Analyzing the Impact of Artificial Intelligence on the Fan Engagement in the Sports Industry

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Abstract

This thesis explores how artificial intelligence is impacting fan engagement in the sports industry. As digital transformation accelerates across sectors, sports organizations are increasingly adopting technologies such as chatbots, personalized content systems, data analytics, and virtual assistants to enhance the way they interact with fans. This research starts with reviewing the development of artificial intelligence and its role in marketing and consumer interaction. It then examines the concept of fan engagement, highlighting how emotional, behavioural, and social factors shape the relationship between fans and sports organizations. The analysis combines insights from an extensive literature review with real-world examples from major sporting events such as the Olympic Games, Wimbledon, and Formula 1 to understand how artificial intelligence is currently being used to improve fan experience. While the benefits of these technologies are clear, ranging from personalized content to more efficient communication, this research also considers the potential negative effects, including ethical concerns, data privacy issues, and the risk of losing the human touch in the relationship with fans. By an extensive literature review, the thesis offers a balanced view of how artificial intelligence is reshaping the landscape of fan engagement. It concludes with managerial recommendations for organizations aiming to integrate such tools in a way that supports authenticity, trust, and long-term connection with fans.

Keywords: Artificial Intelligence, Sports Industry, Fan Engagement, Digital Transformation, Personalization, Ethics, Data Privacy

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Resumo

Esta dissertação analisa como a inteligência artificial está a impactar o envolvimento dos adeptos na indústria do desporto. Com a aceleração da transformação digital, as organizações desportivas recorrem cada vez mais a tecnologias como chatbots, sistemas de conteúdo personalizado, análise de dados e assistentes virtuais para melhorar a interação com os adeptos. A investigação inicia-se com uma revisão sobre o desenvolvimento da inteligência artificial e o seu papel no marketing e na relação com os consumidores. Segue-se a análise do conceito de envolvimento dos adeptos, destacando fatores emocionais, comportamentais e

sociais que moldam a ligação com as organizações desportivas. A dissertação combina uma revisão extensa da literatura com exemplos de grandes eventos — como os Jogos Olímpicos, Wimbledon e a Fórmula 1 — para demonstrar como estas tecnologias estão a ser aplicadas para enriquecer a experiência dos adeptos. Embora os benefícios sejam evidentes, desde a personalização de conteúdos até à comunicação mais eficiente, também se identificam riscos, incluindo questões éticas, privacidade dos dados e a possível perda do toque humano. No seu conjunto, a investigação oferece uma visão equilibrada de como a inteligência artificial está a remodelar o panorama do envolvimento dos adeptos, concluindo com recomendações práticas para que as organizações integrem estas ferramentas de forma ética e sustentável, reforçando autenticidade, confiança e ligação de longo prazo com os seus públicos.

Palavras-chave: Inteligência Artificial, Indústria do Desporto, Envolvimento dos Adeptos, Transformação Digital, Personalização, Ética, Privacidade dos Dados

Título: Análise do Impacto da Inteligência Artificial no Envolvimento dos Adeptos na Indústria do Desporto

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1. INTRODUCTION

Artificial intelligence (AI) has recently emerged as one of the most influential technologies across a wide range of industries. It is changing how companies function internally, make decisions, and interact with their consumers. Although AI has long been used in areas like manufacturing and healthcare for automation and efficiency, its move into consumer-facing domains, particularly marketing and engagement, signals a new stage in digital transformation (Ali et al., 2023; Pendyala & Lakkamraju, 2024). This shift is especially significant in industries where emotional connection, real-time response, and personalized experiences are crucial. With its devoted fan base and growing dependence on digital tools, the sports industry provides an ideal environment to explore how AI is changing the way organizations engage with fans (Xu & Baghaei, 2025).

Engaging fans has always been a core part of how the sports industry creates both cultural and commercial value. From chants in the stands and buying jerseys to fantasy leagues and posts on social media, fans actively help shaping the identity and revenue of sports organizations (Huettermann et al., 2019; Yoshida et al., 2014). However, as sport consumption becomes more digital and AI-powered personalization becomes more widespread, the way fans experience sports is evolving. AI now handles tasks like answering ticket questions through chatbots, generating custom video highlights, anticipating fan behavior, and creating immersive environments using AR and VR (Xu & Baghaei, 2025; Li & Huang, 2023). These developments lead to deeper questions about what it means to be a fan and how technology is influencing emotional and social aspects of fandom. The sports industry stands out in this context because of its unique mix of emotional loyalty, massive reach, and a constant need to innovate. Unlike most industries, fans often form part of their identity around the team they follow, so even small changes in how that relationship is mediated can have significant effects (Yoshida et al., 2014). At the same time, clubs and organizations are pushed to keep up with digital trends and find new ways to reach global, tech-savvy audiences. The growth of mobile-first content, streaming, and interactive platforms has changed the way sports are delivered and consumed (Seymour & Blakey, 2020). In this setting, AI does not just support back-end processes, but it directly interacts with fans and shapes how they perceive and connect with the sport, the team, and the brand. Reactions to AI in fan engagement are mixed. On the positive side, it enables better-targeted content, faster support, and deeper insights into fan behavior, which can improve loyalty and satisfaction (Gao & Liu, 2022; Kshetri et al., 2023). On the other hand, there are

legitimate concerns. Using fan data raises issues of transparency and privacy, and there is a risk of losing the authentic feel of sports experiences when too much is personalized or automated (Górriz et al., 2023; Anantrasirichai & Bull, 2021). Critics have warned that reducing fans to algorithmic profiles may put business performance ahead of real connection (Kotras, 2020). Also, while AI systems can generate or filter content efficiently, they may struggle to replicate the spontaneity and shared emotional highs that define traditional fandom (Billings, 2024; Seymour & Blakey, 2020).

This thesis looks at how AI is changing the way fans engage with sports. Although many previous studies have looked at AI's role in training, coaching, and internal business processes (Hammes et al., 2022), this research turns the lens toward the external side—specifically how these technologies affect the fan experience, from emotional engagement and expectations to loyalty and connection with the sport. The research is based on a wide review of scientific papers, professional reports, and selected case studies. The first section of the literature review outlines key concepts, traces the development of AI, and highlights how it has been applied in marketing and various operational areas of sport—such as injury monitoring, performance optimization, and media production. These domains are important because they often serve as a testing ground for tools that later find their way into fan-facing applications. The second section turns to fan engagement itself, looking at how AI influences content visibility, interactivity, and perceived authenticity. Both parts of the review are supported with concrete examples from industry. Some of the case studies include Wimbledon's use of generative AI for match summaries (IBM, 2024), the International Olympic Committee's fan data platform (Deloitte, 2025), and Formula 1's customized content through AWS (Amazon Web Services, 2023). These cases help illustrate how AI is already being used to shape digital fan experiences, and they are examined in light of existing academic discussions on marketing, fan behavior, and sport management. The thesis also addresses several key challenges, including data handling, algorithmic fairness, and the need to ensure that technological solutions complement rather than compromise the emotional value of the fan experience.

The main research question is:

How does artificial intelligence transform fan engagement in the sports industry?

To address this, the thesis also considers:

- How is AI currently used to engage fans in professional sports?
- What ethical and social challenges arise with AI-driven fan engagement?

- What are the key strategic and managerial takeaways for sports organizations implementing AI?

By focusing on this intersection of technology and emotion, the thesis aims to add to current research on how the sports sector is adapting to digital change. The goal is to help professionals—marketers, tech leads, and policy-makers—make informed choices about how to use AI in ways that are both effective and respectful of what makes sports meaningful. The idea for this topic emerged from the 20552 Sports Business and Management course, where the impact of innovation on the fan experience was discussed in depth. That course sparked a strong interest in how technologies like AI are not just changing operations, but also the core relationship between fans and the sports they love. Alongside academic insights, the thesis offers practical recommendations for organizations aiming to improve their fan strategies in an increasingly digital and data-driven world.

2. LITERATURE REVIEW ON ARTIFICIAL INTELLIGENCE

Before examining how artificial intelligence influences the way fans engage with sports, it is important to understand what this technology is, how it has developed, and how it is used today. This chapter provides an overview of the main ideas and debates surrounding artificial intelligence, focusing on how it has evolved over time and how it is being applied in fields like marketing and sport. By starting with a broader view, this chapter helps build the foundation for later sections of the thesis, which will look more closely at how these technologies affect the fan experience. The chapter begins with Section 2.1: Development of Artificial Intelligence, which outlines the early stages of artificial intelligence research and highlights some of the more recent changes, including the rise of generative models like ChatGPT. Next, Section 2.2: Marketing Applications of Artificial Intelligence discusses how companies use artificial intelligence to better understand and connect with consumers. This part also includes a closer look at consumer engagement, since it plays a central role in fan interactions. In Section 2.3: Risk and Ethical Challenges of Artificial Intelligence, the focus shifts to some of the problems linked to the growing use of this technology. Topics like trust, transparency, and fairness are explored here, especially in relation to systems that affect people's choices or access to services. Finally, Section 2.4: Artificial Intelligence in the Sports Industry brings these ideas together in the specific context of sport. This section looks at how clubs and organisations use artificial intelligence in areas like training, injury prevention, fan communication, and revenue generation, while also touching on related challenges. Altogether, this chapter sets the stage for

understanding how artificial intelligence might shape the future of fan engagement and why it matters for both the industry and its audiences.

2.1 Development of AI

Artificial intelligence (AI) increasingly shapes industries by optimizing processes, enhancing efficiency and revolutionizing decision-making systems (Ali et al., 2023). AI is a very important component in many industries that integrate modern information technologies. AI has been researched for over a decade, but today it has a bigger importance than ever before. This is due to the capabilities of intelligent systems to learn, reason, and adapt (Górriz et al., 2023). The concept of artificial intelligence, which refers to machine behaviour that would be deemed intelligent if performed by humans, has been around for as long as humans have been building machines. AI as a specialized field of study emerged in computer science during the 1950s. The field of AI went through some progress and setbacks, with notable slowdowns often called “AI winters” that happened in the mid-1970s and late 1980s. However, there has been a continuous growth in AI research and development since late 1990s. This growth was accelerated by three factors, namely the rise of machine learning and deep learning methods, the surge of computer power and the digitalization of industries. Together, these shifts have made it possible to process the massive volumes of information—often referred to as "Big Data"—that define the last two decades. Today, AI is part of our everyday lives that would have seemed unthinkable one or two decades ago. From self-driving cars to virtual assistants like Amazon Alexa, Siri, and Cortana, AI has become increasingly visible and accessible. AI continues to develop rapidly, and it surprises many as its applications find their way into more and more areas (Hammes et al., 2022).

Artificial intelligence is characterized by the capability of machines, in particular computer systems, that replicate human intelligence. This includes activities such as learning from patterns, acquiring and applying knowledge, reasoning and deciding based on the information stored (Pendyala & Lakkamraju, 2024). To analyse data and to recognize patterns, AI mimics the intelligence and way of thinking of humans. It is used in a wide variety of ways, such as expert systems, natural language processing, speech recognition, computer vision and chatbots. For instance, chatbots are designed to hold conversations with users in a way that it feels similar to talking to a person. AI often relies on a set of pre-written answers and prompts mostly used to answer routine questions (Keiper et al., 2023). An important par of AI’s success is its ability

to process large amounts of data that allows machine learning (ML) models to identify complex patterns and make predictions (Ali et al., 2023). These capabilities enable AI-driven approaches to achieve exceptional performance in solving complex computational problems, this positions AI as a key driver of societal advancement. AI-powered technologies have reached a stage where minimum human intervention is required for their implementation. There is an increasing necessity of understanding the reasons behind AI-generated decisions as these decisions can directly affect human lives in sectors such as healthcare, law or defence (Górriz et al., 2023). Industries like banking, finance, healthcare, law enforcement, transportation and retail are undergoing significant changes due to the rapid development of artificial intelligence (Ali et al., 2023; Pendyala & Lakkamraju, 2024). For instance, AI can assist in investment decisions, medical diagnosis, risk assessment and automated content generation (Ali et al., 2023). Furthermore, AI can enhance customer experience by enabling businesses to analyse datasets and make data-driven decisions (Pendyala & Lakkamraju, 2024). Artificial intelligence consists of codes and algorithms that allow computer systems to simulate human-like decision-making and behaviour. AI can be classified into two broad categories; general AI possesses human-level intelligence and understanding, whereas narrow AI is designed to perform specific tasks within a limited domain. General AI remain hypothetical, but narrow AI continues to improve rapidly, impacting industries through automation and decision-making. Modern AI is characterized by data-driven approaches, in particular machine learning (ML) that allows systems to adapt and improve with experience. ML is the most important technology behind AI today. Traditionally, programming used to be rule based, but machine learning learns patters from data without explicitly following predefined rules. Moreover, modern ML methods are based on artificial neural networks (ANNs) that mimic the human brain's structure (Anantrasirichai & Bull, 2021).

Earlier artificial intelligence models were easer to interpret. However, recent developments result in more complex decision-making systems, such as the Deep Neural Networks (DNNs). As these systems usually consist of various layers and millions of parameters, they are often defined as black-box models. The internal mechanisms of black-box models are difficult to interpret. This is in contrast with AI transparency that refers to the ability to gain clear insights into how a model operates (Górriz et al., 2023). Transparency-related issues are further discussed under chapter 2.3. In order to maintain the capacities of modern AI systems without sacrificing explainability, the field of eXplainable AI (XAI) has emerged (Peruchini et al.,

2024). The goal of XAI is to develop machine learning (ML) techniques that are in balance with model interpretability and high performance while enabling users to trust and effectively manage AI-driven solutions (Górriz et al., 2023). Machine learning algorithms analyse data, identify patterns and make predictions as well as automated decisions (Pendyala & Lakkamraju, 2024). Furthermore, XAI includes insights from the psychology of explanation of social sciences. These innovations in explainability methods counteract the trend that improvements in performance often lead to reduced interpretability and enable models to keep high accuracy while being more transparent. On the other hand, it is challenging to design models that offer meaningful insights without simplifying the functionality (Górriz et al., 2023).

Recent innovations in generative AI change the production processes and the labour market in ways that are different from automation. For instance, AI models such as ChatGPT and DALL-E can generate text and visual data based on large amounts of data, these outputs are completely distinct from automation technologies (Noy & Zhang, 2023). ChatGPT was launched in late 2022 by OpenAI and it gained widespread attention very quickly due to its potential to transform various industries. Its release catalysed discussions about its impact, some labelled it as a groundbreaking innovation while others highlighted its disruptive nature. The technology received increasing popularity and ChatGPT reached over a million users within a few days and over 100 million in two months. With Microsoft's substantial investment into the company its popularity further increased in 2023 (Keiper et al., 2023). Originally, automation targeted routine tasks that follow clear sequences and can be easily programmed, such as manufacturing processes and bookkeeping. However, generative AI systems can perform now beyond automation and can create creative and complex outputs like writing and design (Noy & Zhang, 2023). Due to the rise of AI-driven technologies, there is a long-standing debate whether employees can benefit from these technologies, or they are replaced by them. Generative AI, like ChatGPT demonstrates a dual potential. On one hand, it could replace certain professionals, such as content writers and marketers, because it enables organizations to generate content and materials with minimal human intervention. On the other hand, it can streamline routine aspects of writing so that professionals can focus on higher-level tasks. Moreover, AI reduces the time that is required for completing tasks and it improves the overall quality of output. This way, generative AI can increase productivity and expand demand for services. Furthermore, this technology contributes to equality in certain professions. However, in industries like advertising or communication, streamlining content creation with AI may result in workforce reductions

rather than expansions. Additionally, it can affect market dynamics as the perception of AI-generated content changes and influences consumer demand, audiences may prefer human-created materials over automated outputs (Noy & Zhang, 2023). Many factors have contributed to the quick adoption of AI in marketing. First, generative AI systems, in particular ChatGPT, have a user-friendly interface and are easy to use, which allows people to perform more advanced tasks without advanced technical skills. Secondly, there is the possibility of experimenting with AI tools without making a commitment. Thirdly, most of the generative AI services are available at affordable prices which makes them easily accessible for corporations, entrepreneurs and private users (Kshetri et al., 2023). A survey conducted by FreshBooks in May 2023 involved around 1,000 small business owners from the USA and Canada, revealed that 25% already used generative AI tools and 66% planned to adopt it next year (FreshBooks, 2024). Lastly, marketing organizations fine-tune generative AI models to align with their brand and marketing policies. The implications of this trend on the sport industry are discussed in a later chapter of this thesis. Artificial intelligence, especially ChatGPT, is often referred to as disruptive innovation. Disruptive innovations are products, technologies or services that seem first less advanced compared to what established companies offer, in particular if valued by average customers. However, they gain appeal in niche markets by offering lower costs, convenience or simplicity. Over time, these innovations improve gradually and begin to satisfy mainstream users overtaking and replacing the previous market leaders (Keiper et al., 2023). The development of AI has led to an increase in efficiency and reduced costs, benefiting the economy with growth and the society with social development and overall human wellbeing. For instance, AI-powered chatbots, like the ones developed by Microsoft, shaped positively customer service by responding the inquiries instantly, improving satisfaction and boosting sales. Additionally, in healthcare AI revolutionized patent care by enabling doctors to provide remote consultations through telemedicine services. The widespread use of AI is reshaping daily life, industries and society (Huang et al., 2022).

2.2 Marketing Applications of AI

By leveraging AI, organizations can improve their operations and enhance efficiency. Companies drive growth and innovations by actively seeking to adopt and implement new technologies in connection with AI. AI-driven insights enable companies to better understand their customers' needs, identify new opportunities, set more precise business objectives and

execute data-driven marketing strategies. With the help of AI, businesses can better achieve successful personalized marketing and customer engagement (Pendyala & Lakkamraju, 2024). AI-driven automation has drastically changed marketing by enhancing efficiency and reducing human error. It automates key processes like customer relationship management (CRM), social media management and content delivery. These innovations have a huge impact on industries like e-commerce, because real-time responses to consumer inquiries are critical. For instance, AI can optimize email campaigns, digital advertisement placements, social media posts so that relevance is ensured (Potwora et al., 2024). As discussed earlier, generative AI can impact the creative industry in two different ways. It can either replace jobs or can help professionals to execute their work at a higher level. In the sports industry, AI-driven chatbots, virtual commentators and interactive storytelling platforms could either replace traditional content creators or help them by automating routine tasks (Noy & Zhang, 2023). Advanced AI algorithms can analyze big datasets, such as social media activity, browsing patterns, purchase history. This way, product recommendations and tailored marketing messages can be delivered and in e-commerce this has boosted engagement and sales. AI is also important for scheduling advertising, automatically buying ad space and targeting users based on behavior and preferences rather than just demographics (Potwora et al., 2024).

One of the most frequent uses of AI in marketing is personalization (Babatunde et al., 2024; Chandra et al., 2022; Noy & Zhang, 2023). Personalization has become an important aspect of modern marketing; it is defined as offering the right product or service to the right customer at the right place and time. It is about tailoring offerings to align with individual customer preferences and needs. Personalization focuses on using customer data such as purchase history, behavioral patterns, demographics to create unique interactions so that customer experience is enhanced. It is often used interchangeably with terms like “segmentation”, “customization” and “individualization” (Chandra et al., 2022). The integration of artificial intelligence into digital marketing has fundamentally transformed the way businesses communicate with consumers. By leveraging sophisticated data analytics, AI allows for the development of highly personalized marketing strategies that move beyond the limitations of traditional, one-size-fits-all advertising (Babatunde et al., 2024). Personalization supported by AI leverages advanced learning systems, like supervised unsupervised and reinforcement learning. With the help of these, companies can analyze consumer data and provide actionable insights. Personalized experiences can be delivered at the right place and time by integrating technologies like Internet

of Things for data collection and AR or VR for enhanced interactions (Gao & Liu, 2022). Organizations individualize products and services to customer preferences by utilizing AI-powered insights. For instance, banks use AI to analyze customer data and provide personalized investment recommendations based on risk profiles (Noy & Zhang, 2023). The integration of AI into the customer journey brought significant transformations and personalization became the most important part of marketing strategies. Personalization is key for building connections, co-creating value with customers and for improving engagement (Gao & Liu, 2022). Furthermore, in retail AI is used to generate personalized product recommendations to drive higher sales as well as engagement. In general, Chief Marketing Officers (CMOs) believe that personalization is important to foster customer loyalty and to improve conversion rates. One of the other very frequent uses of AI in marketing is insight generation (Noy & Zhang, 2023). Personalization includes understanding consumer preferences and tailoring content to their needs. As personalization connects consumers and marketers more closely, it strengthens their relationships and encourages positive behaviors among consumers. AI-enabled personalization can be used to analyze consumers' purchase history to create individual profiles. This is known as personalized profiling, which helps companies to understand consumer preferences, behaviors, and needs. This facilitates micro-targeting, because AI gathers data from all digital touchpoints (Gao & Liu, 2022). This technology Is very important for market research and consumer insights, because it reduces the time of generating such information. For instance, AI can analyze data in a few seconds, this task would be done by human teams in days or weeks. It also allows organizations to process previously illegible or unstructured data. Software companies such as Salesforce or Microsoft embedded generative AI into their platforms to improve the extraction of customer insights. This helps marketers to analyze customer data and refine their strategies. Likewise, ChatGPT Plus has integrated an Advanced Data Analysis tool. This enables users to fill missing data gaps, generate visualizations, apply machine learning models and interpret insights with only simple prompts. Another important application of AI in marketing is in content marketing and creation. AI revolutionizes content marketing that is about producing and distributing engaging content to attract and retain customers. Furthermore, content marketing can be defined as a strategic approach that involves the creation of images, social media posts, videos and blogs to improve engagement and sales. Generative AI supports marketers to automate, ideate and accelerate content production that results in faster response time and lower costs. Companies use generative AI to generate blog posts and articles, to craft personalized ad copies and product descriptions, to produce high-quality visuals and to enhance

customer communications by automating chatbot responses. These make AI a crucial tool for marketing experts who want to improve efficiency, engagement and overall campaign performance. The extent to which AI in the sports industry will increase human creativity or replace the role of creative professionals in the future remains to be discussed (Noy & Zhang, 2023). Various generative AI tools have been developed by different companies. ChatGPT by OpenAI has emerged to be the most widely used and the most preferred tool among both the general public and the marketing professionals (Kshetri et al., 2023). Successful implementation of personalization can result in a 5%-15% increase in revenue and a 10-30% increase in marketing efficiency. This makes personalization one of the most important tools of modern marketing (Chandra et al., 2022). However, challenges also arise when personalization triggers privacy concerns and harms consumers' sense of freedom. There is a balance required between using AI and delivering personalized marketing experiences to avoid negative reactions to personalization. Consequently, businesses need to cautiously approach personalization with AI so that the privacy of consumer is respected. Furthermore, one risk of personalizing is misunderstanding the consumers. Companies might misinterpret consumer behaviour due to the limitations of AI or the sophistication of individual preferences, because firms heavily rely on algorithm-generated insights (Gao & Liu, 2022). While such personalization enhances user experiences by offering tailored content, it simultaneously raises critical concerns about data privacy, surveillance, and manipulation. Driven by large-scale data collection, personalized marketing is often critiqued for reducing consumers to mere data profiles, optimizing corporate outcomes at the cost of individual autonomy. This process—sometimes referred to as "algorithmic capitalism"—abstracts users from their social and human context, potentially compromising personal identity in favor of market segmentation. Despite such criticisms, personalization is not purely a tool of control. Its implementation involves complex negotiations among professionals who must navigate technical feasibility, ethical standards, and commercial goals. These actors shape the systems in nuanced ways, which are often overlooked in theoretical critiques that lack insight into the practical realities of algorithm design. Key challenges in algorithmic personalization include the lack of transparency in data use, embedded biases in algorithmic outputs, and the reduction of user identities to predictive models. Additionally, the design process itself requires balancing personalization benefits with concerns about fairness, consent, and user trust (Kotras, 2020).

2.2.1 Consumer Engagement

Consumer engagement extends beyond the purchasing activity. It includes consumer actions, such as cross-buying, retention, world-of-mouth and social media activities. These influence collectively the companies and brands (Van Doorn et al., 2010). Consumer engagement plays an important role in strengthening the relationships between consumers and brands, driving brand loyalty, increasing revenues and improving competitiveness. This engagement can be described by consuming, contributing to and creating brand-related content. This is influenced by elements such as energy, time and effort invested by the consumer (Annamalai et al., 2021). Customer satisfaction can be described as a positive and fulfilling reaction to a product that is key for customer retention, increasing profitability and reducing marketing costs. Achieving customer satisfaction should be a top priority for most of the businesses (Yoshida & James, 2010). In today's competitive digital landscape, companies should adapt new digital technologies to ensure customer satisfaction. An essential part of this a successful strategy is to optimize the customer journey that includes multiple touchpoints from brand awareness at the beginning to purchase and post-sale support (Pendyala & Lakkamraju, 2024). Nowadays, social media is the most important platform for consumer engagement, because it enables interactions between users and brands with enabling individuals to participate in brand-related activities. Engagement usually arises from these interactions, this emphasizes how motivation drives the actions of consumers (Vale & Fernandes, 2017). Engagement on social media includes emotional, cognitive and behavioural dimensions. Among these the behavioural aspect is the most important which is characterized by activities such as consumption (passive form of looking at content, contribution (liking, commenting, sharing existing posts) and creation (fans posting photos and reviews) (Annamalai et al., 2021). Importantly, consumer engagement can be both positive and negative. Positive behaviours include promoting the brand through social media posts and negative behaviours include organizing protests against the company. In addition, marketing experts are focused on customer-cantered metrics to assess the success of an organization, which highlights that the behaviour of consumers is evolving and it has an increasing influence on a company's performance. These metrics include commitment and trust, brand experience, customer identification and connections between the brand and consumers (Van Doorn et al., 2010). In contemporary marketing, personalization is recognized not only as a means to optimize customer engagement but also as a core strategic approach. By tailoring various elements of marketing mix, including product offerings, pricing strategies, promotional content, and distribution channels—to individual preferences, businesses can enhance customer

satisfaction and operational efficiency. Beyond immediate cost reductions and convenience gains, personalization plays a crucial role in fostering customer loyalty and delivering unique brand experiences, thereby reinforcing competitive positioning in increasingly saturated markets (Chandra et al., 2022).

The effectiveness off content strategies is different in every sector. For instance, informational content performed the best for fast food brands, whereas entertainment content was the most successful engagement for cosmetics. Similarly, low-vividness photos were the most effective for travel agencies. These contrasting outcomes highlight the need of exploring fan engagement in the sport industry in a broader context (Annamalai et al., 2021). Before integrating AI, customer satisfaction usually required human interaction and manual optimization. However, with the emergence of artificial intelligence, businesses need to transform their strategies regarding how they understand, engage and serve their customers (Pendyala & Lakkamraju, 2024). Digital technologies, like generative AI, improve customer experience by delivering personalized communications across multiple platforms. Generative AI is ideal for optimizing marketing strategies, because it is able to generate human-like, individualized content at scale. A good customer experience leads to stronger brand loyalty, greater engagement and better business performance (Kshetri et al., 2023). Generative AI has transformed how businesses interact with customers. The key applications of this technology are content creation, personalization, customer service and product design. Regarding content creation, AI automates the production of marketing materials, product descriptions and multimedia assets. Furthermore, AI analyses customer preferences to give individualized recommendations and to target advertising. AI also enhances chatbots and virtual assistants to provide responses that fit the context (Pendyala & Lakkamraju, 2024). AI focuses on customer touchpoints throughout the customer journey, on prepurchase, purchase and post purchase. With these AI increases the customer experience and foster value co-creation. Strategies like personalized profiling, nudging, navigation and retention can be used to shape interactions at an early stage (Gao & Liu, 2022). In terms of product design, AI assists in prototype development and customizes based on real-time customer feedback. Optimizing the customer journey with AI-powered technologies involves integrating numerous advanced tools such as machine learning algorithms, natural language processing and predictive analytics. These technologies enable businesses to extract valuable information from big amounts of data and facilitate the prediction of customer behaviour, customer preferences and needs. By leveraging these AI-driven

technologies, companies can segment customers more effectively and deliver highly personalized experiences tailored to specific characteristics and behaviours. Furthermore, AI allows businesses to process and analyse customer data from multiple sources. With the help of this data deep insights into customer behaviour, preferences and intent can be extracted that enables personalized content and optimizes customer journeys. AI can be applied in data unification and real-time decision-making. Data unification can be defined by integrating customer data from diverse channels (online and offline) to gain an overview of customer interactions. For real-time decision-making analytics can be used to adapt to customer behaviour. Moreover, by leveraging advanced data analytics using AI, customer behaviours can be analysed very efficiently. Furthermore, AI-powered chatbots can automate routine tasks, address customer inquiries by providing instant responses and provide 24/7 support. Additionally, virtual assistants further refine customer experience by offering personalized product recommendations and guidance, helping consumers in decision-making. These features offer new upsell and cross-sell opportunities for businesses. As AI technology advances, the future of AI-powered consumer engagement will be even more dynamic and personalized. Businesses will use AI to create hyper-personalized content by analysing the data of consumers across all touchpoints. Furthermore, this technology can be used to enhance recommendation systems so that the customer satisfaction improves. The evolution of deep learning will further enhance engagement driven by AI so that human interactions are mimicked with better accuracy and awareness. In conclusion, AI transforms consumer engagement across industries, which gives businesses the ability to hyperpersonalize, automate and to provide immersive experiences. Companies that leverage AI can anticipate consumers' needs, provide personalized experiences and improve efficiency. These drive customer satisfaction an long-term loyalty (Pendyala & Lakkamraju, 2024).

2.3 Risk and Ethical Challenges of AI

AI presents significant ethical issues for users, developers and society. It has already demonstrated its risks in several cases, for example Tesla's autopilot failure in 2016 that resulted in a fatal accident as the system failed to recognize a coming truck. Additionally, Microsoft's chatbot Tay generated racist and sexist content and was shut down afterwards. Other AI-related issues include privacy violations, biases and algorithmic failures that affect security. Moreover, AI was used for fraud, such as criminals mimicking a chief executive's voice and demanding the transfer of $243.000 (Huang et al., 2022). AI can be used to

manipulate visual and auditory media, both for entertainment and harmful purposes. Recent advancement of artificial intelligence and machine learning have increased the number of such manipulations by automating processes that make them easy to produce. Tools that generate text, such as OpenAI, can generate coherent paragraphs, but they can also create fake news and spam content on social media. In particular, deepfake technologies can create highly realistic videos by altering specific elements within existing media. For example, deepfakes can replace a person's face while keeping their body and movements intact. Similarly, AI has been used to synthesize full-body movements, generating realistic body positions by learning from a source video. Deepfake techniques were widely used for malicious purposes, such as creating explicit content featuring celebrities without their consent, spreading misinformation, blackmailing and causing political disruption. As a result of these unethical uses, researchers have developed multiple deepfake detection methods (Anantrasirichai & Bull, 2021). However, AI also presents both opportunities across different areas of life. Transparency, sustainability, fairness and accountability pay a key role in AI governance to ensure that technology benefits society while minimizing harm. Addressing possible issues about AI requires regulatory frameworks, industry guidelines and continuous discussions about AI development (Huang et al., 2022).

2.3.1 Trustworthiness

The question of what trustworthy AI is became a key problem for policymakers and AI developers worldwide. However, artificial intelligence can only achieve its full potential, if users trust its design and applications. In case of lack of trust, even highly effective AI technologies may struggle to achieve broad acceptance. For instance, it is difficult to replace traditional cars by autonomous vehicles if the public doubts their reliability. However, trust is no t only perception, real trustworthiness is needed. AI systems should be only trusted by users if it has proven that it is reliable, ethical and transparent. Trust goes beyond consistent performance; it requires accountability and alignment with human values. Consequently, it is essential to define what makes AI systems genuinely trustworthy. In general, trustworthy AI is characterized by the attributes of safety, fairness, explainability, transparency, robustness and ethical responsibility. However, AI should not only be required to fulfil the requirements of these traits. Instead, AI trustworthiness should be a matter of function, meaning that it should be only compulsory for AI systems to have certain attributes (e.g., explainability) if they are essential to its function. As an example, credit-scoring AI needs to be transparent since individuals must understand why their loan applications were declined, whereas medical AI may not require such explanations if its accuracy and reliability are assured. Thus,

trustworthiness is best defined by AI systems ability to meet expectations set by its function and role in society (Simion & Kelp, 2023). While solving AI ethics related challenges is a continuous problem, AI can provide solutions to ethical concerns. For example, Instagram has developed an anti-bullying system based on AI that detects negative comments before they are posted and prompts users to reconsider their messages (Anantrasirichai & Bull, 2021).

Furthermore, trustworthiness can be a challenge when evaluating the originality of images, videos and conversations, as AI is highly capable of producing fake media. The accessibility of artificial intelligence also means that it can be easily misused by anyone, which makes the development of AI-detection tools crucial. Additionally, trustworthiness of AI is closely related to the integrity of the data these systems rely on. Any bias in the training data can lead to biased outcomes, as AI models rely on data-driven algorithms. This problem is especially relevant in media services, because recommendation algorithms should ensure that diverse content is fairly represented to maintain the trust of users. The trustworthiness of AI systems depends on retraining them to correct biases that emerge as data complexity increases. On the other hand, well-designed AI models can enhance accuracy and reduce human bias (Anantrasirichai & Bull, 2021).

2.3.2 Ethics

AI ethics is a field that emerges and grows rapidly, influencing academia, industry, government policy and societal disclosure. During the past decade, extensive research has focused on identifying and addressing ethical concerns regarding AI technologies. While the integration of AI into various sectors improves productivity and cost-effectiveness, it has introduced ethical concerns as well, such as privacy breaches, bias, security risks and job displacement. The misuse of AI and its application in fraud and criminal activities further highlights the need to solve AI ethics related problems. Ethical issues can be divided into three segments, such as ethical issues at the individual level, ethical issues at the societal level and ethical issues at the environmental level. At the individual level it has multiple ethical challenges, including ensuring human safety in systems like autonomous vehicles and medical diagnostics, protecting privacy and data from misuse or surveillance, preserving human autonomy as AI takes on more decision-making, and upholding human dignity by preventing bias and reducing people to mere data points. Moreover, ethical issues at the societal level include ensuring fairness and justice by preventing AI-driven discrimination, clarifying responsibility when AI systems fail, increasing transparency to address "black box" decision-making, and mitigating risks from AI-

powered surveillance and datafication. Additionally, maintaining human control over AI, protecting democracy from misinformation and manipulation, addressing job displacement due to automation, and considering the impact of AI on human relationships are all critical challenges that need attention (Huang et al., 2022). The fear of job displacement due to AI automation is increasing, especially in the marketing roles. It is a significant concern for professionals that AI has the ability to replace traditional marketing roles (Kshetri et al., 2023). Lastly, ethical issues at the environmental level include the extensive use of rare materials for AI hardware, the high energy consumption of training large models, and the growing problem of e-waste and pollution from outdated technology, highlighting the need for sustainable AI development that minimizes long-term environmental impact (Huang et al., 2022).

2.3.3 Explainability

As artificial intelligence systems become more advanced, they become more difficult to understand. While these systems are very good at identifying patters and making accurate predictions, their black-box nature raises concerns about accountability. The so-called black box issue refers to the lack of transparency in deep learning models. Artificial intelligence models make decisions based on complex layers of computations that even AI developers struggle to explain. These systems work with millions or even billions of parameters that makes difficult to understand why a particular decision was made. This is a significant challenge for industries where accountability, trust and fairness are essential (Ali et al., 2023).

As black-box Machine Learning (ML) models become more important in decision-making, the demand for transparency from stakeholders rises. The risks associated with these models are that their outputs can lack justification, legitimacy or explanations how the outcomes are reached. Explainability and eXplainable AI (XAI) play an important role in developing responsible AI and ensure that AI-driven decisions are aligned with ethical principles, legal requirements and user expectations (Górriz et al., 2023). Sectors such as cybersecurity, autonomous transportation, healthcare, law enforcement and finance require interpretability in order to ensure accountability (Ali et al., 2023; Górriz et al., 2023). For instance, in finance, an AI system might reject a loan application based on hidden patterns in the dataset, but without explanation, the decision may appear biased (Ali et al., 2023).

The need for ethical AI development increases, as a lot of humans are reluctant to fully trust AI models. Moreover, Górriz et al. further highlights the importance of integrating explainability with ethical considerations by creating AI systems that are both high-performing and

transparent and also socially responsible and aligned with regulatory standards. The future of AI lies in its ability to bridge the gap between technical innovation and ethical implementation while ensuring that AI models are in service of society in an accountable way (Górriz et al., 2023). Moreover, AI explainability is a regulatory necessity as well, in particular for high-stakes applications, such as finance or healthcare. Numerous legal frameworks and ethical considerations have an impact on how AI models should operate to ensure transparent decision-making. AI governance is regulated through legal frameworks such as the GDPR (ensuring fairness and transparency in automated decisions), financial regulations (mandating explainability in banking AI), employment laws (preventing bias in hiring and workplace monitoring), healthcare regulations (requiring explainability for medical AI), criminal justice laws (addressing biases in AI-driven legal decisions), consumer protection laws (enhancing transparency in AI recommendations), and competition laws (preventing AI-enabled price-fixing and monopolistic practices). Organizations should align AI development with regulatory standards so that the can build trust and mitigate risks (Wulff & Finnestrand, 2023). On the other hand, striking a balance between transparency and security is a challenge. Explainability raises concerns regarding confidentiality and security, because revealing too much information about the model's decision-making process could expose it to attacks like data manipulation. As an example, there were cases where road signs were misinterpreted by autonomous vehicles due to small modifications (Górriz et al., 2023).

2.4 AI in the sports industry

Over the past few years, artificial intelligence significantly influences multiple industries, including the sports industry. AI leverages machine learning as well as natural language processing to analyze data related to sports and to generate important insights (Li & Huang, 2023). In the sports sector, AI has an increasing importance in improving athlete performance, coaching, injury prevention, business operations as well as fan engagement (Hammes et al., 2022). ChatGPT in sports communications can assist with game recaps, fan-focused content and blogs. In sports law, ChatGPT can help research cases and develop risk management strategies. In sport analytics, it can refine codes in programming languages such as Python and R (Keiper et al., 2023). Historically, one of the earliest applications of AI was in baseball analytics during the "Moneyball" era of the Oakland Athletics in the early 2000s. This period marked a change in player recruitment and performance evaluation, as data-driven methods gained prominence. After this approach was proved to be successful, more and more sport

organizations started using AI to support their decision-making. Nowadays, AI is used widely in the sports industry, not only for player scouting, but also for officiating, like Hawk-Eye technology in tennis and goal-line technology football, as well as tactical analysis, injury recovery and individualized training programs. Additionally, AI is essential in sports broadcasting, because it improves the way fans experience games and it is used in the betting world to make predictions (Hammes et al., 2022). Technology has created new opportunities for innovation and efficiency in the sports industry, and technological advancements play a crucial role in the industry's digital transformation (Xu & Baghaei, 2025). It is important to mention that not only AI, but also other technologies like computing, blockchain and AR further reshape the future of this industry (Li & Huang, 2023).

It is crucial to describe what AI encompasses when discussing its role in the sports industry. AI is often understood as advanced, data-driven technology rather than a single, well-defined system. One framework that is useful for defining AI is the Sense-Model-Plan-Act (SMPA) loop that describes it as a process where the system understands its environment, builds a model based on this perception, formulates a plan and executes an action in response. This way, it continuously adapts based on feedback from the real world that results in self-improvement. Based on this framework, AI can be applied in multiple ways. Firstly, it collects sensory data about athletes' heart rate, video recordings and movement. Secondly, it uses tools like statistics and machine learning to analyze and interpret data, which can predict the effectiveness of a training program, or the effect of a certain strategy could have on the game. Accordingly, AI can support coaches and athletes to optimize training decisions and to give real-time feedback, like pace control during running. Lastly, AI in sports is more than simple data analysis, it is about combining perception, prediction and action (Hammes et al., 2022).

AI systems are capable of performing tasks that originally required human intelligence, this has a significant impact on the sports industry. One of the biggest benefits of AI is its ability to analyze large amounts of data. If datasets ranging from player statistics to fan interactions are available, AI can provide deep insights into engagement patterns and performance trends. Sport organizations can improve training methods, personalize marketing campaigns and enhance operational efficiency (Li & Huang, 2023). As AI continues to develop, it will be more frequently applied in the industry and offer industry players cutting-edge tools for innovation, performance improvement and engagement. The future of the sports industry depends on AI

which provides countless opportunities for the industry's evolution (Xu & Baghaei, 2025). However, the advancement of AI also raises concerns regarding data privacy, transparency, fairness and ethical considerations. As artificial intelligence evolves, business organizations should address these challenges that will not only ensure fairness but also enhance trust and acceptance of technology-powered solutions in the industry (Li & Huang, 2023).

2.4.1 Overview of the Sports Industry

The sport industry is growing year by year. The global sports market, including infrastructure, events, manufacturing, training and retail of sports goods was worth between $600 and $700 in 2016, which accounted for roughly 1% of global GDP (KPMG, 2016). Its expansion resulted in the development of numerous powerful brands, such as FC Barcelona, Nike, Lebron James and the Olympic Games, in television and media rights, sponsorship, sport tourism, live and fantasy events (Kolyperas et al., 2018). Sport plays an important role in our lives, because it impacts not only individuals, but also the society and public sphere at large. Economically, the sports market includes numerous participants and stakeholders that want to achieve their unique goals. Sport organizations, such as clubs, event organizers and associations aim to promote their respective sports and institutions. Additionally, sports are valuable for media agencies, because they can generate revenue from broadcasting and commentary. Furthermore, athletes are considered to be ambassadors of their nations, which can serve political purposes. Lastly, companies participate in the sports industry as well, because they leverage sponsorship for advertising. This variety of stakeholders represents distinct goals of each group that makes the sports industry an important industry. For these industry players market-oriented management is essential. This is the reason why sports marketing needs to be emphasized that is based on targeted marketing strategies, brand management and performance optimization. The stakeholders' sport marketing competencies can result in achieving competitive edge (Bruhn & Rohlmann, 2022).

2.4.2 Performance Analysis

AI has become crucial in athlete training, scouting and performance analysis, because it provides advanced tools for studying player movements and physical capabilities (Xu & Baghaei, 2025). As artificial intelligence can process big amounts of data, it can identify trends and optimize training plans. Additionally, real-time tracking of the athletes is also possible, this provides detailed information for coaches to improve training programs (Li & Huang, 2023). Advanced algorithms process player data and collect key performance metrics such as

movement patterns, speed, endurance and technique precisions. These insights facilitate coaches to create individual training plans and highlight areas for improvement addressing each athlete's requirements while accelerating their skill development. Furthermore, coaches can forecast athlete development and team success with AI, and it plays a crucial role in game strategy. AI allows coaches to perfect their game plans by analyzing historical performance data, uncovering patterns in opponent strategies, tactical approaches and player tendencies (Xu & Baghaei, 2025). In basketball, machine learning models analyze key performance indicators like shooting accuracy, defensive efficiency and passing effectiveness. This technology supports players with detecting tactical patterns and assists them in perfecting their shooting techniques, shot angles and ball trajectories. There are shooting assistants that are based on AI, such as wearable sensors and shooting assistants that provide real-time feedback to athletes. Moreover, intelligent basketball training machines are able to simulate game scenarios to improve the reflexes of players (Li & Xu, 2021).

Additionally, AI can also identify athletes' future potential and predict match outcomes by analyzing historical performance data so that coaches can design effective training plans (Li & Xu, 2021). Another important innovation is AI-driven game simulation technology that recreates real-world scenarios and tests strategic decisions before the game day. These simulations evaluate plays, formations and tactical choices. Moreover, AI has revolutionized real-time feedback and game analysis, which considerably improves decision-making during the game. These systems provide immediate feedback on player movements, tactical positioning as well as physical exertion. This way, coaches can adjust their strategies real-time, and athletes receive immediate recommendations to improve their performance. As an example, in basketball Golden State Warriors use AI to analyze player movements, shooting mechanics and decision-making in real time. This allows coaches to adjust training and to optimize performance. Additionally, his technology also plays an important role in talent identification, because it helps clubs to identify young players with long-term potential by analyzing game footages, performance statistics and scouting reports. Importantly, AI reveals hidden performance trends as well and assists teams in maximizing their potential. As an example, the football club Manchester City utilizes AI-driven scouting systems to analyze young talent worldwide by evaluating their technical, tactical and physical characteristics. This way, the club can make the best recruitment decision possible. Correspondingly, in Formula 1 the team Mercedes-AMG Petronas uses AI to analyze data on engine performance, aerodynamics as well

as tire wear. This supports engineers to adjust race strategies to remain competitive (Xu & Baghaei, 2025).

2.4.3 Injury Prevention and Rehabilitation

AI has revolutionized how athletes train, compete and recover, because it offers insights into movement patterns, biomechanics and workload management. Artificial intelligence contributes to injury prevention and rehabilitation by evaluating diverse factors such as player workload and movement patterns to identify potential injury risks. With biomechanical analysis movements can be identified that potentially lead to injuries. The integration of AI-based wearable devices has transformed injury prevention by providing real time monitoring of athletes (Xu & Baghaei, 2025). These wearable devices are equipped with sensors and AI-driven analytics and collect as well as analyze data. This enables continuous evaluation of sports people's condition and early detection of potential injuries (Li & Huang, 2023). Furthermore, these wearable devices collect like heart rate, distance covered, and energy use, yet AI is needed to examine these trends and turn them into practical advice. With this technology, early signs of fatigue, overexertion and abnormal movements can be detected. Moreover, with computer vision, AI-powered video analysis can monitor movements, identify strengths and weaknesses, and provide immediate feedback to refine technique (Xu & Baghaei, 2025). However, some experts identify a shift from using wearable sensors to video-based methods, because wearable sensors can negatively impact athletes' performance. For example, ski jumpers can be affected by even small amounts of extra weight. Still, wearables are very important in the sports industry, for example for running, where the sensors track individual performance through tools like inertial measurement units (Hammes et al., 2022). Most recent AI developments in sports medicine and orthopedic research have shown significant potential in predicting injury susceptibility, analyzing medical imaging, evaluating athletes-related health data and in enhancing overall rehabilitation effectiveness. This technology contributes to identifying patterns that can indicate an increased likelihood of injury that can be used by medical professionals and coaches to implement preventive measures to avoid injuries (Li & Huang, 2023). Artificial intelligence is also used in game analysis and helps teams to improve tactics by identifying patterns in video footage. Injury prevention tools measure athlete's biomechanics to detect stress points, which supports coaches to modify training for reducing injury risk. With these targeted prevention programs, peak performance of athletes is ensured while minimizing inactivity due to injuries technique (Xu & Baghaei, 2025). Moreover, wearables based on AI provide real-time feedback on movement patterns and technique. Embedded sensors can be

utilized to measure joint angles, weight distribution and acceleration forces analyzing the efficiency of athlete's motion (Li & Xu, 2021). This immediate feedback helps athletes to change their technique, and this reduces the risk of injuries that are in connection with poor movement mechanics. Other than injury prevention, these wearables play an important role in managing athlete workload and recovery (Li & Huang, 2023). AI plays a crucial role in rehabilitation, because it provides real-time feedback on movement patterns during recovery. With this technology, healing process can be optimized and the return to peak performance can be accelerated (Xu & Baghaei, 2025). With analyzing metrics like recovery indicators, intensity levels and training volume, athletes' physical readiness for training or competition can be evaluated. This enables personalized training adjustments that lowers the risks of inadequate recovery and overtraining. A further benefit of AI-powered wearables is that they are able to monitor athletes in the long-term. Collecting data continuously offers valuable insights into performance trends, recovery patterns and athlete's progress over time. Medical teams, coaches and trainers can use this data to make decisions regarding injury prevention strategies, training modifications and rehabilitation protocols. With these advancements, AI-driven wearables revolutionize sports injury management and offer a more data-driven approach to athlete health and performance optimization (Li & Huang, 2023). As an example, AI can detect issues in a basketball player's jump height and quickly offer ways to improve it (Xu & Baghaei, 2025).

2.4.4 Data Analytics for Revenue Growth

AI-driven data analytics are essential for optimizing revenue streams in all industries. In the sports industry, AI algorithms process a large amount of data and support companies to gain insights into fan behavior, financial opportunities, market trends. This helps companies with strategic decision-making. One of the most important applications of AI is using analytics for revenue forecasting. AI models can identify patterns that predict future revenue trends by analyzing past data on ticket sales, sponsorships, media rights and merchandise purchases. With this information companies can refine pricing strategies, optimize ticket sales, and negotiate sponsorship agreements in a more efficient way to maximize financial outcomes. Moreover, with predictive analytics sport organizations can identify emerging market trends as well as shifting consumer preferences (Li & Huang, 2023). Furthermore, AI supports organizations to maximize their revenue by optimizing in-stadium purchases by predicting product demand and strategically positioning vendors. It also helps recommending personalized merchandise bundles based on the profiles of fans and. Importantly, sponsorship value can be increased by demonstrating precise ROI using AI analytics (Seymour & Blakey, 2020). AI provides valuable

insights into fan purchasing behaviors and engagement by analyzing data from ticketing platforms and social media. This data helps create personalized marketing strategies, individualized promotions, and unique fan experiences to enhance engagement and drive revenue growth. Furthermore, analytics with AI support ticket pricing strategies by utilizing dynamic pricing models. AI evaluates factors like demand, past sales data and market conditions to recommend optimal ticket pricing. This helps set ticket prices strategically while maintaining affordable prices for fans to optimize revenue for organizations. Additionally, analyzing the data of consumers is another advantage of AI, because it can segment fans based on demographics, purchasing history and engagement levels. With this segmentation, organizations can categorize fans into different groups based on their behavior and potential lifetime value. This facilitates personalized marketing strategies, loyalty programs, and focused promotions to enhance fan loyalty and sustain long-term revenue growth. With AI-driven analytics sport organizations can enhance profitability and drive successful business in a competitive industry (Li & Huang, 2023). Furthermore, data-driven decision-making has transformed ticketing, pricing and marketing strategies as well in the sports industry. Sports organizations can optimize ticket sales, develop competitive pricing strategies and create personalized marketing campaigns with analytics and algorithms to maximize revenue and fan engagement (Xu & Baghaei, 2025). AI models recommend optimal pricing structures and seating arrangements by analyzing past data, fan demand, competitor pricing and market trends. This way, ticketing systems can leverage dynamic pricing models to increase ticket sales. For dynamic pricing AI measures real-time data, demand fluctuations and ticket availability to facilitate automatic price adjustments. This ensures that ticket prices reflect current market conditions to enhance fan satisfaction. Thus, tickets are priced to maximize revenue while considering factors such as event popularity, seat location and fan purchasing power (Li & Huang, 2023).

2.4.5 Challenges and Ethical Considerations of AI in the Sports Industry

The increasing reliance on AI raises numerous ethical concerns and challenges that need to be addressed to ensure accountability, transparency and fairness in the sports industry (Xu & Baghaei, 2025). It is important to mention that sports with greater financial resources, like basketball and football, have higher chances of adopting advanced AI-based data collection than many Olympic sports that possibly struggle with funding (Hammes et al., 2022).

Data Privacy and Security

AI has become an essential part of the sport industry and simultaneously concerns around data privacy have emerged. It is very important to implement security measures to protect sensitive information as sport organizations process large amounts of personal data from fans, athletes and stakeholders (Kshetri et al., 2023; Li & Huang, 2023). One of the main challenges is to ensure the confidentiality of athlete performance data. Biometric data, injury reports, training records and fan engagement data are highly sensitive information, and they can be exploited without protection, so they need to be safeguarded to prevent misuse and unauthorized access Concerns arise regarding data collection, consent and user privacy in terms of fan engagement and automated ticket pricing strategies as well. Sports companies need to adopt transparent data policies to avoid AI-driven engagement strategies infringing on personal rights (Xu & Baghaei, 2025). There are different methods to enhance security of data analytics such as hash-based data clustering and differential privacy techniques (Li & Huang, 2023). To address the above-mentioned risks, OpenAI offers companies data protection measures to avoid the leakage of confidential data. On the other hand, consumers are more and more concerned about data security and may prefer not to engage with brands that cannot protect sensitive data (Kshetri et al., 2023). Furthermore, AI-powered sports wearables that collect athlete performance data require encryption and secured storage frameworks. As a solution, blockchain technology offers decentralized and protected data storage for athlete contracts, ticket sale and merchandise authentication (Li & Huang, 2023).

Fairness and Transparency

AI models used in sport organizations must be developed with transparency and fairness (Li & Huang, 2023; Xu & Baghaei, 2025). Decision-making with AI is a challenge, because many AI models work as “black boxes”, this makes it difficult for coaches and managers to understand how predictions are made. Explainability of AI algorithms needs to be enhanced to maintain trust and credibility (Xu & Baghaei, 2025). Artificial intelligence often learns from past records, which means it can inherit biases. These biases might skew processes like selecting athletes, scouting emerging talent, and judging performance. Without careful checks, such bias could worsen current inequalities in sports that would ultimately affect both player opportunities and fan experiences (Li & Huang, 2023). If data contains bias, AI generated insights can reinforce existing inequalities in team selection, contract negotiations and player scouting. Moreover, the integration of AI raises challenges about fair play and competition integrity. AI can be used to optimize training techniques, games strategies and player performance, but there is a fine line between legitimate performance improvement and unfair competitive advantages. AI could be

misused to manipulate outcomes, which could affect match fairness and the spirit of the competition (Xu & Baghaei, 2025). Sport organizations should make sure to train AI models on diverse and representative datasets to mitigate bias. Organizations need to frequently check their AI systems to discover any biases and correct them when needed. It is also essential that sport organizations openly explain how their AI-based decision-making works, so that everyone involved can review the methods and have confidence in technology (Li & Huang, 2023).

Regulatory measures

Sport organizations, governing bodies and AI developers should collaborate to address the above-mentioned difficulties and to create clear ethical guidelines for AI use in sports. These guidelines should include strengthening data protection to safeguard both personal and performance-related information, conducting regular audits to detect bias and ensure fairness in AI algorithms, and developing explainable AI models that bring more transparency to automated decision making. Furthermore, equal access to AI tools should be promoted so that smaller teams have equal chances. Building ethical frameworks is also important to make sure that AI supports fair competition. By implementing these measures, the sports industry can have huge advantages using AI. It can boost performance, deepen fan engagement, improve decision-making while being ethical and fair (Xu & Baghaei, 2025).

2.4.6 Human-AI Collaboration

While AI provides data-driven analysis, overreliance on AI can be concerning. It can overshadow human expertise in coaching, talent recruitment and game strategy. AI is best seen as a tool that supports and not a tool that replaces human decision-making. It is important to keep human intuition, experience and contextual understanding the most important part of the decision-making process. There is an emerging need for scientists who both understand sports applications and data science so that they can act as a bridge between disciplines. In an ideal world, AI initiatives should originate from sports practice and not from researchers who are possibly unfamiliar with athletes' needs (Hammes et al., 2022). At the same time, not every team or league has the same access to AI. Organizations that have more financial resources are often able to invest in the latest technologies, while smaller teams might be left behind. This can create an uneven playing field. Making open-source AI tools more accessible and offering financial support could help bridge that gap and promote more equal opportunities (Xu & Baghaei, 2025). Furthermore, companies and employees might be reluctant to transition to AI, because it has its learning costs, perceived risks and corporate culture challenges. It takes time and effort to learn how to use this technology, which leads to productivity loss and frustration

and the beginning. On the other hand, companies need to invest in training employees to use AI tools effectively, which results in additional time and financial costs. Additionally, employees might have difficulties in detecting and correcting the mistakes of AI which leads to inefficiencies (Kshetri et al., 2023). Despite the advanced capabilities of AI, human expertise remains vital in the sports industry. Artificial intelligence enhances human decision-making rather than completely replacing it. AI is not able to fully capture the expertise and contextual knowledge of coaches, trainers and analysts. For example, even though AI can analyze numbers and forecast player performance, there is still a crucial role for human insight in understanding the broader contexts like team chemistry, the players' morale, and unexpected setbacks such as injuries (Li & Huang, 2023). Coaches utilize AI-generated analytics to improve training regimens so that they align with each player's unique strengths and weaknesses. This enhances resource utilization while maximizing team efficiency (Xu & Baghaei, 2025). When sports organizations blend the analytical power of AI with human judgment, they can tap into the best of both worlds (Li & Huang, 2023).

3. LITERATURE REVIEW ON FAN ENGAGEMENT IN THE SPORTS INDUSTRY

Fan engagement has always been an important part of sport, but in recent years, the way fans interact with teams and events has changed a lot. With the rise of social media, streaming platforms, and new technologies, the relationship between fans and sports organisations is no longer limited to what happens in the stadium. Since this thesis is about how artificial intelligence affects fan engagement, it essential to take a closer look at what fan engagement actually means, how it works, and why it matters for clubs and organisations today. This chapter starts by going back to the basics in Section 3.1: Foundations of Fan Engagement. It covers ideas like what motivates fans, what kind of behaviour they show, and how they create value for teams. After that, Section 3.2: Fan Engagement with Artificial Intelligence looks at how new tools are being used to improve the fan experience, both online and at live events. In Section 3.3: Challenges of Fan Engagement with Artificial Intelligence, the focus shifts to some of the risks. These include concerns about data, the feeling of being watched, and the fear that digital engagement might start to feel fake or impersonal. Finally, Section 3.4: Industry Examples presents a few real cases where artificial intelligence is already being used in sport to connect with fans in new ways. Altogether, this chapter helps to understand what makes fans feel involved and what might put that connection at risk.

3.1 Foundations of Fan Engagement

Engaging with fans is one of the most important aspects of modern sports. It is not just about filling stadium seats or getting people to watch games on television. Many fans feel a strong connection to their favorite teams, and this can influence how they behave—whether that means buying merchandise, following club updates online, or talking about the team with others (Yoshida et al., 2014). Researchers have pointed out that when fans feel personally connected, they are more likely to stay loyal over time. The way fans interact has also changed, with social media and mobile apps playing a bigger role. To understand how new technologies like artificial intelligence might affect this relationship, it is first necessary to understand the basic drivers behind fan engagement (Yoshida & James, 2010).

3.1.1 Fan Experience and Satisfaction

Sports marketing is described as the targeted application of marketing principles to sports-related products and the promotion of non-sports products through their association with sports. The focus is on the customer or the consumer with the goal of them trying products or buying services while fostering long-term satisfaction. Customer satisfaction is very important for both live sports experience and the broader engagement with sports fans (Seymour & Blakey, 2020). Furthermore, customer satisfaction strongly influences customers' intention to return, and it serves not only as a measure of service quality but also a key indicator of recurring clientele (Yoshida & James, 2010). A positive experience during a sports event significantly increases the fans' likelihood of attending future events and the likelihood of word-of-mouth recommendations (Madrigal, 1995). The satisfaction and future attendance intentions are influenced by factors such as outcome of the game, home team characteristics, opponent rankings and enjoyment. In sports marketing, a key challenge is to manage the core product and the ancillary services. The core product is the sports competition that is unpredictable and cannot be influenced. Whereas services such as stadium staff, accessibility, seating comfort and facilities can be effectively managed to increase satisfaction. Furthermore, the attitudes of stadium staff and the easiness of accessing the facilities are key predictors of service satisfaction in the United States and Japan (Yoshida & James, 2010).

3.1.2 Motivations of Fans

Sport fans are people who are supporting a sport, team, or athlete in particular and form a collective fan base. There is a shared enthusiasm that fosters a sub-culture of connection and emotional investment among fans (Seymour & Blakey, 2020). Most of them participate in

activities related to their favourite teams. This engagement is often characterized by attending games, watching broadcasts, buying team merchandise, reading sport publications and discussing sports with other people (Yoshida et al., 2014). There are several key motives that drive fan engagement. Fans like to gather information and seek updates as well as statistics about their favourite teams or players, because they aim to be informed. Moreover, entertainment is also an important motive behind fan engagement, as fans enjoy highlights, funny posts and behind-the-scenes content. Additionally, renumeration in terms of rewards, exclusive offers and promotions is also very important. Lastly, fans aim to socialize with other fans, they look for opportunities to connect with other fans and share experiences, this way they fulfil the need for community interactions (Annamalai et al., 2021). Social media has transformed fans from passive supporters into active participants who share their experiences through comments, photos and videos (Yadav et al., 2023). Furthermore, fans contribute both tangible and intangible resources to their fandom, like material goods or skills and knowledge. Tangible contributions include waring team merchandise and bringing banners or flags to events. Additionally, fans show their support by decorating personal belongings like cars or create team-related content digitally. Intangible resources applying knowledge across different platforms like home stadium and digital channels. Moreover, fans organize meetups, secure tickets for special events and coordinate group marches to the stadium. Within the stadium, fans use their skills for rhythmic clapping and singing or even doing choreographies (Huettermann et al., 2019). Highly engaged fans go beyond personal enjoyment, they participate in a wide range of activities that mirrors their loyalty and commitment to their favourite team. Moreover, sport fans usually display behaviours that supports their favourite teams, such as attending events with other sport fans and spreading positive word-of-mouth. Most of the time sport fans also connect with their fellow fans by sharing team-related knowledge and engaging in interactions during events. Through the lens of consumer behaviour, these actions can be identified as promoting a brand through word-of-mouth, offering feedback for product improvements as well as collaborating with other consumers (Yoshida et al., 2014). Important fan engagement examples include Wimbledon AI highlights, Super Bowl Experience and the Formula 1 App (Seymour & Blakey, 2020). Data from Deloitte's Sports Fan Insights survey shows that fan enthusiasm remains strong and current sports fans are willing to invest their resources to support their favourite teams and athletes. In fact, more than 75% of respondents rated their level of fandom at seven or above on a ten-point scale. The reason why they follow sports is that is entertains them and nearly 70% of the respondents identified enjoyment as their

primary motivation of being a fan. However, there are concerns about the sustainability of future fan bases due to the declining participation in youth sports. The number of alternative entertainment possibilities is growing, such as social media, streaming platforms and gaming. This is why the attraction of the attention of younger audiences is becoming increasingly competitive. To continue having a loyal fan base the sports industry needs to adapt by enhancing the entertainment value of sports with more immersive digital experiences to satisfy the younger audience (Giorgio et al., 2023).

3.1.3 Fan Behaviors

Fans engage with their favourite teams through numerous activities like volunteering and cheering across online and offline channels and at different occasions such as following the team on social media or attending games in stadiums. Furthermore, fans actively share team-related information with other fans, this knowledge sharing can complement or even substitute clubs' marketing efforts. Moreover, fans also act as brand ambassadors on digital social media. They share their experiences and post pictures, which is an authentic representation of the club. Managers realize the value of this and note that fan-shared content often emphasizes the things that resonate the most with the fanbase (Huettermann et al., 2019). Another important catalyst of fan engagement is the easily accessible information. Modern fans do more than just watching games, they analyse, criticise and engage real-time with their favourite teams and players. They seek the maximum information about sports with minimum effort. The internet has transformed the fan experience, because it offers comprehensive information about teams, events and athletes. Furthermore, it also provides an interactive platform for deeper engagement. Information that is easily accessible is very important, because it facilitates social interactions, stronger relationships between brands and fans as well as digital world-of-mouth (Yadav et al., 2023).

All of these types of exchanges can be described as the broader term of engagement that describes how fans devote their time, energy and other resources to support a sports team. Even though this interaction can lead to both positive and negative outcomes, high level of fan engagement is usually considered to be beneficial for the organization (Huettermann et al., 2019). In order to describe fan engagement, it is important to distinguish between transactional and non-transactional behaviours. Transactional behaviours include direct exchanges of money and time. For example, buying tickets to go to games or events, purchasing team merchandise, subscribing to social media channels and accessing exclusive content, and participating in fan

loyalty programs that offer rewards. The motivation behind these behaviours is immediate benefit or value that reflects trade-off between cost and gain. In comparison, non-transactional behaviours do not include direct financial exchanges, but reflect loyalty, passion and a sense of community (Yoshida et al., 2014). Community membership plays an important role in fan engagement, because it offers a sense of belonging and identity (Yadav et al., 2023). In this case, fans are not motivated by self-interest, but by the desire to support their favourite team (Fathy et al., 2021). For instance, discussing about the team with fellow fans, displaying loyalty through cheering, creating fan art and sharing posts on social media. Non-transactional behaviour also includes a concept known as performance tolerance when fans show loyalty even if their team is not successful and prosocial behaviour that is characterized by supportive interactions within the fan community. Moreover, fans engage in social interactions, participate in rituals and in playful activities that reinforce their fan identity. Additionally, BIRGin (Basking in Reflected Glory) and CORFing (Cutting Off Reflected Failure) are non-transactional behaviours as well and they describe how people adjust their association with a group based on its success or failure (Yoshida et al., 2014). The main drivers of non-transactional fan behaviour are sports consumer-team relationship quality (SCTRQ), positive affect, fan role readiness and BIRGing. Elements such as commitment, trust, reciprocity, intimacy and identification are categorized under SCTRQ. Additionally, positive affect can be characterized by the happy emotions and feelings fan experience, like contentment and joy, when watching their favourite team. There is a positive relationship between these happy emotions and fan engagement, which means that fans are more likely to engage when they feel such feelings. Besides that, fan role readiness reflects fans knowledge and skills to actively participate in activities in connection with the sports organization. The more prepared they feel, the more likely they are to exhibit engagement behaviours. Furthermore, BIRGing serves as a self-esteem booster and an image management strategy that allows fans to share the glory of teams' success without directly contributing to it. There is a positive relationship between BIRGing and fan engagement (Fathy et al., 2021). BIRGing occurs when people highlight their connection to a successful group to boost their self-esteem. In the context of sports, fan feel a sense of pride when their team wins. For example, after a victory, fans tend the wear the team apparel more often and use phrases like "We won". People enhance their own social image by associating with success. On the other hand, CORFing happens when individuals distance themselves from a team after it has lost. With this behaviour, people avoid being linked with failure to maintain their positive reputation. These actions show fans' dedication beyond

personal gain, go deeper than financial transactions, foster deep emotional connections with the team and create a strong sense of belonging to the community. Non-transactional behaviours often result in long-term loyalty that cannot be purchased, as fans become ambassadors, advocates and important members of their teams' network. This fan culture makes the bond between fans and their teams stronger and ensures engagement that is more than traditional consumer behaviour (Yoshida et al., 2014). Yoshida et al. (2014) found that team identification and BIRGing (Basking in Reflected Glory) are important drivers of fan engagement. Team identification refers to how strongly fans feel to be connected to a team and BIRGing is demonstrated by fans celebrating their teams' success and perceiving their teams' accomplishment as their own. Both team identification and BIRGing increase prosocial behaviours by encouraging fans to connect and to support each other. Moreover, team identification enhances performance tolerance as well by making fans more resilient to their teams' struggles. This promotes future engagement and commitment among fans (Yoshida et al., 2014). Fan engagement is similar to organized religion in its vocabulary and rituals, which emphasize celebration, dedication and community spirit (Seymour & Blakey, 2020). Furthermore, performance tolerance fosters long-term fan loyalty, because fans who can forgive their teams' failures tend to continue to support their team in the long run (Yoshida et al., 2014). Importantly, fan engagement is affected by external variables, such as seasonality and team performance. Engagement fluctuates based on the sports calendar, so that off-seasons require more content to keep fans interacted. Moreover, engagement depends on team performance, because the fans are emotionally connected to their teams and share positive and negative experiences accordingly (Annamalai et al., 2021). According to the Psychological Continuum Model, fan engagement is characterized by four stages: awareness, attraction, attachment and allegiance. Awareness, the first stage of fan engagement is shaped by social influences from family, friends and media. This includes low-effort promotional activities, like strong advertising campaigns that capture attention. In the second phase, attraction, fans start engaging more actively, which is driven by emotional connections and perceived advantages of the sport. Creativity, trendiness and originality are especially important for younger audiences, this can be showcased by the example of Serena Williams' short takeover of Snapchat. In the third phase, attachment, fans associate emotional and practical meaning with the sport and athlete. With personalized experiences, like loyalty programs and targeted content, this connection can be deepened. The last phase, allegiance, is the most committed stage where fans show emotional investment and loyalty consistently. Sport organizations can enhance this connection with tribal

marketing strategies that emphasize shared values and a sense of belonging (Seymour & Blakey, 2020).

3.1.4 Value Creation

Sport organizations should include these insights into their strategies to increase fan engagement (Yoshida et al., 2014). More progressive organizations develop strategies that focus on everyday fan engagement rather than only on the game-day. There are four main strategies for fan engagement according to Seymour and Blakely (2020), namely hosting fans on non-game days, connecting fans away from the stadium, bringing fans closer to live actions and enhancing the game-day experience. Firstly, stadiums should be used to engage fans even when there are not any matches scheduled. Such activities are for example stadium and museum tours that could be enhanced by AR or VR. Secondly, VR and AR enable immersive behind-the-scenes experiences so that fans can connect away from the stadium and deeper connection between fans and players are fostered. Thirdly, organizations bring fans closer to live action remotely by creating behind-the-scenes content such as tunnel cams and streaming pre-season matches. As an example, OTT platforms like the La Liga Sports TV let clubs to broadcast exclusive content and matches globally. Lastly, enhancing game-day experience is one of the most important parts of fan engagement. These include strong stadium Wi-Fi, food-ordering apps, live entertainment and cashless ticketing (Seymour & Blakey, 2020). Furthermore, fans are more likely to attend a sporting event, maintain loyalty and recommend the team to others if they perceive a high value in the entertainment and prestige associated with sports consumption. For instance, the game atmosphere can be improved with thematic designs, special events and ambient conditions, this creates a memorable environment for fans by improving their overall experience (Yoshida et al., 2013). Sport organizations can build a more connected and loyal fan base by investing in non-transactional engagement practices, such as collaborative marketing programs, shared fan experiences and fan-to-fan interactions. By regularly measuring fan engagement, organizations can track the effectiveness of their engagement efforts, identify areas of improvement and boost profitability by further improving successful strategies across fan communities (Yoshida et al., 2014). Engaged fans usually mean a stable source of income for organizations, because they buy items like tickets and merchandise (Huettermann et al., 2019). As engagement increases, fans are more likely to consumer sport-related products and services, like watching media content, purchasing team merchandise and attending events. Fans also seek long-term connections with their favourite teams and form both emotional and cognitive attachments. They engage in activities designed to strengthen bonds

with the team, such as buying season tickets or fan memberships. These behaviours are very important when it comes to deepening fans' commitment to the team fostering ongoing loyalty (Fathy et al., 2021). Clubs benefit from both transactional and non-transactional behaviours, because they directly generate revenue from transactional fans (like buying merchandise) and get indirect value from non-transactional fans who co-create the team's image and community. Social media has drastically transformed fan engagement, because it fosters direct connections between fans, players and teams. Platforms like Twitter help creating an intimate sense of communication, which makes sport organizations part of conversations. There is a real-time interaction that transformed passive fandom into active participation, due to the fact that social media allows companies to precisely segment and target campaigns (Seymour & Blakey, 2020). Interaction, which is defined by a process where two or more parties influence each other, is an important concept in fan engagement. The rise of interactive platforms made it easier and more efficient to engage with fans, these fans are more accessible to organizations than ever before. Social media platforms are tools for brands to build communities and encourage knowledge sharing, which reinforces brand values and expectations (Yadav et al., 2023). Additionally, they stay loyal despite the possible negative performance of their favourite team. Importantly, engaged fans also spread positive word of mouth, as they influence the behaviour of others via social media platforms (Huettermann et al., 2019). According to Yoshida et al. (2014), fan engagement is in connection with team identification, fan loyalty, psychological commitment to the team, consumer-team relationships. It plays a crucial role in managing customer relationships for professional sports organizations. Fans create value for the team with these actions and this brings various advantages for sport organizations. However, engagement is not always beneficial for organizations. In some cases, fan behaviour can result in negative consequences for organizations. For instance, fans can throw objects into the field or set of fireworks and can display aggression toward referees during matches. Outside the stadium, negative fan behaviour includes spreading disrespectful messages on social media and confronting with rival fans. Interestingly, fans that are identified to be highly engaged are more likely to engage in aggressive behaviour, which emphasizes the negative aspects of strong connections between fans and the team. Moreover, ritual behaviours among sports fans often create value, but they can also lead to vandalism and intimidation. These verbal abuse and violence can have a lot of harmful effects on sports organizations. For example, financial penalties, threatening the public safety and disruptions to the team performance (Huettermann et al., 2019). Huettermann et al. (2019) developed framework that categorizes both positive and

negative aspects and outcomes fan engagement in team sports. The findings of this framework reveal positive fan engagement includes fan resource integration, fan learning and fan knowledge sharing. Negative fan engagement components are fan norm violations and fan resistance toward to the team. These can lead to beneficial outcomes such as fan resource development and value co-creation or to negative outcomes like value destruction (Huettermann et al., 2019). In conclusion, sport organizations can enhance deep loyalty and long-term support if they effectively address the needs of fans, such as the desire for brand connection, social interaction and information (Seymour & Blakey, 2020).

3.2 Fan Engagement with AI

Sports marketing is changing very rapidly, and it is being shaped by new digital platforms, immersive fan experiences and by a stronger focus on entertainment, lifestyle and inclusivity. This industry, which was previously about broadcasts and physical attendance, is driven now by constant content creation and consumption. Digital technologies are the core of this transformation, this makes the sports industry an important part of a new and highly connected business model. Sports reach audiences in innovative ways through digital media, which attracts younger fans who value authenticity and live-streamed experiences. As this industry adapts to the digital landscape, data analytics became very important for marketing practices. Sports analytics offers the insights and understanding that are crucial for successful marketing strategies. These strategies are customer-focused and there is an increasing emphasis on user-generated content and fan engagement, this highlights the importance of achieving visibility with “hits” and “mentions”. Content that focuses on consumers is flourishing across wide range of formats, such as videos, podcasts, photos. These are available both on subscription-based platforms (e.g., Netflix, Amazon Prime) and free platforms including social media and online news. Notably, there was a migration of traditional sports channels like Sky Sports, Eurosport and ESPN to mobile technologies (Seymour & Blakey, 2020). The traditional dominance of television broadcasting is being transformed by digital media. This opens new opportunities for communication between fans, sponsors and teams. These changes highlight the increasing strategic role of digital platforms in sports marketing, because they facilitate the promotion and delivery of products and services through online channels, mobile applications, and live experiences (Nalbant & Aydın, 2022). In the digital world of today, sports marketing has shifted its focus to create engaging content to meet both the expectations of sports fans commercial

partners. Digital sports marketing is centred around fostering engagement and conversation (Seymour & Blakey, 2020).

AI is transforming business operations in general, and it has a very strong effect on marketing (Kshetri et al., 2023). Artificial Intelligence is one of the most researched fields of the world and it influences nearly every aspects of life, including fan engagement. In general, human-like thought processes and actions can be replicated with AI (Nalbant & Aydın, 2022). These systems are able to generate content in numerous ways, such as text, images and videos. The broad adoption of AI has revolutionized marketing and engagement by enabling automated content creation that improves communication strategies (Kshetri et al., 2023). There was an evolution from traditional mass media to personalized content creation. This has initiated a strategic transformation driven by digital technologies like AI (Seymour & Blakey, 2020). The use of generative AI has dramatically increased in marketing. As of March 2023, 73% of the companies in the USA have incorporated generative AI tools into their marketing strategies. The market for AI in marketing was valued at $15.84 billion in 2021 and it is projected to reach $107.5 billion by 2028, which highlights the quick expansion of this technology (Kshetri et al., 2023). Fans are a very diverse group, and they have emotional as well as personal connections with their favourite teams. They often feel the successes and the failures of their clubs as their own. This deep emotional engagement makes sports an ideal industry to leverage social media platforms to strengthen relationships. These platforms are new opportunities for fans to engage with their supported teams and clubs, which enables them to become co-creators of brand identity and reputation. Social media became the most important channel for fan engagement, because it empowers fans and creates new interaction opportunities (Vale & Fernandes, 2017). Creative content on social media is a bridge between brands and their target audience, this fosters a strong relationship, because it provides access the to athletes admired by the fans (Seymour & Blakey, 2020).

How we experience sports is changing very quickly, regardless of cheering in the stadium or streaming the game at home. It is not only the athletes who are pushing the limits, AI is completely changing fan engagement. Fans are not only spectators of the game anymore, but they also became a part of it (Forbes Technology Council, 2025). Data analytics with AI enables organizations to gather insights into the behavioral patterns of target audiences. It is valuable, because it translates raw data into strategies that benefit the companies. With the development

of AI organizations have currently unprecedented access to data, but they need tools to translate it into meaningful insights (Seymour & Blakey, 2020). AI-powered platforms revolutionize fan engagement by personalizing content based on individual preferences and create and enhanced viewing experience. AI is reshaping how audiences interact with their favourite teams and athletes. One of the most important applications of AI is its ability to personalize content and recommendations by tailoring the sports content to individual preferences. By analysing fan behaviour and interests, AI can offer personalized highlights, news updates, and interactive features that help build loyalty and boost engagement (Xu & Baghaei, 2025). AI makes sure that fans get exactly what they want and when they want it. It provides personalized video highlights, real-time betting tips or curated feed about your favourite team (Forbes Technology Council, 2025). AI offers exciting opportunities for personalization, for example it can enhance niche sports media, such as YouTube channels that are dedicated to analysing sport injuries. AI can also analyse a fantasy sports team and generate detailed sports reports (Billings, 2024). This custom not only enriches the overall fan experience but also drives higher revenue, as more engaged fans are inclined to purchase tickets, merchandise, and subscriptions (Xu & Baghaei, 2025). Furthermore, this technology can be used to analyse social media sentiment to understand consumer perceptions that is important for targeted marketing efforts. AI algorithms evaluate user data such as preferences, behavioural patterns as well as browsing history to personalize content and to improve fan engagement. Additionally, AI can be also utilized in ticket pricing models and fraud detection that ensures safe transactions in the sport ecosystem (Li & Huang, 2023). In general, fans crave insights into their favorite teams and players, and they desire to have more platforms to watch sports via over-the-top media services and streaming providers. The fan experience looked very different 10 years ago on TV than today, as the big technologies are now integrated into the sports media. For instance, the NBA has partnered with Microsoft to enhance their fan engagement with technology and Amazon Prime offers Next Gen Stats to make a difference in NFL broadcasting. Sport companies should focus on using data and technology to make sports more engaging. This can be done by smart betting tools or AI-generated highlights as fans today look for more personalized and interactive experiences (Hensley, 2022). Many fans already want more from their video streaming services. About one-third are interested in features like live statistics or multiple camera angles. Others are drawn to athlete perspectives, behind-the-scenes content, or shared viewing with friends and family. While features like social media feeds, betting, or shopping are less in demand for now, platforms aiming to attract younger viewers should begin offering more personalized,

flexible features. Sports providers are increasingly introducing interactive features to improve the home viewing experience. Streaming platforms now offer real-time statistics, interactive replays, and alternate commentary, while some applications allow fans to play prediction games or co-watch events with others. Although the long-term adoption of these features is still unclear, they reflect a growing shift toward personalization. According to the Deloitte Center for Technology, Media and Telecommunications, 71% of fans say live events are their favorite form of sports content. Among Generation Z and Millennials, this drops to 58%, with greater interest in highlights, documentaries, and social media videos. Television remains the most common device for watching live sports at home, used 74% of the time on average. Among younger fans, usage drops to 58% for Generation Z and 61% for Millennials, who often prefer mobile devices or laptops. Furthermore, 77% of fans report multitasking during live events. Popular additional activities include checking statistics, browsing social media, watching other matches, betting, or managing fantasy teams. Older generations are more likely to focus solely on the game. Looking ahead, fans anticipate significant changes in how they will experience professional sports at home. When asked about the year 2030, 67% expect the experience to be more interactive, 57% believe it will be easier to access, and 54% foresee it becoming more immersive. However, many also associate these advancements with rising costs—72% of fans believe that accessing such content and features will become more expensive in the future (Giorgio et al., 2023).

3.2.1 Stadium Experience

AI plays an essential role in transforming the fan experience and modernizing stadiums, because it enhances audience engagement and makes sports events more immersive. Platforms powered by AI analyse fan behaviour so that sport organizations can offer customized services, interactive in-game features and ticket recommendations (Xu & Baghaei, 2025). Stadiums will likely become "data temples" as the centre of content delivery and data generation (Tuck, 2022). Stadiums can provide fans with targeted content that offers them everything from personalized seat recommendations to exclusive behind-the-scenes access. AI is enhancing the stadium experience and the energy of a live game in ways that were unimaginable before. Technology is reshaping sports from smart stadiums to AI-driven fan engagement tools (Forbes Technology Council, 2025). Regarding game-day operations, AI optimizes managing crowd control, improves traffic flow and predicts peak concession stand usage within stadiums (Xu & Baghaei, 2025). During the games, real-time analysis and player insights provide the audience with instant access to statistics, replays and play breakdowns, these can be viewed on the stadium

screens or on smart devices (Li & Xu, 2021). Furthermore, AI can also recommend the best spot to see the replays on the screen and predict the best time to buy merchandise based on crowd flow data (Forbes Technology Council, 2025). AI has also changed broadcasting, because it offers fan individualized viewing experiences with AI-generated commentary, customizable camera angles and interactive overlays. Moreover, AI has positively impacted stadium security and fan safety. Facial recognition and crowd monitoring systems powered by AI improve security protocols, because they detect unusual behaviours (Xu & Baghaei, 2025). AI could also manage security collaborating with staff to ensure safe and smooth experience (Tuck, 2022). Furthermore, environmental factors such as air quality and temperature can be monitored by AI as well to ensure a comfortable experience for fans. As AI technology continues to develop, its role will be more and more important in smart stadium management and game-day operations, which will enable sport organizations to offer seamless and highly interactive experiences for their fans (Xu & Baghaei, 2025). As a result, when fans feel like the experience is tailored just for them, the engagement increases (Forbes Technology Council, 2025). Furthermore, global fanbases present unique challenges in fan experience as well. As an example, FC Barcelona has nearly 60 million fans in Europe, but my supporters worldwide do not have the ability to visit the Camp Nou stadium. To address this challenge, professional teams organized international matches, like the tour of Manchester United in Thailand and Australia in 2022. However, fan engagement requires more than occasional live events, there is a necessity to innovate digital experiences. Industry examples of digital innovations and interactive experiences are Manchester City's partnership with Sony to create a virtual replica of Etihad Stadium in the metaverse and FIFA World on Roblox where fans can play interactive games (Schlimm & Breuer, 2023).

3.2.2 Chatbots and Virtual Assistants

AI plays an important role in the expansion of chatbots and virtual assistants, this provides fans with real-time assistance and personalized interactions (Xu & Baghaei, 2025). Chatbots provide real-time answers and personalized information. This creates a sense of accessibility and fosters a stronger connection between fans and teams (Deloitte Digital, 2022). These tools answer straightaway inquiries regarding match schedules, player statistics, ticket availability, and these further enhance fan engagement (Xu & Baghaei, 2025). From a business perspective, chatbots are essential for cost reduction and efficiency, whereas for users they are important due to personalization and convenience. In general, organizations integrate virtual assistants powered by AI to automate customer service and to streamline communication. On the other hand, the

main motivations of users using chatbots are the factors of utility, symbolism as well as social benefits (Peruchini et al., 2024). By offering efficient, personalized and 24/7 assistance, the AI-driven chatbots and virtual assistants revolutionized customer support in the sport industry (Li & Huang, 2023). AI-powered chatbots provide instant responses to routine questions about tickets and merchandise and they provide multilingual support for global audiences. Furthermore, AI also enables voice-activated commands for tasks like seat booking and finding stadium amenities (Seymour & Blakey, 2020). These systems are powered by natural language processing and interpret fan inquiries very fast by delivering responses that enhance user satisfaction. AI-powered chatbots provide relevant information instantly by analyzing the context and the intent behind fan messages. This allows sport organizations to process big volumes of inquiries efficiently, to reduce waiting times and to ensure seamless customer service. Virtual assistants take this interaction on the next level, because they are integrated with mobile apps and websites allowing fans to access updates, buy tickets and get personalized recommendations. One of the main advantages of AI-powered chatbots is that they operate 24/7 so that fans can access information and support any time. Moreover, these systems continuously learn from past interactions and refine their answers over time to improve accuracy (Li & Huang, 2023). For sport organizations, automated customer support reduces the workload on employees and streamlines operations, because these tools handle routine administrative tasks efficiently so that companies can focus on enhancing the fan experience (Xu & Baghaei, 2025). Furthermore, the data collected from the fan interactions can be used to analyze user preferences, behavioral patterns as well as sentiment trends. These provide extremely valuable insights into marketing strategies and decision-making (Li & Huang, 2023).

3.2.3 Fan Insights

AI considerably improved fan engagement strategies by enabling sentiment analysis and real-time social media monitoring. This helps sport organizations to measure public sentiment and understand fan opinions so that they can tailor their engagement strategies accordingly. Sentiment analysis, also known as opinion mining, uses AI algorithms to measure fan sentiments expressed in social media posts, comments and reviews. With natural language processing, AI can categorize sentiments as positive, negative or neutral, which provides companies with valuable insights into the way of thinking of the audience (Li & Huang, 2023). Facial recognition and emotional analysis play an important role in measuring customer satisfaction (Peruchini et al., 2024). With this sentiment analysis, sport organizations can improve their marketing as well as content strategies and respond proactively to fan concerns.

Additionally, companies can utilize real-time sentiment tracking as well to assess fan reactions during live events so that they can make immediate adjustments in order to enhance their overall experience (Xu & Baghaei, 2025). As an example, if sentiment analysis reveals dissatisfaction with a specific part of the event, organizations can take quick action to address concerns and reduce negative reactions. Moreover, sentiment analysis with AI helps to identify influential people in the sports community, like social media influencers and opinion leaders who have a significant reach. If sport organizations pinpoint these individuals, they can collaborate with them to increase their visibility, boos fan engagement and expand their digital footprint. Furthermore, with social media monitoring conversations and interactions can be tracked across digital platforms, this increases fan engagement as well. With AI algorithms, large amounts of social media data can be analyzed to identify trends, popular topics and emerging discussions in the fan community. This tool supports sport organizations to create targeted content, enhance engagement strategies and to align their PR strategies with the interests of the audience (Li & Huang, 2023). Based on sentiment analysis and demographic trends ticket sales based on the interests of fans can be predicted. Furthermore, the most effective promotional strategies to boost fan engagement during the off-season can be identified. Analyzing fan sentiment on social media is also essential to measure brand loyalty and adapt communication strategies (Seymour & Blakey, 2020). To summarize, with AI-powered insights, sport companies can develop better data-driven strategies to ensure strong connections with their fanbase and to optimize the overall fan experience (Li & Huang, 2023).

3.2.4 Personalized Content

Beyond the fact that AI increases productivity and saves time as well as costs, it also enables brands to achieve a new level of one-to-one personalized marketing. Personalization has been always a very important part of effective marketing and AI has revolutionized its scope, because it enables highly customized experiences at scale powered by advanced data anyltics and machine learning (Kshetri et al., 2023). Artificial intelligence has changed the way of how sports organizations communicate with their fan base. With AI these organizations can provide their fans with personalized content and enhanced interactive experiences (Li & Huang, 2023). According to Deloitte Digital (2022), 69% of the consumers they surveyed are more likely to buy something from a brand if it offers personalized experience. They want to be treated as induvial and unique people who are heard, understood and respected. Furthermore, 71% of the B2C leader brands said that personalization has a significant impact on their brands' strategies (Deloitte Digital, 2022). AI generates personalized recommendations, highlights reel and

provides tailored videos to the fans' interests (Kshetri et al., 2023). Tailoring engagement strategies is especially important for sports organizations and they need to ensure that all touchpoints resonate with individual preferences (Deloitte Digital, 2022). Furthermore, with AI targeted marketing messages based on fan preferences and personalized content such as player highlights, match summaries and statistics can be delivered. With this technology key moments during the games can be pinpointed so that shareable social media content can be created. To enhance engagement, AI can customize visual and textual content for different fan segments. Additionally, predictive recommendations, such as suggesting upcoming games, can be provided with AI (Seymour & Blakey, 2020). This is possible because AI assesses factors like past viewing habits, favourite teams, athletes and social media activity of fans. This way viewer satisfaction can be increased because it is ensured that content aligns with their preferences that fosters deeper engagement with sports platforms (Li & Huang, 2023). For fans who are passionate about statistics and analysis, AI has created a whole new world. This technology brings real-time insights to fans' screens so that they do not need to wait until the game ends. Data is delivered instantly, for example there are statistics about player's performance or predicting the game outcome. Sport organizations like NFL and NBA have integrated AI to make the viewing experience more dynamic and engaging (Forbes Technology Council, 2025). As example, US Open has a collaboration with IBM to provide fans with match insights. Fans can track live statistics, access AI generated insights and explore player trajectories in the US Open app (Baughman, 2025). As another example La Liga leverages Microsoft's AI services to deliver personalized fan experiences on platforms like Edge and Xbox Live. Over 500 million fans in 26 languages can access individualized digital content like highlights, videos and player statistics. These are all examples of sports organizations embracing new technologies to engage fans and to increase revenues (Seymour & Blakey, 2020). Moreover, AI plays an important role in segmenting fans based on demographics, purchasing behaviour and preferences. AI-powered models can segment audiences and develop customized marketing strategies by analysing large amounts of data. This way, sports organizations can connect with specific fan groups through personalized messages exclusive offers, and promotions to boost engagement, conversion rates, and brand loyalty. Furthermore, AI enables marketing automation so that companies can streamline their communications across multiple platforms. AI-powered tools deliver personalized content and recommendations multiple channels by analysing fan engagement patterns. This level of personalization improves fan engagement. Additionally, data analytics helps to measure the effectiveness of marketing campaigns. It provides insights into campaign

performance by tracking fan responses, conversion rates and engagement metrics. This way, organizations can improve their marketing efforts, increase return on investment (ROI) as well as allocate resources more effectively. Predictive analytics is another key aspect of AI-powered personalization, because it uses past data to forecast future behaviour and preferences. As an example, AI can predict the products a customer might be interested in buying based on their browsing and purchasing patterns (Li & Huang, 2023). Furthermore, AI can enhance interactive experiences by integrating virtual reality (VR) and augmented reality (AR). These technologies enable fans to immerse themselves in live sports events as if they were physically present (Xu & Baghaei, 2025). Furthermore, AR and VR enable fans to attend the matches anywhere from the world. With these technologies stadium tours and gamified fan experiences can be also provided (Seymour & Blakey, 2020). For instance, the NFL is experimenting with AI apps that allow fans to track player statistics by pointing their phone at the field (Forbes Technology Council, 2025). For instance, with AR and VR gadgets fans can access 360-degree views, live statistics and features like real-time polls or even virtual meet-and-greet sessions with athletes. These experiences make remote sports watching more engaging and significantly increase fan participation as well as overall enjoyment of such events (Xu & Baghaei, 2025). AI brings sports experience closer to the action than ever before, because it offers personalized content, real-time statistics and even immersive experiences. This technology presents an important opportunity for sports organizations to create deeper relationships with their fans and to increase fan loyalty by delivering more engaging experiences. As AI tools are developing, they will play a more and more important role in shaping fan engagement on a global scale (Forbes Technology Council, 2025). However, integrating personalized marketing strategies requires collaboration between various stakeholders such as sports organizations, stadium operators, sponsors, technology developers and the fans themselves (Tuck, 2022). It is important to highlight in recent years brands trying to meet the expectations of consumers through strategies like retargeting. This can be effective, but most of the time it fails to focus on the needs of consumers. Consequently, customers often feel stalked instead of feeling engaged – by the ads that follow them everywhere or bx the daily texts. In the survey by Deloitte Digital 50% of consumers said that they do not feel targeted by personalization, and it often does not meet their preferences. Personalization is valuable for consumers if it creates a seamless experience that connects interactions across time and platforms. They value if they are recognized as loyal customers and their preferences are respected. Brands that are more advanced in personalization saw better consumer engagement results compared to the brands with low personalization. On

average, they achieved around 1.5 times higher increases in revenue per customer and loyalty. They also reported 2x improvement in customer engagement, along with notable gains in both loyalty and revenue (Deloitte Digital, 2022).

3.3 Challenges of Fan Engagement with AI

Despite the fact that the potential of personalization with AI very extensive, there are still challenges to overcome. The most significant challenge of personalized marketing is protecting the data privacy of customers and to ensure that data management is secure. There are ethical concerns regarding data privacy and consumer trust. One of the core difficulties in using AI for fan engagement lies in striking the right balance between automation and authenticity. Fans expect real, meaningful interactions—not just algorithm-driven responses. When AI tools are overly relied on, the human element that makes fan relationships special can fade. This creates a sense of detachment, where fans might feel like just another data point rather than valued members of a community. As AI technologies advance, businesses must strike a balance between enhancing customer experiences and addressing concerns over data privacy and compliance with regulatory requirements. Moreover, smaller organizations face challenges when it comes to adopting AI tools, because of the limited availability and affordability of these tools (Davenport, 2023). Tackling these issues starts with a strong commitment to data security and keeping user information safe should be the first priority of businesses. It is also important that companies are open about how their AI systems work, so fans know what is happening behind the scenes. And above all, the use of AI should be fair and respectful. When brands stay transparent and use technology in a way that puts people first, they not only build trust but also create more lasting connections with their audience (Potwora et al., 2024). The challenges outlined above are not isolated. As explored in earlier chapters, AI technologies used in sports also raise broader concerns. One key issue is that many AI systems—especially those based on deep neural networks—lack transparency. Users often cannot see how decisions are made, which complicates accountability (Ali et al., 2023; Górriz et al., 2023). In addition, when AI tools rely on historical data, they risk reproducing existing biases, potentially affecting which fan groups are prioritized in engagement strategies (Huang et al., 2022). Questions about fairness and the reliability of AI outputs are especially relevant in sports, where emotional connection and trust are central. As Simion and Kelp (2023) argue, trust in AI cannot be taken for granted—it must be earned through careful design and responsible use. In the context of fan

engagement, this means that personalization and automation need to be handled with sensitivity to ensure that fans feel seen, respected, and involved.

4. METHODOLOGY

This chapter describes the research methodology used to explore how artificial intelligence is shaping fan engagement in the sports industry. Considering how fast digital technologies are evolving, this thesis was designed to rely on recent, high-quality sources in order to provide a relevant and up-to-date perspective. The research was primarily conducted through a structured literature review, drawing from academic, industry, and professional materials to better understand current trends and their broader implications.

To gather the necessary sources, the electronic databases and resources available through the Bocconi University Library and Google Scholar were used. The search was carried out by using terms like “artificial intelligence,” “artificial intelligence AND sports,” “fan engagement,” “fan engagement AND artificial intelligence,” “sports marketing” “personalization AND artificial intelligence,” and “digital transformation in sport.” Only publications written in English and published relatively recently were included. In total, around 35 academic articles and papers were reviewed, covering areas such as artificial intelligence in the sports industry, sports marketing and sports management. An essential part of the theoretical foundation for this thesis comes from the work of Yoshida et al., who developed a framework for understanding fan engagement from both a transactional and non-transactional perspective. Their ideas were useful in identifying how different AI technologies—like personalized content or chatbots—might influence emotional loyalty, identification with teams, and other behavioural aspects that go beyond just economic transactions. In addition to academic literature, several industry reports were consulted to better understand how theoretical concepts are currently being applied in professional contexts. Two reports were especially relevant: one published by PwC on the role of artificial intelligence in the sports sector, and another by Deloitte, which explored trends in fan engagement with a specific focus on the Olympic Fan Data Platform. These documents offered insight into how organizations use technology and data to improve the fan experience, and examples from them were later incorporated into the analysis. As academic research can take time to reflect ongoing developments, a selection of sources from company websites, media articles, and professional blogs was also reviewed. These were not considered part of the literature review but were used to support the empirical case studies—for example, in relation to the digital strategies used at the Wimbledon tennis tournament or the data-driven innovations

in Formula One. Only sources from established and trustworthy platforms were included, and care was taken to ensure that they contributed information not already addressed in academic publications. This structure made it easier to compare theoretical insights with real-world examples and to reflect on the current direction of the sports industry. To conclude the chapter, a comparison table was created to highlight the key similarities and differences in how Wimbledon, the Olympic Games, and Formula 1 apply artificial intelligence to enhance fan engagement. One of the main goals of the literature review was to go beyond simply summarizing existing research. To goal of this thesis is to better understand how the insights and trends found in the academic and industry sources could be useful in practice. The idea was to identify examples, patterns, and challenges that could help sports organizations make more informed decisions when it comes to using AI for fan engagement. By connecting academic findings with what is already happening in the industry, the review also aimed to provide suggestions and practical takeaways that could support professionals working in this field.

5. ANALYSIS OF INDUSTRY PLAYERS

Wimbledon, the Olympic Games, and Formula 1 were selected for this thesis because they offer distinct, yet advanced examples of how artificial intelligence is used to enhance fan engagement. These sports differ in structure and scale, allowing for meaningful comparisons across events ranging from single-sport tournaments to global, multi-sport spectacles. Each organization has actively adopted AI technologies: Wimbledon works with IBM to deliver personalized highlights, the IOC developed a year-round fan data platform with Deloitte, and Formula 1 uses AWS and IBM tools for real-time insights and individualized content (IBM, 2024; Deloitte, 2025; Amazon Web Services, 2023). These initiatives are frequently cited in both academic and professional literature as leading cases in digital transformation within the sports industry (Xu & Baghaei, 2025; Kshetri et al., 2023; Gao & Liu, 2022). For these reasons, they provide a strong foundation for analyzing the evolving relationship between AI and fan engagement. These industries also hold practical relevance for managers, as they offer clear examples of how AI can be used to enhance fan experiences, streamline operations, and support commercial goals. The approaches taken by Wimbledon, the Olympic Games, and Formula 1 can act as reference points for other sports organizations looking to apply similar technologies in their own contexts.

5.1 Olympic Games

At the Paris 2024 Olympic Games, the IOC took digital fan engagement to a new level. Social media activity soared, with official Olympic accounts recording 16.7 billion interactions, more than twice as many as during Tokyo 2020. Broadcasting also advanced significantly. Using cutting-edge tools, the Olympic Broadcasting Services produced over 11,000 hours of content. This made it possible for media rights holders to offer an unprecedented volume of Olympic programming 178,000 hours on TV and more than 308,000 hours online. Altogether, global audiences watched 28.7 billion hours of Olympic coverage, marking a 25% increase compared to the previous Games in Tokyo (Olympics, 2025). The International Olympic Committee recently launched a project with Deloitte to improve the way it connects with fans. Together, they built the Olympic Fan Data Platform, which first went live during the 2024 Winter Youth Olympic Games in Gangwon. The idea behind it was fairly simple: bring together various types of fan data, such as what people are interested in or how they interact with Olympic content and use it to tailor what they see online. Instead, it is meant to keep fans involved all year round, aligning with the IOC's broader shift toward digital innovation and more personalised communication (International Olympic Committee, 2025). The Olympic Games held in Paris in 2024 marked a noticeable shift in how fans engaged with the event. One key reason behind this growth was the platform's ability to let users personalize their experience. Users can choose their preferred sports, athletes, or teams, fans could receive updates and notifications that matched their individual interests. Someone following gymnastics, for example, might get notified when tickets become available or receive details about where to meet their favorite athlete. This kind of personalized experience adds a layer of connection that traditional broadcasting cannot offer. By understanding what fans look for—whether it is top performances, inspiring moments, a sense of community, or pure entertainment—the International Olympic Committee can create content that feels more relevant and engaging. In many ways, this reflects how the role of fans is changing: they do not just watch anymore, they interact, follow, and expect experiences that match their interests (Deloitte, 2025). Another example of how artificial intelligence is already changing fan experiences was introduced during the Olympic Games in Paris. NBC tested a new feature called "Your Daily Olympic Recap on Peacock," which used an artificial intelligence-generated version of sportscaster Al Michaels to deliver personalized highlight reels to viewers. The system was built on roughly 5,000 hours of Olympic footage and could produce more than 7 million different combinations of content, based on each user's individual viewing habits and preferences. This kind of tailored storytelling shows how

artificial intelligence can go beyond simply improving operations or analyzing data. This approach creates a viewing experience that feels more individual and dynamic. Fans can focus on the events that interest them the most, without having to scroll through endless highlights or full replays. At the same time, event organizers have the chance to build stronger relationships with audiences by sharing content that matches their preferences and watching habits. It is a way of making large-scale sports events feel more personal, even when watched from home (PricewaterhouseCoopers, n.d.). Thanks to new technologies, the way people experience the Olympics is changing fast. Augmented reality now gives fans the chance to explore parts of the venues that are usually off-limits, like locker rooms or warm-up areas. During live events, fans can use their phones to get extra layers of information, such as athlete stats displayed directly on their screens. Behind the scenes, filming and broadcasting have also evolved. Camera systems now follow the action automatically, and commentary is made available in several languages to ensure broader access. Meanwhile, social media has become a more interactive space for fans. Automated assistants provide quick answers and event updates, while organizers use feedback from online conversations to understand how the audience is responding. These changes help make the Games feel more connected, giving fans around the world a greater sense of involvement (Machaiah, 2024).

5.2 Wimbledon

Wimbledon is hosted by the All England Lawn Tennis Club (AELTC) and it is one of the most important tennis tournaments of the world. IBM partnered closely with Wimbledon to introduce cutting-edge digital technologies and to improve fan engagement as well as to increase the tournament's global presence. Wimbledon uses AI to adapt as fast as possible and deliver personalized content. This technology enables taking decisions more quickly based on fan engagement. Furthermore, it is important to position Wimbledon beyond tennis within the sports and entertainment landscape. The tournament understood the fans expectations of speed, relevance and efficiency all year round. AI enhances content delivery so that personalized information can be delivered on all digital platforms (Seymour & Blakey, 2020). While exact production hours are not publicly disclosed, digital reach and interaction levels have increased significantly. In 2024, BBC coverage alone achieved a record-breaking 54.3 million streams on BBC iPlayer and BBC Sport online. Behind the scenes, the digital infrastructure was able to scale up by 55,000 percent at peak times, making sure fans received timely updates and uninterrupted service. Since the beginning of its partnership with Wimbledon, IBM has

gathered more than 62 million data points, which now support advanced features like Slamtracker and Match Insights. These tools help turn complex match data into content that is easier to understand and more engaging for fans, strengthening the connection between the audience and the sport (Guarda, 2024). Wimbledon has taken a slightly different approach compared to other tournaments. Instead of just using AI for performance stats or match analysis, they are now using it to shape the fan experience more directly. With IBM's help, they added features like personalized match summaries and highlights, which are based on what fans are most interested in. For instance, someone who follows a particular player might get updates just about that athlete and there is no need to search for them manually. The system also picks up on moments that fans are likely to care about, like a dramatic rally or a sudden crowd reaction, and turns those into short clips or posts (IBM, 2023). This kind of AI-generated content helps fans feel more involved, even if they did not watch the full match (Ingle, 2022). In 2024, Wimbledon introduced a new digital feature called "Catch Me Up" that focuses on helping fans follow matches in a more personal and accessible way. The tool creates short pre-match and post-match summaries about specific players, depending on what each fan is interested in. So, if someone is mainly following a favorite player or only checking in during key moments, the content they see will reflect that. These summaries are written in the same tone and style fans are used to from Wimbledon's official content (IBM, 2024). These innovations reflect growing fan interest in digital enhancements: recent research indicates that 55% of global tennis fans believe AI will have a positive impact on sport. As digital spectatorship becomes increasingly important, features like 'Catch Me Up' illustrate how AI can scale storytelling and enrich the fan experience far beyond the physical boundaries of the tournament grounds (Law, 2024). The system uses recent developments in artificial intelligence, including language models trained to process large amounts of match data. The idea is to make sure fans can stay informed without having to watch everything live. According to IBM (2024), the goal behind this feature is not just to simplify updates but to help fans feel more connected to the players and the storylines of the tournament (IBM, 2024). IBM built a custom language model for Wimbledon in 2024, made up of three billion parameters. What makes it unique is that it was trained not just on match data, but also on the tournament's particular way of communicating, like using phrases such as "gentlemen's draw" instead of "men's draw.". All of this runs on a combination of IBM's cloud and Amazon's servers. The impact was clear: in 2023 alone, Wimbledon's digital platforms connected with 19 million people (Glick, 2024).

5.3 Formula 1

Formula 1 uses machine learning in collaboration with Amazon Web Services to process sixty years of race data. This makes races more immersive, as it enables fans to get deeper insights and predictions during live broadcasts. AI is a key tool to tell stories in a better way during broadcasts, because it reduces human error and analyses data faster. The value not only lies in the data itself, but in how AI can identify patterns, calculate real-time predictions and deliver statistical highlights. This makes the storytelling more exciting for fans (Tuck, 2022). Building on this, Formula 1 has expanded its streaming capabilities through F1 TV Premium, which also runs on AWS technology. The platform delivers personalized, high-quality streams to fans around the world, offering multi-language support, multiple camera angles, and on-demand replays. With this setup, fans can follow a specific driver, access exclusive data, or switch between different perspectives, which creates a more engaging and interactive viewing experience (Amazon Web Services, 2023). Formula 1 has recently taken a big step in how it presents races to viewers by using generative artificial intelligence in its live broadcasts. In partnership with Amazon Web Services, new tools have been introduced that help explain technical details—like tire wear, race pace, or strategy shifts—in ways that are easier for fans to understand. These insights now appear on screen during the race, giving people a clearer picture of what is happening as events unfold. Rather than replacing the commentators, the technology works alongside them, offering extra layers of information that can help explain why a team is making certain decisions or how a driver is performing. The aim is to make broadcasts more engaging, especially for fans who might not be deeply familiar with the technical side of the sport (Brittle, 2024). The Real-Time Race Track Experience uses machine learning to process over 60 years of race data, offering live insights that are both detailed and easy to follow. Viewers can now see how a driver's performance compares to their own past races, or to F1 legends from previous decades. The platform also gives predictions during the race, like when a driver is likely to make a pit stop or how tire choices might affect lap times. This information is available through the F1 TV app and website, and fans can adjust their settings to focus on the data they care about most. Instead of just watching the race, people can now interact with it in real time, making the whole experience more personal and engaging (Formula 1, 2025). Another recent step towards deepening the digital fan experience comes from Scuderia Ferrari HP, which has partnered with IBM to redesign its official mobile application. The app introduces several features powered by IBM's watsonx artificial intelligence technology. These include automatically generated race summaries, interactive

post-race insights with visual data, and comparisons between current race moments and Ferrari's historic milestones. Fans can also participate in daily polls, send messages directly to the team, and revisit iconic races through curated highlights. The goal behind these features is to create an experience that goes beyond race weekends, giving fans 24/7 access to Ferrari content and fostering a closer connection between the team and its supporters worldwide. By combining real-time and historical data with user interaction, the app sets a new benchmark for how technology can enhance engagement with one of the most recognized brands in Formula 1 (IBM, 2025). In recent years, Formula 1 has started using new digital advertising tools to bring fans closer to the sport while helping sponsors reach their audiences more effectively. One of the most interesting developments is the use of virtual advertising, which makes it possible to show customized brand messages directly in the race broadcast. These ads are not physically present at the track, but appear in the video feed, allowing for more flexibility in where and how they are shown. What makes this technology especially relevant today is its potential to personalize content. On platforms like F1 TV Pro, it is possible to tailor virtual ads to a viewer's profile, including language, location, or even their birthday. The study Alexopoulos et al. (2024) found that placing these ads in specific areas, like tight corners or track bridges, can increase their visibility, with some reaching up to 20 percent of the screen. In addition, using a method called white space analysis, broadcasters can identify parts of the track that are unbranded and suitable for displaying such ads without interfering with the viewing experience. With Formula 1's enormous global reach, these digital placements give sponsors a chance to connect with fans in a way that feels more personal and timely. Instead of just showing a logo, the ad can now say something relevant to the moment or to the viewer, which could help fans feel more engaged with both the race and the brand (Alexopoulos et al., 2024).

5.4 Comparative Overview of the Industries

The table below offers a clear comparison of how Wimbledon, the Olympic Games, and Formula 1 use AI for their fan engagement. Although all three are seen as digital pioneers in the sports world, they each operate in very different ways. Because of this, it is essential to analyze both their similarities and differences. The table shows where their approaches overlap, such as using AI for personalized content or interactive features, but also where they take distinct paths based on their unique formats and fan expectations. This kind of overview helps

show what implications can be drawn for the sports industry, and where a better strategy is needed. It is an essential tool for understanding how AI can be applied in different contexts.

Category	Olympic Games	Wimbledon	Formula 1
Sports Type	Multi-sport global event	Tennis	Motorsport
AI Partners	Deloitte, NBC	IBM	Amazon Web Services, IBM
AI Use for Personalization	- Olympic Fan Data Platform for year-round personalization - AI-generated recaps with Al Michaels - Custom notifications based on user interest	- "Catch Me Up" for custom player summaries - Match highlights based on fan interest - Language model trained on Wimbledon's communication style	- F1 TV Premium lets fans follow specific drivers and access tailored personalized streams - Scuderia Ferrari app includes polls, chat, and historic comparisons
Interactive Features	- Fans explore behind-the-scenes areas - Real-time mobile updates - AI-generated multilingual commentary	- AI-curated match summaries and dramatic moments - Real-time content scaling during peak traffic	- Real-Time Race Track Experience - Predictions and technical explanations during races - On-demand race comparisons with past drivers
Volume of Digital Content	- 11,000 hours of content produced in 2024 - 178,000 hours on TV - 308,000 hours online - 28.7 billion total viewed hours	- BBC recorded 54.3 million streams in 2024 - Digital infrastructure scaled by 55,000% - 62M+ data points used in AI features	- No exact volume stated, but extensive integration of AI in streaming and broadcast enhancements described
Fan Data & Insights	- Centralized fan preferences via Olympic Fan Data Platform - Used for personalized content and long-term engagement	- Data points gathered used in Slamtracker and Match Insights to create fan-friendly content	- Uses 60+ years of historical data - Real-time predictions and personalized race stats
Year-Round Engagement	- Platform designed to maintain engagement beyond the Olympic window	- IBM's tools support fan engagement outside tournament periods	- Ferrari's app offers content and interaction beyond race weekends

Language & Localization	- Multilingual commentary and content personalization	- Custom AI model reflects Wimbledon's language and tone	- Streams and ads customized by language and location
Advertising Innovations	Not highlighted	Not highlighted	- Virtual ads tailored by viewer profile (e.g., birthday, location), embedded during live streams and placed strategically on-screen
Fan Involvement & Control	Fans choose sports and athletes - Receive customized alerts and highlights	- Fans follow specific players - Get personalized content without searching manually	- Fans select driver views, camera angles, and stats preferences
Technological Innovation Highlights	- AI-generated Al Michaels recaps - AR exploration of venues - Multilingual AI commentary - Automated camera systems	- 3B-parameter language model trained on Wimbledon data - Personalized content via IBM and AW	- Generative AI in live broadcasts - Ferrari app with watsonx, visual insights, and interactive race data

6. MANAGERIAL IMPLICATIONS

Artificial intelligence is changing how sports organisations communicate with fans. While many of these developments are positive, they also come with certain risks and responsibilities. Based on the findings of this thesis, the following recommendations may help clubs, federations, and other stakeholders apply AI in a way that supports, rather than harms, the connection with their supporters.

Learn from Leading Examples in the Industry

Several high-profile sports organizations have adopted artificial intelligence in ways that offer inspiration for others. While the technologies used by events like the Olympic Games, Wimbledon, and Formula 1 are often advanced and costly, many of their strategies can still be translated into simpler formats and applied more broadly. The Olympic Games provide an example of how personalization can strengthen the relationship between fans and event organizers. Through the Olympic Fan Data Platform, supporters could select their favorite sports, athletes, or national teams and receive relevant notifications and content. Smaller clubs

might not need such a large-scale system, but the core idea, allowing fans to indicate their preferences, can be adopted in simpler ways. For example, a short questionnaire during app registration or event ticket purchase could already serve this purpose. At Wimbledon, artificial intelligence has been used to create match summaries and personalized highlight reels that reflect what individual fans are most interested in. This feature helps fans stay updated without having to search for content manually. While developing fully automated systems may be out of reach for many teams, organizations can still apply similar ideas by curating and distributing highlights based on fan behavior or past engagement. Formula 1 has gone even further by combining real-time data, historical records, and AI-powered visualization to offer a highly interactive viewing experience. While this level of detail is not realistic for most clubs, elements such as live statistics, commentary overlays, or basic predictive features delivered through mobile apps or websites can still create a more immersive experience.

Recommendation: While the technologies themselves may differ depending on scale and budget, the principles behind these examples, offering relevant content, allowing fans to personalize their experience, and enhancing live interaction, can be adapted by many organizations. The key is not to replicate the tools directly but to adopt the mindset behind them. By focusing on relevance, timing, and user control, even smaller clubs or associations can use AI-supported features to improve how they engage with their audience.

Put People First

Even though AI can make operations more efficient, that should not come at the cost of real human interaction. Fans often form emotional bonds with clubs or teams. Replacing too many personal touchpoints with automated systems could weaken that connection.

Recommendation: Let AI take care of standard processes, like sending notifications or handling basic questions, but make sure human staff are still involved, especially when fans give feedback or raise concerns. People are more likely to remain loyal when they feel someone is genuinely listening.

Be Transparent About Data

A lot of the personalisation offered through AI relies on collecting data. Many fans are not fully aware of what information is gathered, or how it is applied. If the process feels too hidden, it can create mistrust.

Recommendation: It helps to be transparent. A simple explanation, both in writing and in settings menus, about what data is collected and why, can make a big difference. Let people opt out or choose how much personalisation they prefer. Giving them some control often results in stronger engagement.

Be Fair

Since AI tools learn from existing data, there is always a risk that some groups of fans will be underrepresented or treated unfairly. This could happen in how tickets are offered, what content is suggested, or who receives certain promotions.

Recommendation: Organisations should regularly check who is being reached by these systems and who is not. If patterns show that particular age groups, regions, or communities are being left out, this should be corrected. Sometimes a small change to the system or its training data can already help.

Be Realistic

While some smaller clubs may have the budget and staff to use advanced AI systems, many others do not. If only the biggest teams can benefit from these tools, the gap between organisations could grow, both in terms of performance and fan connection.

Recommendation: Focus on flexible tools that can be scaled up or down. In many cases, simpler systems are more than enough. Mobile-friendly platforms or shared services might be a good solution for smaller clubs. Collaboration between clubs could also allow them to test technologies together.

Establish Guidelines

As AI becomes more common, ethical questions will come up. These might include fairness, privacy, or even whether a certain application is appropriate in the first place. Staff members need some guidance, otherwise responses will be inconsistent.

Recommendation: It might be helpful to write down a few principles internally. Nothing too complex, just a clear idea of what the club considers acceptable and what not. This could be updated over time. Assigning someone to oversee this area, even part-time, is often enough to make sure these points are not overlooked.

In conclusion, is already shaping how sports organisations connect with their fans, but its impact depends largely on how it is applied. The tools themselves do not guarantee better engagement, what matters is the way they are used. When implemented with care, AI can support more relevant, timely, and personalised experiences. However, if it replaces too much human contact or lacks transparency, it may weaken trust instead of building it. The examples and recommendations in this chapter highlight that meaningful fan engagement relies on balance. Technology should enhance connection, not replace it. Organisations that focus on relevance, fairness, and communication will be better positioned to use AI in ways that truly strengthen their relationship with fans.

7. CHALLENGES AND LIMITATIONS

During the course of the research, several limitations emerged that influenced the scope and depth of the analysis. One of the most significant challenges was related to the novelty of the topic. Artificial intelligence in the context of sports fan engagement is still developing, and as such, only a limited number of academic publications focus directly on this combination. Most existing literature tends to examine these areas separately, which made it necessary to rely on studies from adjacent fields and interpret their relevance to the research focus. Another limitation was associated with the nature of the sources. Due to the speed at which new technologies are being introduced, many relevant examples have been documented primarily in industry reports, corporate publications, and online articles. These types of sources were often more up to date than academic papers, but they do not always offer the same analytical depth or methodological transparency. The reliance on such materials made it more difficult to evaluate certain claims with the same academic rigor expected in peer-reviewed studies. Furthermore, no primary data collection was carried out in the form of interviews, surveys, or case-based field research. As a result, all insights were derived from secondary sources. Although efforts were made to select materials from reliable and varied perspectives, this limitation restricted the opportunity to include direct input from practitioners or fans, which may have enriched the analysis. It must also be acknowledged that the forward-looking nature of the topic presented further challenges. Many artificial intelligence applications described in the research are either recent innovations or currently being piloted. Consequently, their long-term effects on fan engagement have not yet been fully studied or measured. The conclusions drawn in this work were therefore based on early indicators and theoretical connections, rather than on long-term evidence. Despite these limitations, the research was guided by a clear

intention to collect, review, and structure available knowledge in a way that highlights current developments and suggests possible directions for future application. While generalizations must be made with caution, it is believed that the analysis presents a useful contribution to an area that will likely continue to gain importance in both academic and professional discussions.

8. CONCLUSION

Artificial intelligence is becoming increasingly present in many areas of life, and the sports industry is no exception. This thesis set out to examine how artificial intelligence influences the ways fans engage with sports, and what changes this may bring in the future. The research showed that artificial intelligence can support sports organizations in many ways—from tailoring content to individual preferences to making communication faster and more efficient. However, these benefits come with important considerations. Supporters of sports teams are not just customers. They are people with deep emotional connections to their teams. While technology can help make experiences more relevant and interactive, it also carries the risk of feeling impersonal or overly automated. Some supporters may welcome the innovations, while others might prefer more direct and human interactions. The real-world examples presented in the thesis, such as the Olympic Games, Wimbledon, and Formula One, demonstrated that artificial intelligence works best when it complements, rather than replaces, traditional forms of engagement. There are also ethical and practical concerns. Questions about data protection, fairness, and transparency must be taken seriously. Furthermore, smaller sports organizations may not have the same resources to adopt advanced technologies, which could increase the gap between different levels of competition. Ensuring responsible and inclusive use of artificial intelligence will be essential for building and maintaining trust among supporters. One of the key takeaways for managers is that artificial intelligence should not be treated as a one-size-fits-all solution. While it can support marketing, communication, and service delivery, its real value lies in how it is used. Managers in the sports industry need to think carefully about how these tools fit with their organization's goals and culture. For example, using artificial intelligence to personalize content or automate responses can be helpful, but it must still feel genuine to fans. It is equally important to be transparent about how data is collected and used. This means making sure that staff are trained, ethical concerns are considered, and that technology does not replace the emotional connection fans have with their teams. In the years to come, artificial intelligence is likely to play an even greater role in shaping fan experiences. However, the technology alone is not enough. Its value will depend on how thoughtfully it is

used and whether it respects the human side of sports and serves to strengthen the connection between organizations and their audiences. To conclude, artificial intelligence holds great potential to transform the sports experience in positive ways. If applied carefully and ethically, it can help organizations create deeper, more meaningful relationships with supporters, while also bringing innovation and efficiency to the industry as a whole.

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