantly, the literature has not yet clarified whether a framework developed largely for utilitarian technology settings is adequate, by itself, for explaining adoption in a sport consumption environment where value may be simultaneously cognitive, affective, and experiential. The unresolved issue, then, is not simply the absence of evidence, but the absence of a context-specific theoretical articulation of how AI should be conceptualized as a fan-facing phenomenon in tennis.

This paper addresses that issue by developing a conceptual model that positions AI adoption in tennis as a distinct theoretical problem at the intersection of sport consumption and technology acceptance. Rather than reporting empirical results, the purpose of the paper is to pave the way for future empirical research by specifying the mechanisms, boundary conditions, and relationships that should guide subsequent testing. The paper therefore asks how tennis fans may perceive and adopt AI technologies, which factors are most likely to shape their behavioral intentions, and why an adaptation of TAM is needed to account for the specificities of AI-mediated fan engagement in this context. These questions matter because, without a clearer conceptual foundation, future empirical work risks being fragmented, descriptively rich but theoretically thin, or insufficiently tailored to the realities of tennis spectatorship.

The contribution of the paper is accordingly forward-looking. Theoretically, it reframes AI in tennis from a predominantly technical and operational issue into a fan adoption problem that requires a more context-sensitive explanatory model. In doing so, it identifies a missing bridge between the AI-in-sport literature and the technology acceptance literature. Conceptually, it offers an organizing framework for future empirical inquiry by clarifying the role of core TAM mechanisms while recognizing the relevance of engagement-oriented considerations in sport settings. Practically, it provides guidance for sports organizations, broadcasters, and AI developers seeking to design AI-enabled experiences that audiences are more likely to understand, value, and embrace. Ultimately, the stakeholders who stand to benefit include tennis governing bodies, tournament organizers, media partners, technology firms, and fans themselves, all of whom are implicated in the ongoing transformation of tennis into a more data-rich and AI-mediated consumption environment.

1. LITERATURE REVIEW

1.1. Artificial intelligence in sport as a fan-facing phenomenon

Artificial intelligence has become increasingly visible in contemporary sport consumption. Rather than remaining confined to backstage functions such as operational optimization or performance analytics, AI now also shapes what audiences see, how they interpret events, and how they engage with sport content across broadcast, streaming, and platform-based environments (Wu et al., 2022). This shift is important because it moves AI from a purely technical infrastructure role to a consumer-facing one, making fan acceptance central to the long-term viability of AI-enabled sport experiences.

Existing research documents this transformation across several sports. In football, AI is used to personalize content, automate fan support, enhance in-stadium interaction, optimize digital communication, and create new monetization opportunities (Billington, 2020; Salvat, 2019). These applications include chatbots, personalized highlights, AI-assisted commentary, interactive mobile tools, and immersive formats enabled by augmented and virtual reality. In cricket, particularly in the IPL, AI and digital media are increasingly integrated into real-time analytics, fan interaction, fantasy sport ecosystems, and streaming experiences, with evidence of growing trust in AI-driven analysis and rising demand for digitally enhanced viewing formats (Hussain et al., 2021; Singh & Sharma, 2022; Kumar, 2021; Mahajan et al., 2023). Collectively, this literature shows that AI is becoming embedded in sport not only as a performance technology, but also as a consumption technology.

However, the existing discussion remains uneven. Most studies describe AI-enabled features and their practical effects, but provide less clarity on the psychological processes through which audiences evaluate and adopt them. As a result, the literature explains what AI does in sport more effectively than why spectators embrace some applications while remaining skeptical of others. This limitation is especially consequential in tennis, where AI increasingly mediates the fan experience but the theoretical logic of fan adoption remains underdeveloped.

1.2. The tennis context: from officiating technology to AI-mediated consumption

Tennis is a particularly relevant setting for advancing theory on AI adoption because it combines long-standing use of technological systems with an increasingly digital and data-rich spectator experience. AI applications in tennis now extend from line-calling systems and performance analytics to predictive match tools, AI-generated commentary, and digitally curated memorabilia (Liu et al., 2024). Hawk-Eye remains the most visible illustration of AI-assisted officiating, and prior work suggests that such systems improve fairness, accuracy, and confidence in decision-making by reducing human error (Schaefer, 2024; Sampaio et al., 2024). These findings show that AI can create value in tennis through reliability and procedural legitimacy.
Yet AI in tennis now extends beyond officiating. IBM SlamTracker and related analytics systems provide real-time insights, predictive information, and enhanced interpretive layers that help viewers follow matches more closely. AI-generated commentary and automated summaries further reshape how match narratives are constructed and consumed across digital channels (Milmo & Hern, 2023). More recent initiatives such as Traces and AO Animated indicate that AI is also becoming central to the entertainment and symbolic dimensions of tennis fandom by enabling collectible digital experiences, animation-based viewing, and youth-oriented content formats (Snape, 2025). AI in tennis is therefore no longer reducible to officiating efficiency; it increasingly mediates the broader experience of spectatorship.

This matters theoretically because it broadens the types of value AI may create for tennis fans. Some applications are primarily utilitarian, such as line-calling accuracy and match analytics, whereas others are experiential, such as immersive broadcasts, entertainment-enhancing formats, and personalized content. Research has largely emphasized technical effectiveness, especially in officiating and player-related analytics, while giving less attention to how fans interpret the usefulness, usability, credibility, and enjoyment of AI-enabled tennis experiences (Sampaio et al., 2024; Takahashi, 2022). This gap is important because fan-facing AI applications are unlikely to be adopted on technical performance alone.

1.3. Tennis tournaments as sport tourism destinations and the role of AI

Tennis occupies a distinctive position in sport tourism. The four Grand Slam tournaments, namely the Australian Open in Melbourne, Roland Garros in Paris, Wimbledon in London, and the US Open in New York, generate substantial international tourist flows, contribute significantly to local economies, and function as high-profile experiential products for the cities and regions that host them. Wimbledon alone attracts over 500,000 visitors annually and generates tens of millions of pounds in tourism-related expenditure, while the Australian Open has grown into one of the largest annual sporting events in the Southern Hemisphere, drawing visitors from over 100 countries (Tourism Australia, 2023). These events are not simply sports competitions; they are curated experiential destinations in which venue atmosphere, service quality, ancillary entertainment, and increasingly digital and technological infrastructure all contribute to the overall visitor experience.

The sport tourism literature defines sport tourists as individuals who travel primarily or partly to observe or participate in sporting events, and highlights that such tourists represent a particularly motivated and high-spending visitor segment (Gibson, 1998; Hinch & Higham, 2011). In this context, the quality and distinctiveness of the on-site experience is central to destination competitiveness, repeat visitation, and word-of-mouth recommendation. For major tennis tournaments, AI has become an increasingly visible component of that experience. Smart officiating systems, AI-powered fan information services, personalized in-venue content, and data-driven broadcast enhancements are no longer peripheral features; they are part of the experiential infrastructure that differentiates one tournament from another and shapes how visiting fans remember and evaluate their stay. Governing bodies such as the International Tennis Federation, Tennis Australia, and the All England Club have made significant investments in AI-enabled fan services precisely because these technologies are seen as tools for elevating the live attendance experience and strengthening the event's appeal as a tourism product (Azhar, 2024; Schaefer, 2024).

This intersection between AI adoption and sport tourism is theoretically important for at least two reasons. First, on-site fans at major tournaments are a qualitatively distinct audience segment compared with remote viewers. They are physically present in the destination, immersed in the full event environment, and often combine their tournament attendance with wider tourism activities such as accommodation, dining, and sightseeing. Their evaluation of AI-enabled features therefore takes place within a richer experiential context than that of a television or streaming audience, and their responses may be shaped by additional factors such as wayfinding needs, service expectations, language barriers, and the social dynamics of group travel. Second, in the sport tourism literature, the concept of the "tourist experience" emphasizes that satisfaction is determined not by any single touchpoint but by the cumulative quality of a complex service encounter (Ritchie & Crouch, 2003). If AI-enabled services are a meaningful part of the on-site experience at tennis tournaments, then understanding fan adoption of these technologies becomes directly relevant to questions of tourist satisfaction, destination image, and event legacy. This paper therefore argues that a framework capable of explaining AI adoption among tennis fans has direct relevance for sport tourism management, and that the sport tourism context simultaneously enriches the theoretical framing by highlighting dimensions of the fan experience that are specific to live attendance.

1.4. AI and fan engagement: toward a richer account of value creation

The literature on sport fan engagement offers a useful starting point for understanding why AI matters to spectators. Across sport settings, AI-driven content can increase personalization, immediacy, and immersion, thereby enhancing the richness of the viewing experience (Mahajan et al., 2023). Research on digital fan engagement also suggests that technologically enhanced formats can attract younger and digitally fluent audiences by offering more interactive, responsive, and entertaining modes of consumption (Eccleshare, 2025). In tennis, predictive analytics, match simulations, automated storytelling, and animated viewing formats reflect this shift toward more interactive spectator experiences (Snape, 2025).

At the same time, the literature points to a tension: AI may enrich the fan experience for some audiences while creating distance for others. El-Maghrabi & Sharif (2022) suggests that growing AI use in sport broadcasting and engagement can alienate fans who prefer more traditional, human-centered forms of sport consumption. This indicates that AI does not have a uniform effect across fan segments; rather, its impact depends on how well AI-enabled features align with fans' preferences, habits, and interpretive expectations.

Future empirical research should therefore move beyond asking whether AI improves fan engagement in general. The more relevant question is under which conditions AI enhances engagement, for whom, and through which mechanisms. The literature already suggests several plausible pathways. AI may create value by increasing informational depth, reducing uncertainty, enabling personalization, and making consumption more entertaining (Mahajan et al., 2023; Eccleshare, 2025). Conversely, resistance may emerge when AI is perceived as opaque, intrusive, overly technical, or misaligned with the traditional aesthetic of sport spectatorship (El-Maghrabi & Sharif, 2022). A conceptual framework for tennis should thus capture both enabling and constraining processes rather than assuming uniformly positive effects.

1.5. Technology acceptance as a theoretical foundation

To explain these processes, the Technology Acceptance Model (TAM) offers a useful starting point. TAM proposes that adoption is shaped mainly by perceived usefulness and perceived ease of use, which influence attitudes and, ultimately, behavioral intention (Leso & Cortimiglia 2021; Ibrahim, 2014). In the tennis context, perceived usefulness refers to the extent to which AI enhances the viewing experience, deepens understanding, improves confidence in match interpretation, or otherwise adds value to the fan experience. Perceived ease of use refers to whether AI-driven tools are intuitive, accessible, and readily integrated into routine sport consumption.

TAM is helpful because many fan-facing AI applications require active interpretation. Viewers must decide whether predictive analytics, AI-generated commentary, or digitally enhanced broadcasts are worth attending to and easy enough to engage with. If these tools are perceived as useful and effortless, they should be more likely to generate favorable evaluations. In this respect, TAM offers a parsimonious basis for theorizing adoption in AI-mediated sport settings.

However, the literature also suggests that a narrow TAM specification may be insufficient for explaining AI adoption in tennis. AI in sport is not merely a productivity tool; it is also a trust-laden and experience-oriented technology. Capasa et al. (2022) argues that technology acceptance frameworks can be strengthened by including variables beyond usefulness and ease of use, notably trust and enjoyment. In AI-enabled sport contexts, this extension appears especially warranted. When spectators rely on AI systems to interpret contested events, generate match insights, or mediate engagement with the sport, trust becomes central. Fans are more likely to adopt AI when they see it as accurate, objective, reliable, and fair (Yoo et al., 2017). This is especially relevant in tennis, where officiating systems such as Hawk-Eye carry strong implications for legitimacy and confidence in outcomes (Sampaio et al., 2024; Schaefer, 2024).

Perceived enjoyment is equally important. Research on technology use shows that intrinsic motivation and enjoyment can shape favorable attitudes toward digital systems, particularly in consumption settings where entertainment value matters (Capasa et al., 2022). This is directly applicable to tennis fandom. AI-enhanced viewing formats, interactive content, and animation-based broadcasts may be adopted not only because they are useful, but also because they are enjoyable, novel, and experientially engaging. Accordingly, the literature supports an adapted TAM perspective in which perceived usefulness, perceived ease of use, trust, and enjoyment jointly operate as antecedents of fan attitudes toward AI, with attitude then shaping behavioral intention to use AI-enabled tennis applications.

1.6. Boundary conditions of AI adoption in tennis

Although the core mechanisms of AI adoption are important, the literature also indicates that these relationships are unlikely to be invariant across audiences. Several boundary conditions appear especially relevant. First, demographic differences matter. Younger fans tend to be more receptive to AI-enabled sport experiences, whereas older audiences may be more skeptical of technologically mediated changes in sport broadcasting and engagement (Uren & Edwards, 2023). This suggests that acceptance depends not only on the properties of the technology, but also on the social characteristics of the audience.

Second, prior technology exposure is likely to influence adoption. Fans who regularly engage with digital sport platforms, predictive tools, automated content, and AI-enhanced media may be more likely to perceive AI applications as understandable, normal, and beneficial (Yoo et al., 2017). Exposure can reduce uncertainty, build familiarity, and strengthen confidence in AI-enabled experiences. The broader digital ecosystem also matters, as social media, influencer content, and platform-based interaction increasingly normalize AI-mediated sport consumption (Salian, 2025).

Third, fan experience and involvement are likely to condition adoption. More involved fans generally possess greater domain knowledge, stronger motivation to process sport-related information, and greater openness to innovations that enrich engagement with the sport (Uhrich, 2021). Hardcore fans may therefore derive more value from AI-driven analytics and real-time match data, whereas casual fans may respond more strongly to applications that reduce complexity and increase enjoyment.

These boundary conditions indicate that AI adoption in tennis should not be treated as homogeneous. Instead, the strength, and possibly the direction, of relationships among usefulness, ease of use, trust, enjoyment, attitude, and intention may vary across demographic groups, levels of digital exposure, and fan segments. The literature therefore points toward a contingent rather than universal model of AI adoption in tennis.

1.7. Literature gap and conceptual direction

The review reveals four interconnected gaps. First, research on AI in sport has disproportionately focused on technical performance, officiating, and player-related analytics, leaving fan adoption comparatively underdeveloped, especially in tennis (Sampaio et al., 2024). Second, although TAM offers a robust starting point for explaining adoption, its application to AI-driven fan engagement in tennis remains limited and insufficiently adapted to the experiential and trust-sensitive nature of sport consumption (Chatterjee, 2024; Capasa et al., 2022). Third, the literature has identified several potentially important boundary conditions, but has not yet integrated them into a coherent tennis-specific framework capable of guiding cumulative empirical testing. Fourth, and most directly relevant to the present paper, neither the AI-in-sport literature nor the technology acceptance literature has sufficiently engaged with the sport tourism dimension of fan-facing AI. The fans who attend major tennis tournaments are sport tourists as much as they are spectators, yet no prior work has theorized AI adoption in this population as a tourism-relevant process. This is a consequential omission because the adoption of AI-enabled services at live sporting events is shaped by factors that are specific to the tourism experience, including the novelty of the destination, the intensity of the on-site environment, service expectations calibrated by international travel experience, and the degree to which AI tools facilitate or complicate the logistics of attending an event in an unfamiliar location. A conceptual framework that ignores these dimensions risks being incomplete for the very fan segment most relevant to tournament operators and destination managers.

This paper addresses these gaps by treating AI adoption in tennis as a distinct conceptual problem at the intersection of sport consumption, technology acceptance, and sport tourism. Rather than testing the model empirically, the purpose is to specify the relationships that future studies should examine. The literature suggests that perceived usefulness and perceived ease of use remain foundational mechanisms, but that trust in AI and perceived enjoyment should also be incorporated as central antecedents of favorable attitudes toward AI-enabled tennis experiences. It further suggests that the translation of these attitudes into behavioral intention is likely to depend on technology exposure, demographic characteristics, and fan experience, a set of boundary conditions that is particularly consequential in the sport tourism context, where fan populations are internationally diverse, culturally heterogeneous, and distinguished by the intensity of their travel motivation. In this way, the paper reframes AI in tennis from a purely technical innovation issue into a contingent fan adoption process shaped by cognitive, affective, and contextual forces, with implications that extend beyond sport management into the governance and design of AI-enhanced tourist experiences at major sporting events.

2. CONCEPTUAL FRAMEWORK AND PROPOSITION DEVELOPMENT

Building on the foregoing literature review, this paper develops a conceptual framework for understanding AI adoption in tennis as a fan-centered process shaped by cognitive, affective, and contextual forces. The framework is anchored in the Technology Acceptance Model, but it extends that foundation to better reflect the particularities of AI-mediated sport consumption and, crucially, the sport tourism context in which much of that consumption takes place. In conventional TAM applications, perceived usefulness and perceived ease of use operate as the central drivers of favorable evaluations and subsequent adoption intentions. In the present context, however, these mechanisms alone are unlikely to capture the full logic of fan responses to AI. As the literature suggests, tennis spectators do not engage AI only as a functional technology. They also encounter it as an interpretive, experiential, and trust-sensitive interface through which the sport is increasingly consumed. For those attending major tournaments as sport tourists, this interface is encountered within a bounded, high-intensity travel experience in which the stakes of every service interaction are amplified by the effort and cost of traveling to the event.

The conceptual model therefore proposes that fan adoption of AI in tennis is shaped by four core antecedents: perceived ease of use, perceived usefulness, trust in AI, and perceived enjoyment. These antecedents are expected to influence fan attitude toward AI technology, which in turn shapes behavioral intention to adopt and use AI-enabled tennis applications. In addition, the model recognizes that this process is unlikely to unfold uniformly across all spectators. Instead, the literature indicates that

the attitudinal translation into behavioral intention may depend on important boundary conditions, particularly technology exposure, demographic characteristics, and fan experience. The purpose of this section is not to report statistical testing, but to specify the causal architecture that future empirical studies should examine.

2.1. Perceived ease of use and attitude toward AI technology

Perceived ease of use is one of the foundational constructs of TAM and refers to the degree to which an individual believes that engaging with a technology requires limited effort. In the context of AI-enabled tennis, this mechanism concerns whether fans perceive AI applications such as match analytics, automated commentary, line-calling interfaces, or interactive viewing tools as intuitive, accessible, and simple to use. When spectators experience such systems as unnecessarily complex or difficult to interpret, the likelihood of favorable evaluation diminishes. By contrast, when AI applications are integrated seamlessly into the consumption experience, fans are more likely to respond positively because the technology supports rather than disrupts engagement with the sport. This logic is consistent with TAM research showing that usability facilitates favorable technology evaluations and lowers resistance to adoption (Davis, 1989; Venkatesh & Davis, 2000; Lee et al., 2019).

In tennis, this mechanism is especially relevant because spectators are not uniformly technologically sophisticated, nor are all AI applications equally transparent in their operation. Ease of use is therefore likely to function as a first-order evaluative cue. Fans who can effortlessly access and interpret AI-based tools should be more likely to perceive them as compatible with the viewing experience and, in turn, to develop a more favorable attitude toward their use. Future empirical work should therefore examine the following proposition:

P1: Perceived ease of use positively influences attitude toward AI technology in the tennis fan context.

2.2. Perceived usefulness and attitude toward AI technology

Perceived usefulness refers to the extent to which individuals believe that a technology enhances their performance or experience. Within tennis spectatorship, this construct should be interpreted not in occupational terms, but in experiential and interpretive ones. AI may be perceived as useful when it helps fans understand match dynamics more clearly, access more informative insights, interpret officiating decisions with greater confidence, or engage more deeply with the unfolding contest. Prior work on TAM consistently identifies usefulness as a central predictor of favorable technology evaluation (Davis, 1989; Pavlou, 2003; Venkatesh et al., 2003), and the literature on AI in sport suggests that fan-facing tools are often justified in precisely these terms, that is, as mechanisms that improve informational quality, reduce ambiguity, and enrich engagement.

In tennis, usefulness may derive from several sources. AI-assisted officiating systems can strengthen perceptions of fairness and decision quality. Predictive analytics and match insights can deepen interpretive engagement. Automated digital content can increase access to personalized or real-time information. In the sport tourism context, AI applications also extend to wayfinding, multilingual service support, ticketing management, and venue orientation, forms of usefulness that are particularly salient for international visitors unfamiliar with the host city or tournament infrastructure. In each case, the core theoretical claim is that the more fans perceive AI as adding substantive value to the consumption experience, the more likely they are to form a favorable attitude toward it. Accordingly, future studies should evaluate the following proposition:

P2: Perceived usefulness positively influences attitude toward AI technology in the tennis fan context.

2.3. Trust in AI and attitude toward AI technology

Although TAM provides a strong starting point, the literature reviewed earlier indicates that AI adoption in sport also involves a distinct trust dimension. This is particularly salient where AI is involved in decision support, officiating, performance interpretation, or content generation. Trust refers here to the extent to which spectators regard AI systems as accurate, reliable, credible, and fair. In tennis, trust is especially consequential because many AI applications intervene in moments that fans view as consequential to match legitimacy, such as line-calling and performance interpretation. If AI is perceived as opaque, biased, or unreliable, fan acceptance is likely to weaken even when the system is useful or easy to use. Conversely, when AI is trusted, fans should be more willing to incorporate it into their evaluative and consumption routines. This logic is consistent with prior work emphasizing the role of trust in technology acceptance and intention formation (McKnight et al., 2002; Zeng et al., 2025).

The inclusion of trust is theoretically important because it recognizes that AI in tennis is not merely an efficiency tool. It is also a legitimacy-bearing system whose acceptance depends partly on whether spectators believe it warrants reliance. This is particularly relevant in sport settings where interpretive authority and fairness are central to the audience experience. Future empirical research should therefore assess the following proposition:

P3: Trust in AI positively influences attitude toward AI technology in the tennis fan context.

2.4. Perceived enjoyment and attitude toward AI technology

Sport consumption differs from many utilitarian technology settings because it is deeply experiential. Fans do not adopt technologies solely because they are effective or convenient. They also respond to whether these technologies make the sport more enjoyable, immersive, and emotionally engaging. Perceived enjoyment captures this intrinsic dimension of technology evaluation and refers to the extent to which interacting with a technology is experienced as pleasurable in itself. Prior research has shown that enjoyment can meaningfully shape attitudes toward technology, especially when use takes place in entertainment-oriented or high-involvement environments (Davis et al., 1992; Hsu and Lin, 2008; Moon & Kim, 2001).

This mechanism is especially relevant for AI in tennis because many emerging applications are designed not simply to inform, but also to entertain. AI-generated commentary, interactive visualizations, animated match formats, and personalized media experiences can increase novelty and immersion. In such settings, enjoyment may function as an independent driver of favorable attitude rather than as a secondary byproduct of usefulness. A conceptual account of AI adoption in tennis would therefore be incomplete if it focused exclusively on instrumental evaluations. Future research should test the following proposition:

P4: Perceived enjoyment positively influences attitude toward AI technology in the tennis fan context.

2.5. Attitude toward AI technology and behavioral intention

In line with both TAM and broader attitude-intention reasoning, the model proposes that fan attitude toward AI technology serves as the immediate precursor to behavioral intention. Attitude reflects an overall evaluative orientation toward AI-enabled tennis applications, incorporating the combined effects of usefulness, ease of use, trust, and enjoyment. Behavioral intention refers to the fan's willingness to adopt, use, or continue engaging with AI-driven features in the tennis experience. The core argument is that favorable attitudes should increase the likelihood of intended adoption because spectators who positively evaluate AI are more likely to integrate it into their actual patterns of sport consumption. This logic is well established in prior technology acceptance and behavioral research (Venkatesh & Bala, 2008).

In the tennis setting, this means that positive evaluations of AI should translate into stronger intentions to use AI-enabled tools such as predictive insights, line-calling systems, interactive platforms, and automated content. The framework therefore treats attitude not as an endpoint, but as the central mediating mechanism through which antecedent beliefs shape likely adoption. Future empirical work should examine the following proposition:

P5: Attitude toward AI technology positively influences behavioral intention to adopt AI-enabled applications in tennis.

2.6. Boundary conditions shaping the attitude-intention relationship

Although the model posits a positive relationship between attitude and behavioral intention, the literature suggests that this relationship is not likely to be equally strong across all fan segments. Instead, several contextual factors may condition the degree to which positive evaluations of AI are translated into adoption intentions.

One relevant boundary condition is prior technology exposure. Fans with greater exposure to AI-enabled tools, digital platforms, or technologically enriched sport experiences may be more likely to convert favorable attitudes into intended use because familiarity reduces uncertainty and strengthens perceived compatibility. Prior work on innovation diffusion and technology adoption suggests that previous experience can facilitate acceptance by lowering ambiguity and normalizing new forms of use (Rogers, 2003; Turner, 2007). In the tennis context, spectators who are already accustomed to interacting with analytics, digital match interfaces, or algorithmically curated sport content may be more prepared to act on favorable evaluations than those with more limited exposure.

A second boundary condition concerns demographic characteristics, particularly age and gender. Prior work has suggested that demographic differences may shape how technology beliefs are translated into intention and use (Venkatesh et al., 2003). In the present context, such variation may reflect differences in digital familiarity, openness to technological change, or broader consumption habits. The conceptual point is not that demographic groups respond uniformly, but that the strength of the attitude-intention link may differ systematically across them.

A third boundary condition is fan experience or involvement. Spectators who are more deeply involved in tennis may respond differently to AI than casual fans because they process sport information differently, value interpretive depth more strongly, and may be more motivated to adopt innovations that intensify engagement with the sport. Drawing on the logic of domain-specific involvement and consumer innovativeness (Goldsmith & Hofacker, 1991), it is plausible that highly involved fans are particularly likely to act on favorable attitudes toward AI, especially when these tools enhance analysis, immersion, or symbolic participation.

A fourth boundary condition, particularly relevant in the sport tourism context, is attendance mode, that is, whether the fan is present on-site at the tournament or consuming content remotely. On-site sport tourists encounter AI in a fundamentally different

way from remote viewers: they are embedded in the physical destination, navigating a live event environment, and relying on digital services under the time pressure of a finite visit. This situational intensity may amplify both the perceived usefulness and the perceived ease of use of AI tools, while also raising the stakes of trust failures. Cultural background and international travel experience may further condition how on-site visitors respond to AI-enabled services, especially where language accessibility and digital literacy vary across national audiences. Future research should therefore examine whether attendance mode and cultural background moderate the attitude-intention relationship in ways that are specific to the sport tourism context.

P6a: The positive relationship between attitude toward AI technology and behavioral intention to adopt AI-enabled tennis applications is stronger for fans with higher technology exposure.

P6b: The positive relationship between attitude toward AI technology and behavioral intention to adopt AI-enabled tennis applications varies across demographic groups.

P6c: The positive relationship between attitude toward AI technology and behavioral intention to adopt AI-enabled tennis applications is stronger for highly involved tennis fans than for casual fans.

P6d: The positive relationship between attitude toward AI technology and behavioral intention to adopt AI-enabled tennis applications is stronger for on-site sport tourists attending the tournament than for remote spectators, and varies across fans with different cultural backgrounds and levels of international travel experience.

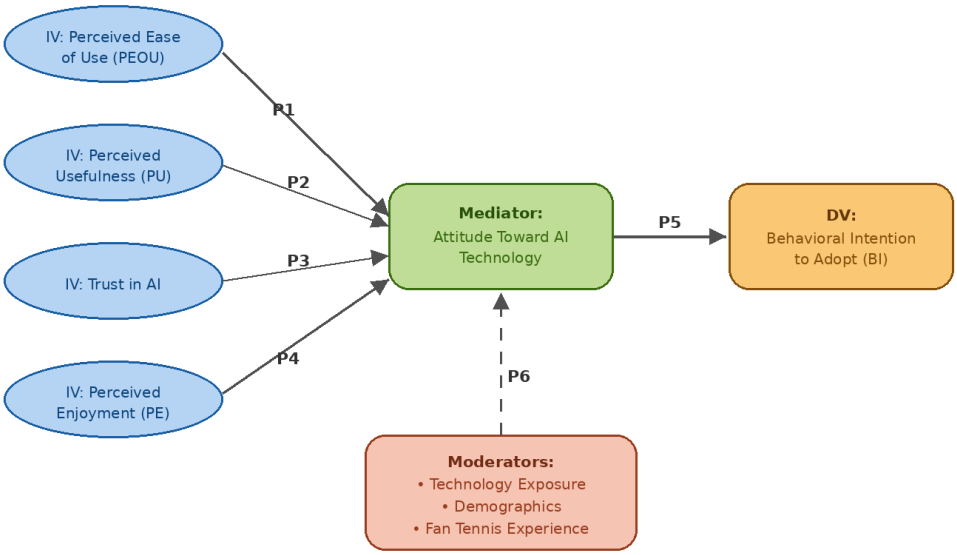
Taken together, these moderators indicate that AI adoption in tennis should be understood as contingent rather than universal, and that the sport tourism context introduces a set of boundary conditions (attendance mode, cultural background, and travel experience) that are not typically addressed in standard technology acceptance research but are essential for understanding how AI-enabled event experiences are evaluated by the internationally diverse audiences that attend major tennis tournaments.

2.7. Theoretical implications of the conceptual framework

The proposed framework (Figure 1) contributes conceptually by repositioning AI adoption in tennis as a multi-mechanism process that cannot be reduced to technical utility alone. It preserves the core explanatory value of TAM while adapting it to a sport consumption context in which trust and enjoyment are not peripheral but central. In doing so, it connects the AI-in-sport literature with the technology acceptance literature through a more context-sensitive account of fan behavior. It also clarifies that future empirical work should not merely test whether AI is accepted, but should specify how cognitive judgments, affective responses, and contextual conditions combine to shape adoption intentions.

This perspective has two broader implications. First, it suggests that fan-facing AI should be theorized as both an informational and experiential technology. Second, it indicates that adoption is likely to be segmented, such that the same AI application may generate different levels of acceptance depending on user characteristics and prior exposure. The conceptual model (Figure 1) therefore offers a structured agenda for future empirical research by identifying the key mechanisms, relationships, and contingencies that should guide subsequent testing in tennis and, potentially, in adjacent sport settings.

Figure 1: **Proposed conceptual framework of AI adoption among tennis fans**



Source: The authors

To advance this conceptualization, the next section discusses the implications of the proposed framework for future empirical research. In doing so, it outlines how the identified mechanisms, boundary conditions, and proposed relationships can be operationalized and examined across different AI-enabled tennis contexts. This step is important because the value of the framework lies not only in integrating existing insights, but also in providing a structured foundation for cumulative theory testing in subsequent studies.

3. IMPLICATIONS FOR RESEARCH

The framework developed in this paper provides a basis for future empirical research on AI adoption in tennis by clarifying the mechanisms and boundary conditions likely to shape fan responses. This is important because research on AI in sport has expanded rapidly, but most studies still emphasize performance enhancement, officiating systems, and technological applications rather than the ways fans evaluate and adopt AI-enabled experiences (Brady et al., 2021; Chatterjee, 2024; Sampaio et al., 2024). In tennis, scholarship has likewise focused primarily on player development, match analysis, and data systems, leaving fan-centered adoption processes underdeveloped (Huang, 2021; Takahashi, 2022; Liu et al., 2024; Sampaio et al., 2024). Future research should therefore treat tennis not only as a technologically advanced sport, but also as a consumption environment in which AI shapes spectators' perceptions, engagement, and intentions.

A first implication concerns construct specification. Prior technology acceptance research consistently identifies perceived usefulness and perceived ease of use as core predictors of technology evaluation and adoption (Davis, 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Wicaksono & Maharani, 2020). This logic also applies in sport consumption contexts (Ibrahim, 2014; Lee et al., 2019). However, the present framework suggests that fan-facing AI in tennis should not be reduced to a purely utilitarian model. Spectators are likely to assess not only whether AI is useful and easy to use, but also whether it is trustworthy and enjoyable. This is consistent with research emphasizing the relevance of enjoyment in digital settings (Davis et al., 1992; Moon & Kim, 2001; Hsu & Lin, 2008) and trust in technology-mediated services (Gefen, 2002; McKnight et al., 2002; Pavlou, 2003). Future studies should therefore conceptualize AI adoption in tennis as a multidimensional process that combines instrumental, affective, and relational evaluations.

A second implication is the need to place the fan, rather than the technology itself, at the center of analysis. Existing sport technology literature shows that digital transformation reshapes the fan experience through interactivity, personalization, immediacy, and immersion (Billington, 2020; Wu et al., 2022; Mahajan et al., 2023). More broadly, digital systems increasingly mediate how consumers interact with brands, platforms, and experiences (Jiang & Stylos, 2021). In sport, these changes matter because they influence attachment, participation, and value co-creation (Previati, 2020; Hussain et al., 2021; Singh & Sharma, 2022). Tennis is a particularly relevant context because AI is already embedded in commentary, predictive analytics, and enhanced tournament experiences (Milmo & Hern, 2023; Azhar, 2024; Schaefer, 2024; Eccleshare, 2025). Future research should therefore examine how fans interpret AI as part of the broader meaning structure of tennis spectatorship.

A third implication is that future studies should distinguish among different categories of AI application. AI in sport serves heterogeneous functions, including officiating, analytics, storytelling, and immersive broadcasting (Brady et al., 2021; Walch, 2024; Forbes Councils, 2025). In tennis, Hawk-Eye and related systems raise questions of accuracy, objectivity, and legitimacy (Liu et al., 2022; Uzor et al., 2023), whereas AI-powered commentary, animated match formats, and personalized digital content are more closely tied to enjoyment, novelty, and media engagement (Milmo & Hern, 2023; Azhar, 2024; Eccleshare, 2025; Snape, 2025). These differences suggest that the relative importance of usefulness, trust, ease of use, and enjoyment is unlikely to be uniform across all AI applications. Trust may matter more in officiating contexts, whereas enjoyment may be more influential in entertainment-oriented applications. Comparative studies across AI categories would therefore be especially valuable.

A fourth implication concerns mediation and causal process. The proposed framework positions attitude toward AI as the mechanism linking perceived ease of use, perceived usefulness, trust, and enjoyment to behavioral intention. This is consistent with broader attitude-based models, which suggest that beliefs shape attitudes and attitudes shape intentions (Ajzen & Fishbein, 1972; Fishbein & Ajzen, 1975), as well as with technology acceptance research showing that beliefs about system qualities are translated into adoption intentions through overall evaluation of the technology (Davis, 1989; Venkatesh & Bala, 2008). In sport settings, related work suggests that trust and perceived usefulness can affect attitudes and intentions in mobile content contexts (Yoo et al., 2017). Future research should therefore test the mediating role of attitude explicitly rather than assuming that each antecedent independently predicts intention.

A fifth implication concerns heterogeneity across fan segments. Technology acceptance is rarely uniform across user groups and often varies according to demographics, prior experience, and exposure (Venkatesh et al., 2003; Venkatesh & Bala, 2008). Research on attitudes toward AI also shows that demographic and individual differences shape responses to AI systems (Kaya et al., 2022). In addition, prior familiarity with digital technologies may increase openness to AI-enabled solutions (Uren & Edwards, 2023). Within sport, fan involvement is especially important because highly involved spectators process information differently, value specialized content more strongly, and may be more willing to adopt innovations that deepen engagement (Uhrich, 2021). Consumer innovativeness research further suggests systematic differences in the propensity to adopt new technologies (Goldsmith & Hofacker, 1991). Future work should therefore move beyond average effects and test moderators such as technology exposure, age, gender, and fan involvement.

A sixth implication is that AI adoption should be examined within the broader digital consumption environment. Contemporary sport consumption is increasingly multiscreen and cross-platform, with audiences engaging simultaneously across streaming services, mobile applications, social media, and immersive technologies (Khan et al., 2020; Wu et al., 2022). In this environment, AI functions as part of a wider digital ecosystem rather than as an isolated technology decision (Lin et al., 2020; Jiang & Stylos, 2021). This is especially relevant in tennis, where governing bodies and event organizers are using AI to create enhanced and personalized experiences for global audiences (Azhar, 2024; Schaefer, 2024). Future research should therefore analyze AI adoption as embedded within a broader configuration of digital touchpoints.

A seventh implication is that the framework should be applied with explicit attention to the sport tourism context. Much of the existing research on technology adoption in sport implicitly assumes a remote or home-based viewer, yet many of the most consequential fan-AI interactions at major tennis tournaments take place on-site, among visitors who have traveled specifically to attend. For these fans, AI-enabled services carry a distinct experiential weight. Wayfinding tools, AI-powered ticketing and queuing systems, multilingual chatbot services, and personalized in-venue content all contribute to the quality of a short and often once-in-a-lifetime visit. The stakes of a poor interaction are therefore higher than in a routine streaming context, and the perceived usefulness and trust dimensions of the framework become especially salient. Moreover, the international composition of Grand Slam audiences introduces cultural heterogeneity that may moderate how different groups respond to AI applications. Future studies should therefore examine AI adoption specifically among on-site attendees at tennis tournaments, and should situate these findings within the broader literature on tourist experience quality and event satisfaction. Practically, the framework offers guidance to tournament operators and destination management organizations seeking to design AI-enabled services that are genuinely valued by a culturally diverse visiting public, and that contribute positively to the perception of the host destination.

A final implication concerns research design. Because the framework specifies multiple antecedents, attitudinal processes, and moderators, future studies should use designs capable of capturing both structural relationships and contextual variation. Quantitative models would be appropriate for testing the proposed relationships among usefulness, ease of use, trust, enjoyment, attitude, and behavioral intention, especially given their established relevance in technology acceptance research (Hair et al., 2021). Comparative and experimental designs could help identify whether fan responses differ across AI scenarios, such as officiating tools versus AI-generated media content. Longitudinal work would also be valuable, since repeated exposure may reduce uncertainty and normalize AI use over time (Rogers, 2003; Turner, 2007).

Overall, the framework offers a roadmap for a more theory-driven and fan-centered research agenda on AI in tennis, one that is equally relevant to sport management scholars and tourism researchers. The key issue is not simply whether AI is present in the sport, but how spectators evaluate its usefulness, ease, trustworthiness, and experiential value, how these evaluations shape attitudes, and under what conditions those attitudes translate into adoption intentions. For the sport tourism community in particular, the framework opens a productive avenue for examining how AI-enhanced event experiences contribute to tourist satisfaction, destination competitiveness, and the long-term appeal of major tennis tournaments as international tourism products.

CONCLUSION

This paper develops a conceptual framework for understanding AI adoption in tennis from the perspective of fan experience, behavioral intention, and sport tourism. Although AI research in sport has grown considerably, much of it remains focused on performance analytics, officiating systems, and operational applications rather than on the mechanisms through which spectators evaluate and adopt AI-enabled experiences (Brady et al., 2021; Chatterjee, 2024; Sampaio et al., 2024). In response, this paper argues that AI in tennis should be understood not only as a technological development, but also as a consumer-facing transformation that reshapes how fans interpret and experience the sport, and one that carries particular significance in the context of sport tourism, where on-site fans at major tournaments are simultaneously tourist consumers whose satisfaction with AI-enabled services contributes to the overall quality of a high-involvement travel experience.

The framework contributes in three main ways. First, it extends technology acceptance logic to the tennis fan context. Building on TAM, it retains perceived usefulness and perceived ease of use as foundational drivers of evaluation, but argues that these mechanisms are insufficient on their own in a sport consumption setting (Davis, 1989; Venkatesh & Davis, 2000; Ibrahim, 2014). Because AI in tennis operates as both a functional tool and an experiential interface, the framework incorporates trust in AI and perceived enjoyment as additional antecedents of attitude. This extension is consistent with prior research emphasizing trust in digital environments and enjoyment in technology-mediated experiences (Gefen, 2002; McKnight et al., 2002; Davis et al., 1992; Moon & Kim, 2001; Hsu & Lin, 2008).

Second, the paper positions attitude as the central mechanism through which beliefs about AI are translated into behavioral intention. This is consistent with broader attitude-based models of behavior, which hold that beliefs shape evaluations and evaluations shape intention (Ajzen & Fishbein, 1972; Fishbein & Ajzen, 1975). In the present context, fans are more likely to adopt AI-enabled tennis applications when they develop a favorable overall orientation toward them. This shifts the discussion from the question of whether AI is beneficial to the more precise question of how fans process AI within the consumption experience.

Third, the framework emphasizes that AI adoption in tennis is contingent rather than universal. The relationship between attitude and behavioral intention is likely to vary according to technology exposure, demographic characteristics, and fan involvement. This argument is supported by prior work showing that technology acceptance depends on user heterogeneity, familiarity, and involvement-related differences (Venkatesh et al., 2003; Kaya et al., 2022; Uren & Edwards, 2023; Uhrich, 2021). Fan responses to AI should therefore not be treated as homogeneous across audience segments.

The paper also has broader relevance for the study of AI in sport and for sport tourism scholarship. Tennis is a particularly useful context because it combines a long history of technological officiating with increasingly sophisticated digital fan engagement initiatives, including AI-powered commentary, predictive analytics, and enhanced media experiences (Milmo & Hern, 2023; Azhar, 2024; Schaefer, 2024; Eccleshare, 2025). At the same time, the four Grand Slam tournaments serve as paradigmatic cases of sport tourism at scale, attracting internationally diverse audiences who experience AI-enabled services as part of a broader travel and event consumption experience. The conceptual logic developed here therefore bridges sport management and tourism research by framing AI adoption as a phenomenon that is simultaneously relevant to spectator behavior, destination competitiveness, and event quality management. This perspective may also inform comparative work across other major sporting events, such as the Olympics, football world cups, or Formula 1 races, in which AI is becoming increasingly embedded in the on-site visitor experience.

This paper is intentionally conceptual, which should be recognized as a limitation. It does not empirically test the proposed relationships or establish the relative strength of the identified mechanisms. Its purpose is instead to provide a theoretically grounded structure for subsequent empirical inquiry. Future research should therefore examine the propositions across different AI applications and fan segments, using designs capable of testing mediation, moderation, and contextual variation.

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