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Technological Entrepreneurship in Football: Review of the Current Innovation Trends and Challenges in The Beautiful Game.

Master's thesis

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We hereby declare that we have written this master's thesis independently. All viewpoints, literary sources, and data from other authors used in this thesis have been properly referenced.

Abstract

This thesis examines technological entrepreneurship in football, focusing on current innovation trends, the challenges facing technology entrepreneurs, and future opportunities within the ecosystem. The study adopts a qualitative, exploratory design, combining a literature review with semi-structured interviews with four professionals from structurally distinct positions in the football technology ecosystem. The findings show that football has entered a phase of broad commercialisation, with artificial intelligence, data analytics, wearable monitoring, and digital fan engagement at the centre of entrepreneurial activity. However, the research identifies four interconnected challenges that shape participation in the ecosystem. These are data access and governance, financial inequality between elite and lower-tier clubs, weak evidence and trust deficits, and organisational resistance combined with ethical concerns. The study also identifies future opportunities in explainable AI, affordable lower-tier solutions, federation-level data infrastructure, responsible data governance, and fan analytics. A process roadmap is proposed describing technological entrepreneurship in football as a staged pathway from opportunity recognition through validation, governance alignment, and scaling.

Introduction

Technological entrepreneurship in football is understood in this thesis as a process through which entrepreneurs, startups, technology firms, practitioner-innovators, clubs, federations, and users turn new technologies into usable football products. Innovation is not driven only by top-down decisions from governing bodies. It also emerges when ventures identify practical problems in the game and build tools that clubs, athletes, supporters, federations, broadcasters, betting-adjacent markets, and commercial partners can use.

Entrepreneurship research commonly defines entrepreneurship as the discovery, evaluation, and exploitation of opportunities to create future goods and services (Shane & Venkataraman, 2000). User-innovation research adds that solutions often originate from users or practitioners outside incumbent producers and later diffuse more widely (von Hippel, 2005). In sport, innovation is also shaped by networks of firms, clubs, athletes, governing bodies, fans, and technology providers (Potts & Ratten, 2016; Ratten & Thompson, 2020). Football increasingly reflects this pattern because the sport now produces large volumes of event, tracking, performance, commercial, and fan data (Pappalardo et al., 2019), while broader technological change is reshaping elite sport practice and management (Frevel et al., 2022).

Technologies such as artificial intelligence, analytics, wearable monitoring, connected equipment, live-data systems, and digital platforms have widened what can be measured, predicted, and commercialised in football. Decroos et al. (2019) introduced VAEP as a framework for valuing on-ball actions by estimating how they change the probability of scoring and conceding. Mead et al. (2023) and Bandara et al. (2024) show how expected-goals models can be improved through additional contextual and sequence-based information. At the same time, AI and predictive analytics are increasingly used in performance, scouting, injury-risk management, and fan-facing products (Xu & Baghaei, 2025). These developments create entrepreneurial opportunities, but they also create new challenges around evidence quality, data access, governance, trust, and adoption.

This thesis aims to explore the current state, challenges, and future opportunities of technological entrepreneurship in football. It is guided by three research questions: What is the current state of technological entrepreneurship in the football industry? What are the main challenges faced by technology entrepreneurs in the football ecosystem? What are the future opportunities for technological entrepreneurship in football?

The thesis first reviews literature on technology entrepreneurship, sport innovation, digital sport ecosystems, innovation domains, and adoption barriers in football. It then explains the qualitative methodology, presents findings from four expert interviews, and discusses how the barriers identified in the literature and interviews can become future entrepreneurial opportunities. The interview guide is presented in Table 3, the coding matrix is provided in Appendix B, and the process roadmap is provided in Appendix C.

Keywords: technological entrepreneurship, football, innovation, sports technology, artificial intelligence, entrepreneurial ecosystem

Research classification code(s) (CERCS): S190 - Management of enterprises

2. Literature Review

This thesis uses a theoretical model that treats technological entrepreneurship in football as a staged ecosystem process. The model combines four perspectives: opportunity-based entrepreneurship theory, sport innovation theory, digital sport entrepreneurial ecosystem theory, and diffusion of innovations theory. Together, these perspectives explain how technological change creates opportunities, why football-specific conditions shape the development and adoption of products, and why some innovations scale while others remain limited.

Opportunity-based entrepreneurship theory explains the starting point. Shane and Venkataraman (2000) argue that entrepreneurship involves discovering, evaluating, and exploiting opportunities to create new goods and services. Eckhardt and Shane (2003) add that entrepreneurial opportunities often appear under conditions of uncertainty and change. In football, technologies such as AI, analytics, wearable monitoring, connected equipment, live-data systems, and fan platforms create openings for ventures that can turn technical possibilities into useful products.

Sport innovation theory explains why football must be treated as a specific innovation environment rather than a passive receiver of technology from other industries. Potts and Ratten (2016) argue that sport innovation is shaped by market demand, institutions, and entrepreneurial action. Football has its own competitive rhythms, organisational cultures, data restrictions, commercial pressures, and governing bodies. These conditions affect how innovations are evaluated and adopted.

Digital sport entrepreneurial ecosystem theory explains why football technology ventures cannot succeed through technical quality alone. Ratten and Thompson (2020) show that value in digital sport entrepreneurship is co-created by multiple actors. In football, these include startups, clubs, federations, leagues, investors, data providers, broadcasters, betting operators, technology suppliers, coaches, analysts, athletes, regulators, and fans. A product may be technically strong, but it still needs data access, trusted partnerships, organisational legitimacy, funding, governance acceptance, and fit with football workflows.

Diffusion of innovations theory explains adoption. Rogers (2003) argues that technologies spread depending on relative advantage, compatibility, complexity, trialability, and observability. This matters in football because clubs and federations are often cautious adopters. New products may be slowed by cost, conservative organisational culture, unclear return on investment, weak internal skills, privacy concerns, poor evidence, or poor fit with existing routines.

Based on these perspectives, the thesis treats football technology entrepreneurship as a process in which technological change creates opportunities, ventures develop products, and adoption depends on ecosystem conditions. Barriers are also treated as sources of opportunity. Fragmented data access creates opportunities for interoperable infrastructure. Financial inequality creates opportunities for lower-tier SaaS models. Weak validation creates opportunities for explainable and evidence-based analytics. Governance uncertainty creates opportunities for responsible data-rights systems, and workflow friction creates opportunities for products that integrate smoothly into club and federation routines.

2.1. Technology Entrepreneurship and Technological Innovation: Conceptual Framework and Application to Football

Technology entrepreneurship focuses on identifying opportunities to create new products or services and building ventures around them. Technological innovation refers to the development and application of new tools, knowledge, and processes that change how organisations work. In practice, the two are closely linked: innovation creates new possibilities, and entrepreneurs turn those possibilities into products, services, and business models.

Shane and Venkataraman (2000) shifted entrepreneurship research away from a narrow focus on entrepreneur traits and toward opportunities and market conditions. Eckhardt and Shane

(2003) further emphasise uncertainty as a defining feature of entrepreneurial action. This is useful in football because growing data availability, AI, and digital platforms have created new gaps for ventures that can provide useful tools for clubs, federations, athletes, fans, and commercial partners.

Sport entrepreneurship research also shows why football is a relevant setting. Potts and Ratten (2016) argue that sport innovation emerges from the interaction between market demand, institutions, and entrepreneurial activity. Hammerschmidt et al. (2024) show that sport entrepreneurship research has developed through conceptual, diversified, and digitally oriented phases, but also note that the field remains heavily theoretical. This supports the need for empirical work that examines how football technology entrepreneurs experience adoption barriers and opportunity areas in practice.

Football is attractive for technology ventures because it combines global demand, commercial scale, and increasing data availability. Deloitte Sports Business Group (2024) reported that the European football market reached EUR 35.3 billion in 2022/23, while the 2025 edition reported continued expansion to EUR 38 billion in 2023/24. Beiderbeck et al. (2023) found that technical directors from FIFA member associations broadly expect technology to become more important in football, with smaller associations showing strong interest in scalable and affordable tools. Industry evidence also points to AI and data management as important market areas, while noting that many sports organisations still face skills gaps (GSIC & Sportian, 2024).

Overall, technological entrepreneurship in football is not limited to equipment or gadgets. It includes analytics services, monitoring tools, communication platforms, data infrastructure, fan engagement products, live-data services, and integrated digital systems that help football organisations make better sporting and commercial decisions.

2.2. Innovation Domains and Technology Applications in Football

The literature identifies several main domains of football technology entrepreneurship. The first is AI and football analytics. Elstak et al. (2024) reviewed 190 studies on AI across football codes and identified nine application areas, including event detection, player evaluation, and match outcome prediction. AI is increasingly used to process complex datasets for scouting, tactical analysis, personalised training, injury prediction, and fan personalisation.

Football analytics has also developed beyond simple statistics such as goals, assists, passes, or possession. VAEP values on-ball actions according to how they change scoring and conceding probabilities (Decroos et al., 2019). xG models estimate the probability that a shot will become a goal and can be improved by adding features such as player ability, team quality, goal differential, and preceding event sequences (Mead et al., 2023; Bandara et al., 2024). However, Davis et al. (2024) warn that sports analytics models can become misleading when evaluation design is weak, when models overfit, or when outputs are difficult for practitioners to interpret. This makes trust, usability, and validation central to the commercial value of analytics products.

The second domain is wearable technology and athlete monitoring. Wearables track internal and external workload, movement, recovery, physiological stress, and other indicators used in performance management. Seshadri et al. (2019) show that advances in sensors, semiconductor technology, physiology, and predictive analytics have made wearable devices more useful in sport settings. At the same time, the evidence base remains uneven. Rebelo et al. (2023) and Benson et al. (2020) show that links between workload variables and actual injury outcomes remain inconsistent, partly because studies use different injury definitions, populations, and metrics. Robertson et al. (2024) therefore argue for more systematic evaluation of sports technology quality.

The third domain is digital fan engagement and commercial analytics. Clubs increasingly use digital tools to understand fans, personalise content, improve sponsorship value, and monetise global audiences. Romero-Jara et al. (2023, 2024) show that social media strategy and engagement differ across clubs and leagues, while Chouaten et al. (2024) demonstrate how AFC Ajax used online merchandising transaction data and machine-learning methods to segment fans by estimated customer lifetime value. Martins et al. (2023) also identify room for more innovative in-stadium and matchday engagement tools.

The fourth domain is sports betting technology and live-data systems. Sports betting is an important adjacent market through sponsorship, in-play products, data licensing, and betting content. However, the relationship between betting and football creates integrity risks. Forrest (2012) highlights betting-related corruption as a threat to football, especially where oversight is weaker. Stadler Blank et al. (2021) also caution that betting does not automatically increase fan

engagement and may reduce it when fans lose bets. This makes integrity monitoring, live data, and responsible governance important parts of the football technology ecosystem.

2.3 Barriers and Challenges to Technological Innovation Implementation

The literature also shows that adoption and scaling are difficult. Football technology ventures need credibility, access to clubs and data, and the ability to prove that their products are worth integrating into high-pressure football environments. Research on digital sport ecosystems highlights network access, institutional backing, and trusted relationships as important conditions for success (Ratten & Thompson, 2020). Broader sport technology research also shows that benefits are unevenly distributed because organisations differ greatly in resources, expertise, and readiness to adopt new tools (Frevel et al., 2022; Qi et al., 2024).

Five barriers are especially relevant. The first is cost and resource inequality. Qi et al. (2024) identify high upfront costs, organisational resistance, and difficulty proving return on investment as recurring adoption problems. The second is evidence quality. Davis et al. (2024), Rebelo et al. (2023), Benson et al. (2020), and Robertson et al. (2024) show that analytics and wearables are often difficult to evaluate because of weak validation, inconsistent methods, or limited interpretability. The third is data access and governance. Football data is valuable but often fragmented, commercially controlled, or legally sensitive. The fourth is ethics and AI governance, including privacy, fairness, transparency, and accountability (Kim et al., 2025; Elstak et al., 2024). The fifth is system fit. Samuel et al. (2020) show that even VAR required adaptation, training, and legitimacy-building, which suggests that entrepreneurially introduced technologies also need careful integration into existing football routines.

These barriers provide the foundation for the empirical analysis in Chapter 4, where the literature is compared with interview evidence from four football technology ecosystem actors.

3. Methodology

This study adopts a qualitative, exploratory research design to examine technological entrepreneurship in football, with a focus on current innovation trends and the challenges shaping the modern game. Qualitative research is appropriate here, because the phenomenon of how entrepreneurs navigate a complex, relationship-driven, and institutionally embedded ecosystem is better understood through depth of insight. Moreover, qualitative research allows

for a richer exploration of context, meaning, and process than quantitative methods. This makes it especially well-suited to studying an emerging and underexplored field where existing theory is still developing (Bryman, 2016). The exploratory design takes into account that academic research on technological entrepreneurship in football is still in its early stage. According to Hammerschmidt et al. (2024), the literature on sport entrepreneurship is still mostly theoretical, with little empirical research looking at actual obstacles and practices in particular sport contexts. In a field where existing frameworks have not yet been thoroughly validated with primary data, an exploratory strategy is therefore acceptable since it enables the research to find patterns, produce insights, and develop understanding. The study uses semi-structured expert interviews to gather primary data and a thorough literature review. Thematic analysis was applied to interview data, while literature and industry sources were used for contextual triangulation. This combination was selected to enable triangulation between the first-hand viewpoints of experts operating within the football technology ecosystem and the body of current academic and industrial knowledge. Figure 1 depicts the research design

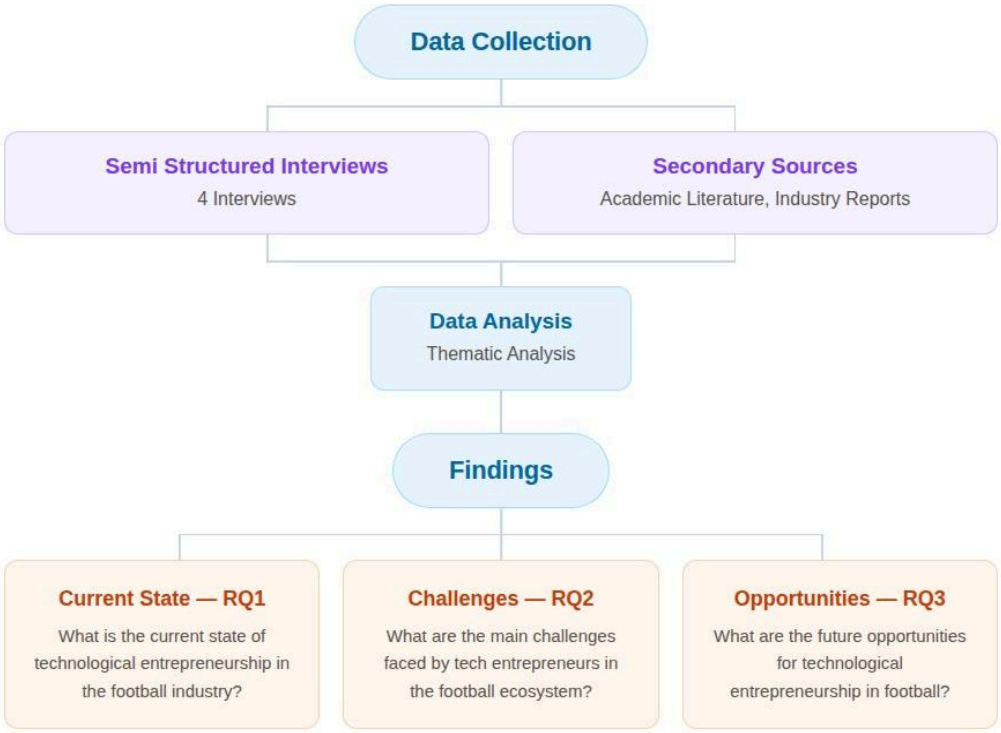

Figure 1. Research Design

Source: Created by the authors

3.1. Data collection

Secondary data were gathered from peer-reviewed academic publications, industry reports, and case studies on sports technology, football innovation, entrepreneurship, analytics, wearables, AI, fan engagement, betting-adjacent technologies, and digital transformation. Academic sources were identified through targeted searches in databases such as Scopus, Web of Science, and Google Scholar. Industry sources included football finance reports, sports technology market reports, and digital transformation reports in sport.

Primary data were collected through semi-structured interviews with experts occupying different roles in the football technology ecosystem. This format allowed flexible, in-depth discussion while keeping enough structure for comparison across participants. The interview guide was organised around four areas: current innovation trends, entrepreneurial practices and barriers, technology adoption dynamics, and future opportunities.

Each interview lasted approximately 45 to 60 minutes and was conducted remotely by video call. Participants were assured of organisational anonymity before the interview, and transcripts were reviewed by participants where requested. Participants were selected through purposive sampling because the aim was to access expert perspectives, not to produce statistical representativeness (Patton, 2002).

Three criteria guided participant selection: direct involvement in football technology development, adoption, or governance; sufficient seniority to discuss strategic and commercial dimensions; and positional diversity across the ecosystem. The four participants represented sports technology supply, commercial growth, federation-level implementation, and digital analytics. The purpose of the sample was not statistical representation or full saturation, but exploratory expert insight. This allowed comparison across different ecosystem positions while remaining realistic given the access-constrained and commercially sensitive nature of the sector.

The use of an expert sample is consistent with elite interviewing traditions in organisational research, where highly knowledgeable informants can provide insights that may not be available through larger, less targeted samples (Harvey, 2011). In qualitative research, sample adequacy depends not only on size but also on analytical depth, participant relevance, and saturation (Mason, 2010). Guest et al. (2006) found that key themes can emerge within the first six interviews in focused purposive samples, while Hagaman and Wutich (2017) suggest

that even smaller samples may identify common themes when participants come from the same professional field and research questions are clearly defined.

Several factors support the analytical adequacy of the four interviews used in this thesis. Each participant occupied a distinct position within the football technology ecosystem: sports technology startup, specialist sports technology company, national football federation, and commercial digital analytics company. This positional diversity allowed comparison across supply-side, governance-side, and commercial perspectives. In addition, each interview lasted 45–60 minutes and produced detailed responses across the four research themes. The exploratory design also fits the wider sport technology literature, where focused expert samples are used to generate contextual insight into emerging phenomena (Samuel et al., 2020; Qi et al., 2024). Since sport entrepreneurship research remains strongly conceptual and review-based, even smaller empirical studies can contribute by providing primary evidence on real-world barriers and practices (Hammerschmidt et al., 2024). For this research in total, 33 organisations were contacted for interviews (Table 1).

Table 1

Overview of interview requests

Response	**Number**
Organisations Contacted	33
No response	24
Declined participation	5
Agreed to participate	4

Source: Created by the authors

The organizations and professionals (Table 2) contacted for this research represent a targeted cross-section of selected football technology ecosystem actors. The participants provide a

multi-dimensional perspective on tech entrepreneurship, digital scaling, and the practical integration of advanced analytics within the global football sector.

A. Organization 1 - A global sports-tech and commercial enterprise, represented by its Head of Commercial, offering a strategic perspective on international partnerships, revenue scaling, and digital growth within the football industry.
B. Organization 2 - A specialized sports-technology startup, represented by its Head of Marketing, who provides expertise on brand growth and market entry within the football innovation sector.
C. Organization 3 - A national football governing body, represented by its Project Manager, focusing on the practical implementation of new technologies and the operational management of innovation projects within the Federation environment.
D. Organization 4 - A sports technology company, represented by its Managing Director, providing insight into strategic decision-making, product development, and the operational challenges of scaling technology solutions within the football ecosystem.

Table 2

Interview Participants

Participants	**Job Title**	**Type of Company**
Organization 1	Head of Commercial	Sports technology
Organization 2	Head of Marketing	Sports technology
Organization 3	Project Manager	Football Federation
Organization 4	Managing Director	Sports technology

Source: Created by the authors

The interviews were conducted in accordance with the ethical guidelines. The following procedures were observed throughout:

A. Every participant gave their informed consent before each interview. The goal of the study, the intended use of the data, and the participants' choice to withdraw at any time without repercussions were all explained to them.
B. The study was conducted with organisational anonymity. To protect commercially sensitive data, the federation and participating companies are referred to as Organization 1, Organization 2, Organization 3 and Organization 4. There are no known personally identifying details.
C. Interview recordings and transcripts were stored securely and accessed only by the research team. Data was used only for the purposes of this thesis and will not be shared with third parties.
D. The study did not collect sensitive personal data beyond participants' professional roles and areas of expertise. No biometric, financial, or personally sensitive information was requested or recorded.
E. Participants were given the opportunity to review their transcript and request corrections or clarifications prior to analysis.

3.2. Interview questions selection

Interview questions were selected based on the discovery areas outlined by the literature review (Table 3).

Table 3

Interview Questions

Interview Question	**Main literature basis**	**Purpose of the question**
What are the main products your organisation offers, and who are your primary customers within the football ecosystem?	Sport innovation as ecosystem analysis: 1. Ratten & Thompson (2020) 2. Potts & Ratten (2016)	It’s important to identify the participant’s position in the football technology ecosystem and understand which stakeholders the innovations serve.

Which innovation domain, such as AI/analytics, wearable monitoring, fan engagement, live-data systems, or betting-related technologies, do you see generating the most entrepreneurial activity right now, and why?	Innovation domains: 1. Decroos et al. (2019) 2. Davis et al. (2024) 3. Elstak et al. (2024) 4. Xu & Baghaei (2025) 5. Seshadri et al. (2019) 6. Romero-Jara et al. (2023) 7. Chouaten et al. (2024)	Discovering the innovation/technology domains driving the football entrepreneurship
How has the role of startups and external technology firms changed relative to clubs and governing bodies as drivers of innovation?	Exploring the innovation ecosystem: 1. Ratten & Thompson (2020) 2. Potts & Ratten (2016) 3. Hammerschmidt et al. (2024)	To explore whether football innovation is mainly driven by established institutions or by external entrepreneurial actors such as startups and technology companies.
How do you identify opportunities to develop new products in the football industry, and to what extent is this process demand-led versus technology-led?	Starting point of innovations: 1. Shane & Venkataraman (2000) 2. Eckhardt & Shane (2003) 3. von Hippel (2005)	We need to understand how opportunity recognition happens in football technology, and whether new products are shaped more by customer needs, practitioner feedback, technical possibilities, or market trends.
What were the biggest challenges you faced when entering and operating within the football market?	Innovation barriers: 1. Qi et al. (2024); Hammerschmidt et al. (2024); 2. Ratten & Thompson (2020) 3. Davis et al. (2024) 4. Robertson et al. (2024)	To add more to the innovation barriers outlined by these works.

How do financial asymmetries between clubs shape your go-to-market strategy and the scalability of your product?	Resource gap and its effects: 1. Frevel et al. (2022) 2. Qi et al. (2024) 3. Beiderbeck et al. (2023) 4. Deloitte Sports Business Group (2024, 2025)	examine how the resource gap between elite and lower-tier clubs affects technology adoption, pricing, customer targeting, and scalability.
How do governing bodies and regulations such as IFAB rule changes or data governance requirements affect innovation adoption in football?	Regulations and governance: 1. Rogers (2003) 2. Samuel et al. (2020) 3. Kim et al. (2025) 4. Elstak et al. (2024) 5. Beiderbeck et al. (2023)	Understand whether regulation acts mainly as a barrier, an enabler, or both in the adoption of football technologies.
What structural changes such as data standardisation, interoperability mandates, or player data governance frameworks are needed to accelerate responsible technological innovation in football?	Discussion of structural fixes: 1. Pappalardo et al. (2019) 2. Ratten & Thompson (2020) 3. Kim et al. (2025) 4. Qi et al. (2024) 5. Robertson et al. (2024)	Examine what ecosystem-level changes could improve responsible innovation, data access, trust, and interoperability.
Where do you see the biggest untapped market opportunities: explainable AI, lower-tier/grassroots SaaS platforms, integrated federation-level data infrastructure, or commercial fan analytics?	Discussion on future opportunities: 1. Davis et al. (2024) 2. Beiderbeck et al. (2023) 3. GSIC & Sportian (2024) 4. Romero-Jara et al. (2023) 5. Chouaten et al. (2024) 6. Martins et al. (2023)	To identify future opportunity areas and connect interview insights to the opportunity themes developed from the literature review.

Source: Created by the authors

3.3. Data Analysis

In order to identify patterns in the interview transcripts, primary data analysis was conducted using Braun and Clarke's (2006) six-phase approach (Table 4). Following a thorough review of each transcript, initial codes were generated from meaningful data segments, significant phrases, and notable statements. These codes were then grouped into broader themes. The study used a hybrid deductive-inductive methodology: subthemes were developed from the interview data, while the research questions and interview structure served as a guide for the initial coding. After comparing the codes of the participants, they were iteratively divided into four themes that represent the main components of the research.

The four themes are as follows:

A. Current Innovation Trends: The technologies, products, and business models currently driving entrepreneurial activity in football, including AI-driven analytics, wearable monitoring, digital fan engagement, and integrated tactical data systems.
B. Entrepreneurial Practices and Barriers: How opportunities are identified and pursued within the football technology sector, and the structural obstacles that shape market entry, including data access constraints, financial asymmetry between elite and lower-tier clubs, integrity risks, and the trust deficit created by methodological weaknesses in existing products.
C. Technology Adoption Dynamics: The factors influencing how football organisations evaluate, accept, or resist new technologies, encompassing organisational culture, seasonal procurement cycles, incumbent advantage, regulatory enablers, information asymmetry, and the role of cross-institutional collaboration.
D. Future Opportunities: The areas where participants identified the strongest potential for entrepreneurial growth, including live data infrastructure, technology democratisation for grassroots football, data governance frameworks, interoperability standards, and fan-driven product development.

These themes serve as the analytical structure for the findings presented in Chapter 4, offering a detailed understanding of how ecosystem-level conditions shape the trajectory of technological entrepreneurship across the football industry. The coding matrix is provided in Appendix B.

Table 4

Braun and Clarke's (2006) six-phase approach

Phase	**Description**
1. Familiarising with data	By reading and rereading the raw data (such as transcripts and notes), researchers become fully immersed in it. They actively interact with the content, taking note of preliminary concepts and possible trends.
2. Generating initial codes	Work methodically through the data to find features that are significant. Data segments are summarised by codes, which might be latent or semantic. Researchers may use software, but manual coding is also valid. The goal is comprehensive and thorough coding.
3. Searching for themes	Researchers start organising codes into more general themes or patterns. A theme represents significant patterns in the data that are pertinent to the research issue. Thematic maps and mind maps are two tools that help organise themes. Interpretive reasoning is required at this stage.
4. Reviewing themes	The coherence within and differences between candidate themes are examined. To guarantee proper depiction, researchers go back to the data. Themes may be combined, divided, or eliminated as a result of this process.
5. Defining and naming themes	Researchers refine the essence of each theme and describe how it relates to the research question. Effective naming should be concise and reflective. Supporting quotations and detailed descriptions are developed to enhance clarity
6. Writing Up	Researchers present findings through a coherent narrative. The report includes a detailed account of themes, data extracts, and analytic commentary. The write-up should interpret the data meaningfully and link findings to the literature, ensuring methodological transparency

Source: Braun, V. & Clarke, V. (2006).

4. Findings

The findings from industry reports, academic literature and interviews provide a detailed overview on the current state, challenges and future opportunities of technological entrepreneurship in football.

4.1. Current state

The findings suggest that technological entrepreneurship in football has moved from isolated experimentation toward broader commercialisation. Football's global fan base, commercial scale, and increasing use of data make it an attractive market for technology ventures. The European football market reached EUR 35.3 billion in 2022/23 and EUR 38 billion in 2023/24 (Deloitte Sports Business Group, 2024, 2025). This scale helps explain why clubs, leagues, federations, investors, and technology companies are paying more attention to digital products and data-driven tools.

A recurring finding is that clubs and governing bodies are no longer the only drivers of innovation. Startups and external technology firms increasingly provide solutions in scouting, performance analytics, wearable monitoring, fan engagement, live data, and data infrastructure. Interviewee 4 argued that "there is very little innovation coming from the clubs themselves," adding that many clubs mainly build dashboards or front-end layers on top of third-party data. This supports the ecosystem view of Ratten and Thompson (2020), where value is co-created by technology firms, established sport organisations, investors, and regulators rather than by one actor alone.

Interviewees also described a clear acceleration after the 2018 FIFA World Cup and the broader adoption of VAR. Although VAR is not an entrepreneurial product in the same way as a startup tool, it showed that advanced technology could be formally integrated into the game. Since then, entrepreneurial activity has expanded into performance science, commercial operations, supporter engagement, tactical analysis, and live-data products. Sports technology investment also indicates continued market interest, with major deal flow reported in 2024 (SportsTechX, 2024).

AI and analytics emerged as central technologies in both the literature and interviews. They are used in scouting, tactical analysis, injury prediction, performance monitoring, and fan

personalisation. Examples such as AI-supported scouting tools and real-time performance platforms show how AI is becoming part of football decision support. However, the interview evidence also suggests that the value of AI depends less on hype and more on whether it can produce trusted, usable, and explainable insights for football decision-makers.

Wearable technology is another active domain. Clubs use internal and external workload data to support performance management and injury-risk monitoring. The literature shows that wearables can support athlete monitoring and personalised training, but the evidence that wearable data directly reduces injury risk remains mixed (Seshadri et al., 2019; Benson et al., 2020; Rebelo et al., 2023). This creates opportunities for ventures that can offer validated tools rather than broad performance claims.

Digital fan engagement has also become a major area of entrepreneurial activity. Interviewee 4 distinguished between the sporting side of innovation, focused on analytics and player performance, and the commercial side, focused on fan data, social media measurement, and monetisation. He argued that many clubs still invest far less in commercial tools than in player-related spending. Interviewee 2 similarly noted that ‘clubs want tools that connect the data they hold with commercial outcomes’. This suggests that fan engagement and commercial analytics are no longer side issues, but part of how football organisations create value.

A final current trend is the growth of scalable platforms for lower-tier and grassroots football. Advanced technology was previously concentrated at elite clubs, but SaaS tools for player development, squad management, communication, scouting, and basic analytics are increasingly targeting clubs and academies lower in the football pyramid. Connected equipment, such as sensor-enabled match balls, also shows how hardware and software are converging to create new data streams for performance, officiating, broadcasting, and fan-facing products.

Overall, the current state of technological entrepreneurship in football is best understood as commercial growth and wider adoption across multiple domains. AI and data analytics are central, but the ecosystem also includes wearables, fan engagement tools, live-data systems, lower-tier platforms, and connected equipment. The next phase will depend not only on the amount of technology entering football, but on whether entrepreneurs can build products that are trusted, affordable, usable, and aligned with daily football operations.

4.2. Challenges

While the current state of technological entrepreneurship in football reflects strong growth and expanding opportunity, the findings from this study reveal that entry into and scaling within the football technology ecosystem remains structurally difficult. The challenges identified across the interviews and the academic literature are interconnected and mutually reinforcing: data access problems compound financial inequality, methodological weaknesses undermine commercial credibility, and ethical concerns shape the terms on which technology is adopted. These are not simply operational inconveniences for individual ventures, they represent systemic barriers that shape who can participate in football's innovation ecosystem and on what terms. As Hammerschmidt et al. (2024) note in their bibliometric review, sport entrepreneurship research has invested heavily in building conceptual frameworks but has done comparatively little to examine the real-world barriers that prevent ventures from succeeding in specific sport contexts. This section addresses that gap directly, drawing on both the literature and the primary interview data collected for this study.

4.2.1. Data Access and Governance

The most consistently cited challenge across the four interviews was data access. Football produces large amounts of match, performance, biometric, commercial, and fan data, but this does not mean that entrepreneurs can easily use it. Interviewee 2 explained that much club data is fragmented across internal systems, delayed, or restricted because of commercial sensitivity and ownership disputes. Real-time analytics and injury-monitoring products become difficult to build when the underlying data pipeline is unreliable or controlled by existing contracts. Organization 3 framed the issue more strongly, arguing that “interoperability mandates” are needed because football data should not remain “locked into silos.”

The same problem appears on the commercial side. Interviewee 4 described football as an industry with “a lot of scattered data,” where ticketing, merchandising, social media, broadcast, and fan data often sit in separate systems. Organization 3 described similar problems at federation level, where inconsistent data standardisation across member clubs makes it harder to build system-wide digital tools. This aligns with Pappalardo et al. (2019), who show that detailed football event data has historically been commercially mediated rather than openly available.

Data governance adds another barrier. As clubs collect player biometrics, tracking data, and fan behavioural data, questions of ownership, consent, privacy, and access become central. For entrepreneurs, the challenge is therefore double: they need access to useful data, and they must handle it responsibly enough to satisfy legal requirements and maintain trust among clubs, athletes, fans, and federations.

4.2.2. Financial Inequality and Uneven Technology Access

A second major challenge is financial inequality across the football pyramid. Elite clubs can afford customised systems, analytics departments, specialist staff, and premium technology products. Lower-tier clubs and developing football markets often lack the resources to adopt even basic digital tools. This imbalance limits the diffusion of football technology beyond the elite level.

Interviewee 2 summarised the tension clearly: “the clubs that most need our product often cannot afford it, and the clubs that can afford it already have in-house teams doing similar work.” Interviewee 4 made a similar point, noting that below a certain level “there’s just no money whatsoever to invest on third-party tools.” This creates a difficult go-to-market problem. Elite clubs have budgets but often already have internal capability, while lower-tier clubs have unmet needs but limited ability to pay.

The literature supports this finding. Frevel et al. (2022) link technology-driven advantage to resources and expertise, while Qi et al. (2024) identify high upfront costs and unclear return on investment as common adoption barriers. The interviews also suggest one possible solution: league or federation-level procurement. Interviewee 4 explained that leagues such as the National League in England or Serie C in Italy can buy products centrally and provide them to member clubs. This model may help ventures scale beyond individual club sales.

4.2.3. Product Evidence Gaps and the Trust Deficit

A third challenge is the gap between commercial claims and reliable evidence. In analytics and wearables, products often promise performance improvement, injury prevention, better scouting, or improved decision-making. However, the evidence behind these claims can be difficult for clubs to evaluate. Davis et al. (2024) identify problems such as overfitting, weak test design, and poor interpretability in sports analytics, while Benson et al. (2020), Rebelo et al.

(2023), and Robertson et al. (2024) show that wearable and sports technology products often need stronger validation.

Interviewees confirmed that this creates a trust deficit. One startup interviewee described how clubs have been “burned before” by vendors who over-promised, meaning they now want proof rather than promises. Interviewee 4 added that even strong products can fail without internal capability: “We can have a great product, but then you have nobody on the other side to kind of use it and champion it.” He noted that at some clubs one person may be responsible for social media, ticketing, and matchday concessions, leaving no dedicated internal champion for new technology.

This evidence problem raises the cost of market entry. New ventures must not only build technically strong products, but also demonstrate that those products work in real football contexts, are understandable to users, and fit actual decision-making routines.

4.2.4. AI Governance and Organisational Resistance

AI governance and organisational resistance form a fourth challenge. AI, biometric monitoring, fan analytics, and live-data systems raise questions about privacy, fairness, accountability, transparency, and responsibility for automated recommendations (Kim et al., 2025; Elstak et al., 2024; Qi et al., 2024). For entrepreneurs, these issues are practical adoption barriers. A club or federation may reject a tool if it cannot explain how data is stored, how outputs are produced, or how player and fan privacy are protected.

Organization 3 provided a clear example: the federation paused the evaluation of one analytics product because it could not adequately explain how individual player data was stored and used. This shows that governance credibility is not optional; it can determine whether a product moves from interest to adoption.

Organisational resistance also matters. Organization 3 described this resistance bluntly: “Culture is the ‘Innovation Killer’... coaches still trust their own eye over data-driven tools”. Samuel et al. (2020) show that even VAR, introduced through a top-down mandate, required adaptation and legitimacy-building. Entrepreneurially introduced products face an even harder challenge because they often lack institutional backing. Interviewee 4 described football as commercially underdeveloped relative to the money it generates, with many organisations still prioritising player spending over operational and commercial technology. These barriers require

relationship-building, internal champions, phased implementation, and products that fit existing workflows.

4.3. Opportunities

The strongest future opportunities are likely to come from the same problems that currently slow adoption. Fragmented data, weak validation, financial inequality, unclear governance, workflow friction, and integrity risks all show where ventures can create value. Table 5 summarises this barrier-to-opportunity logic.

Table 5

Barrier-to-opportunity bridge.

Barrier	Opportunity
Fragmented and closed data access	Interoperable federation and league data infrastructure
Financial inequality across the football pyramid	Lower-tier SaaS and modular pricing models
Weak validation and trust deficits	Explainable, rigorously validated analytics tools
Unclear data rights and governance	Player data rights, open APIs, and governance frameworks
Workflow friction and procurement barriers	Workflow-compatible, plug-in style products
Integrity risks in live-data and betting markets	Integrity monitoring and richer live-data systems

Source: Created by the authors

Explainable and validated analytics are a central opportunity. As AI becomes more involved in recruitment, tactics, injury monitoring, and fan personalisation, clubs need systems that can explain outputs and demonstrate practical value. Davis et al. (2024) show that overfitting, data leakage, and poor interpretability can weaken analytics tools. This creates space for ventures that combine technical performance with transparency, validation, and usability. The interview evidence also supports this. Organization 3 described the direction of football

technology as a move "from data collection to predictive analytics — injury forecasting and tactical simulations." However, interviewees also stressed that AI tools must solve real efficiency problems, such as reducing manual video tagging or improving scouting decisions, rather than simply using AI for its own sake. This means the opportunity is not only to build more advanced models, but to make those models understandable and useful for coaches, analysts, sporting directors, and federation staff.

Affordable technology for lower-tier football is another major opportunity. Many clubs in second divisions, regional leagues, academies, and developing football markets lack access to tools that elite clubs now take for granted. Beiderbeck et al. (2023) suggest that lower-ranked football associations show strong demand for scalable and affordable technology. Combined with interview evidence and examples such as 360Player, ScoutWizz, and Tonsser, this supports the opportunity for SaaS products, modular pricing, simple onboarding, and training-supported tools. Organization 2 linked this opportunity to the wider development of the game, arguing that "access to technology, tools and resources will play a key role in leveling the playing field globally." At the same time, lower-tier adoption cannot depend only on cheap pricing. Interviewee 4 noted that federation or league-level procurement can help smaller clubs access tools they could not afford individually, with leagues buying technology centrally and distributing it to member clubs. This suggests that successful lower-tier ventures may need to sell not only to individual clubs, but also to leagues, federations, and academy networks.

Data infrastructure, governance, and interoperability form a third opportunity area. Football data is often stored in incompatible systems and controlled by different actors. Pappalardo et al. (2019) show that open event-log data can support research and method development; by extension, federation-level data platforms could create shared infrastructure for further innovation, although the commercial effect would need separate validation. The interview evidence strongly supports this direction. Organization 3 argued that "interoperability mandates" are needed because football data should not remain "locked into silos." The same participant also described longitudinal player data as a major opportunity, suggesting that tracking a player's development pathway from youth football to professional level through a "Data Passport" could create new value. This should be treated as an interviewee's view rather than proven market size, but it fits the wider finding that football lacks integrated data infrastructure across clubs, federations, and development pathways. Ventures that provide open APIs, consent-management

systems, player-data rights frameworks, and interoperable environments may therefore build strong positions in the next phase of football technology development.

Workflow-compatible products are also likely to matter. Adoption depends not only on sophistication, but on whether a tool fits club routines, procurement windows, analyst workflows, coaching habits, and existing software systems. Organization 2 gave a practical example, explaining that its "semantic layer" helps analysts use tactical data "in a format that is right for them," allowing the product to integrate with existing workflows. This matters because football organisations often do not have the time, staff, or technical capacity to reshape their routines around a new platform. The same organisation also noted that football clubs do not buy services all year round, but within narrow procurement windows. The opportunity is therefore not only to build better models, but to make them easy to test, easy to integrate, and easy to use inside real football organisations.

Finally, fan engagement, live-data products, and integrity monitoring remain important opportunity areas. Romero-Jara et al. (2023), Martins et al. (2023), and Chouaten et al. (2024) show that football clubs can use digital engagement, CRM, merchandising data, and in-stadium tools more effectively. Interviewees also argued that many clubs still fail to monetise global fan relationships properly. Organization 4 stated that many clubs "still don't fully understand that the majority of their consumers and fans are not in their local markets anymore," which points to an opportunity for products that help clubs understand international audiences, personalise content, and improve sponsorship or merchandise value. At the same time, Organization 1 pointed to live data as a separate opportunity, stating that "live data is one topic where federations, leagues and streaming providers can level up." This connects fan experience with integrity: richer live-data products can improve viewing and betting-adjacent services, but they also increase the need for anomaly detection, information-sharing, and match-integrity monitoring. Ventures that combine commercial usefulness with privacy and integrity safeguards are therefore likely to be well positioned.

5. Discussion

The findings suggest that technological entrepreneurship in football is best understood as an ecosystem process rather than a collection of separate technologies. AI, analytics, wearables, fan engagement tools, live-data systems, and betting-adjacent products are important, but the

central issue is how opportunities move from recognition to product development, validation, governance alignment, adoption, and scaling. This connects the three research questions: the current state shows where entrepreneurial activity is concentrated, the challenge findings explain why adoption is uneven, and the opportunity findings show where the process can be improved.

A first contribution is that the opportunity space is broader than elite-club performance technology. The literature identifies AI, analytics, wearables, fan engagement, and betting technologies as major domains, but the interviews show that ventures operate across the wider football value chain. They serve clubs and federations, but also rights holders, streaming providers, betting-adjacent markets, commercial teams, lower-tier clubs, and fans. This supports the digital sport ecosystem view of Ratten and Thompson (2020) and adds football-specific detail by showing that demand-side actors such as fans, viewers, and betting users also shape innovation.

The interviews also show that opportunity recognition in football is usually both demand-led and technology-led. Ventures do not succeed simply because they possess technical capability. They succeed when they combine technology with football-specific knowledge, customer feedback, and a clear understanding of daily operational friction. This extends Shane and Venkataraman's (2000) opportunity-based view by showing that, in football, credible opportunity recognition depends heavily on proximity to the game and the ability to speak the language of clubs, analysts, coaches, commercial staff, and federations.

A second major insight concerns data and workflow fit. Data access is a gatekeeping mechanism, but the interviews show that different parts of the ecosystem need different kinds of data. Betting and streaming products depend on low-latency information and integrity protection. Club-facing performance products need contextual event and tracking data. Commercial fan products need integrated ticketing, merchandising, social, and broadcast data. In all cases, value depends on turning data into workflow-compatible insight. A product must not only be accurate; it must be understandable, usable, and compatible with existing routines.

Governance should also be understood as both a barrier and an enabler. Privacy, consent, player-data rights, AI transparency, and integrity concerns can slow adoption, but clear rules can also open markets. VAR illustrates how rules can create a formal space for technology adoption (Samuel et al., 2020), while interview evidence shows that pitchside technology permissions, federation cooperation, and integrity information-sharing can enable new products. Responsible

innovation in football therefore includes AI ethics and athlete welfare, but also live-data integrity, match-fixing prevention, and cooperation between operators, federations, clubs, regulators, and police.

The scaling problem is also more complex than selling to elite clubs. Elite clubs have budgets, but many already have internal capability. Lower-tier clubs have unmet needs, but often lack budget and implementation capacity. This creates room for SaaS products, modular pricing, federation-level procurement, and products that can scale through leagues or mass consumer markets rather than only through individual club contracts. The process roadmap in Appendix C captures this logic: football technology ventures must recognise a real opportunity, gain data and ecosystem access, translate technology into a usable product, validate it, align with governance and workflows, secure adoption, and then scale through appropriate market channels.

Overall, the future of football technology entrepreneurship depends less on adding more tools and more on making tools usable, trusted, and easy to adopt. The strongest ventures are likely to be those that turn data into clear insight, respect privacy and integrity rules, and serve parts of the football ecosystem that remain underserved.

6. Conclusion

6.1. Answering the research aim

The aim of this thesis was to examine technological entrepreneurship in football by identifying the current state of innovation in the industry, the main challenges faced by technology entrepreneurs, and the future opportunities likely to shape the football technology ecosystem. The study concludes that technological entrepreneurship in football should not be understood as a set of separate technologies entering the sport, but as an ecosystem-based process in which entrepreneurs, clubs, federations, investors, data providers, athletes, fans, and commercial partners jointly shape how innovation is developed, validated, adopted, and scaled.

The central conclusion is that football has moved from isolated technological experimentation toward a more commercialised and interconnected innovation environment. However, this development remains uneven. The ability of a venture to succeed depends not only on technical quality, but also on data access, trust, governance, organisational fit, and the capacity to demonstrate value in real football settings. This supports the view of entrepreneurship

as the discovery, evaluation, and exploitation of opportunities under uncertainty (Shane & Venkataraman, 2000; Eckhardt & Shane, 2003), while also showing that in football these opportunities are strongly shaped by ecosystem relationships, institutional rules, and adoption conditions (Potts & Ratten, 2016; Ratten & Thompson, 2020; Rogers, 2003).

6.2. Conclusion to Research Question 1: What is the current state of technological entrepreneurship in the football industry?

The current state of technological entrepreneurship in football is best described as ecosystem-wide commercialisation. Entrepreneurial activity now includes AI, analytics, wearable monitoring, tactical-data platforms, digital fan engagement, live-data services, betting-adjacent technologies, connected equipment, and SaaS products for lower-tier clubs and academies. The strongest activity is concentrated around data-driven value creation, but football technology is no longer only about elite performance. It also covers commercial, governance, and consumer-facing functions.

Innovation is produced through interaction between startups, technology companies, clubs, federations, leagues, investors, data suppliers, broadcasters, betting operators, coaches, analysts, athletes, and fans. This supports the digital sport entrepreneurial ecosystem perspective (Ratten & Thompson, 2020).

6.3. Conclusion to Research Question 2: What are the main challenges faced by technology entrepreneurs in the football ecosystem?

The main challenges faced by football technology entrepreneurs are structural: fragmented data access, uneven financial resources, weak validation, trust deficits, organisational resistance, and governance or integrity concerns. These barriers reinforce one another. Limited data makes validation harder, weak validation reduces trust, and low trust slows adoption in conservative football organisations.

Data is the most important gatekeeping resource. Many products require reliable and contextual data before they can be built, tested, or scaled. Financial inequality also shapes adoption because elite clubs have budgets and internal capability, while lower-tier clubs often have unmet needs but limited resources. Finally, ethical and governance issues around AI, biometric monitoring, fan analytics, and live data are now central to whether products can be

trusted and adopted.

6.4. Conclusion to Research Question 3: What are the future opportunities for technological entrepreneurship in football?

The strongest future opportunities are likely to emerge from today's biggest frictions. Data fragmentation creates opportunities for interoperable infrastructure. Financial inequality creates opportunities for affordable SaaS models. Weak validation creates opportunities for explainable and evidence-based analytics. Governance uncertainty creates opportunities for data-rights and consent systems. Workflow resistance creates opportunities for modular products that fit football routines.

The main opportunity areas are explainable AI, validated analytics, affordable lower-tier tools, federation-level data infrastructure, interoperability systems, fan analytics, live-data products, and integrity monitoring. These opportunities are commercially relevant because they address practical problems that clubs, federations, leagues, and technology users already face.

6.5. Theoretical Contribution

This thesis makes a modest theoretical contribution by connecting opportunity-based entrepreneurship theory, sport innovation theory, digital sport entrepreneurial ecosystem theory, and diffusion of innovations theory into a football-specific process view of technological entrepreneurship. Rather than treating football technology ventures as isolated firms introducing isolated products, the thesis shows that entrepreneurship in this sector moves through a staged pathway: opportunity recognition, ecosystem entry, product development, validation, governance alignment, adoption, and scaling.

The contribution is modest because the thesis does not propose a new general theory of entrepreneurship. Instead, it refines existing theory by showing how football-specific conditions shape entrepreneurial processes. Shane and Venkataraman's (2000) opportunity-based view explains why technological change creates openings for new ventures, but the findings show that in football these opportunities can only be exploited when ventures also secure data access, legitimacy, organisational fit, and trust. Similarly, Ratten and Thompson's (2020) ecosystem perspective is supported, but this thesis adds football-specific detail by identifying procurement

cycles, data fragmentation, lower-tier affordability gaps, integrity risks, and federation-level infrastructure as important ecosystem conditions.

The thesis also contributes by reframing barriers as opportunity-producing conditions. In the football technology ecosystem, the same structural problems that slow adoption also indicate where future ventures can create value. This barrier-to-opportunity logic helps explain why the next stage of football technology entrepreneurship will depend less on simply introducing more advanced technologies and more on solving the practical frictions that prevent useful technologies from spreading across the game.

6.6. Practical Implications

For entrepreneurs, the most important implication is that technical sophistication is not enough. Football technology ventures should prioritise explainability, validation, usability, and workflow fit from the beginning. Products should be designed around real football routines, seasonal procurement windows, and the needs of coaches, analysts, commercial teams, and federation staff. Entrepreneurs should also build governance credibility early by showing how data is collected, stored, explained, and protected.

For clubs and federations, the main implication is that innovation requires internal structure. Clubs should create clearer processes for testing new technologies, define data-sharing rules, and appoint internal champions who can connect technical products with football practice. Federations have an especially important role because they can support common standards, shared data infrastructure, interoperability, and responsible innovation pathways for smaller clubs that cannot build these capabilities alone.

For ecosystem builders such as investors, incubators, accelerators, data providers, and technology hubs, the priority should be to support ventures that solve adoption bottlenecks rather than only those using the newest technology. The most valuable investments are likely to be in explainable analytics, validated monitoring tools, lower-tier SaaS platforms, open data infrastructure, player-data governance systems, integrity monitoring, and fan analytics. Ecosystem builders can also reduce market friction by helping ventures access pilots, football expertise, procurement networks, and credible validation environments.

Overall, this thesis concludes that technological entrepreneurship in football is an ecosystem process shaped by opportunity, trust, governance, data access, and uneven resources. The future of the field will not be determined simply by the arrival of more advanced technologies. It will depend on whether entrepreneurs and football organisations can turn technology into validated, understandable, affordable, and responsibly governed solutions that fit the real operating conditions of the sport.

6.7. Final Conclusion

The main finding is that football technology entrepreneurship is entering a more mature phase. In this phase, competitive advantage will come from combining technical depth with ecosystem understanding. Ventures that can solve the frictions of data fragmentation, affordability, weak trust, governance uncertainty, workflow incompatibility, and integrity risk are likely to create the strongest value. In this sense, the future of technological entrepreneurship in football lies not only in innovation itself, but in building the conditions that allow innovation to spread responsibly and effectively across the game.

Limitations

This research has several limitations. First, the primary data are based on four expert interviews. Although the participants were selected purposely and represent different positions in the football technology ecosystem, the sample remains small. The small sample size means that the current state of technological entrepreneurship represented in RQ1 is derived from a narrow number of perspectives, even though the participants represent substantially distinct ecosystem positions. The landscape may be described variously by players, investors, fans, and club sporting directors. Similar to this, the difficulties noted in RQ2 may not fully represent the variety of difficulties encountered by other ecosystem members, rather, they just represent the difficulties faced by these four positions in particular. Future studies should increase the number of participants to see if the themes found here apply to a larger variety of viewpoints.

Second, the participating organisations are anonymized. The anonymisation of participating organisations protects commercially sensitive data. However, not providing deeper detail about the interviewees' organisations, such as company size, operational scope, or whether they primarily work with elite or lower-tier clubs, limits the reader's ability to fully contextualise

each participant's perspective. Including such detail in future research would offer a richer understanding of how ecosystem position shapes the challenges and opportunities described in RQ2 and RQ3.

Third, the research relies partly on secondary sources and industry reports. These sources are useful for understanding market trends and commercial scale, but they may reflect the priorities and reporting practices of the organisations that publish them. Instead of focusing on failure, non-adoption, or discontinued products, these reports typically highlight growth, investment, and possibility. Because of this, both the present situation and the prospects for the future discussed in this thesis may seem more promising than the whole picture. This viewpoint would be balanced with research that included information on failed projects or rejected technology uptake.

Fourth, football technology is changing quickly. The speed at which football technology is developing restricts the applicability of results for all three research questions. As new technologies develop, the current situation described in RQ1 may change. As market structures and governance frameworks evolve, the difficulties listed in RQ2 may become more severe or less severe. The opportunities identified in RQ3 may shift as new technologies, regulations, and market conditions develop after the completion of this thesis. Future longitudinal studies that follow the same ecosystem actors and domains over a longer time frame would be helpful in determining whether the trends found here are transient or long-lasting.

Fifth, the study does not directly evaluate the performance or financial impact of specific technology products. Instead of assessing the real effects of certain technological products, the study looks at perceptions and ecosystem dynamics. This affects RQ2 and RQ3 in particular, as the evidence problem and the opportunities around validated products are discussed based on what participants believe rather than what measurable data confirm. Combining qualitative insights with product-level case studies, adoption data, or quantitative performance metrics would strengthen future research in this area.

Finally, the broad ecosystem-level scope of the study is useful for identifying patterns across domains but means that individual areas such as AI scouting, wearable validation, fan analytics, or federation data infrastructure are treated at a general level. Domain-specific challenges within RQ2 and domain-specific opportunities within RQ3 may look different when examined in greater depth. Future research should investigate these areas separately and compare

how barriers and opportunities differ across elite, lower-tier, youth, and emerging football markets.

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Appendices

Appendix A. Summary of barriers

Barrier Category	Specific Issue from Literature Review	Main Level	Key Sources	Implications for Entrepreneurs
Data Access and Governance	Difficult access to reliable, live, and integrated club/federation data; fragmented ownership; lack of standardisation; commercial restrictions on data sharing	Club / Federation / Ecosystem	Pappalardo et al. (2019); Ratten & Thompson (2020)	Harder to build, validate, and scale products; ventures need partnerships, data-sharing agreements, and interoperable solutions
Financial Inequality and Uneven Technology Access	Large gap between elite clubs and lower-tier clubs in budget, infrastructure, and internal analytical capacity	Club / Industry Structure	Frevel et al. (2022); Qi et al. (2024); Ratten & Thompson (2020)	Startups face a narrow market: elite clubs may already have in-house capability, while smaller clubs may lack resources to adopt
Methodological Weakness and Evidence Problem	Overfitting, poor validation design, data leakage, weak interpretability, and insufficient evidence that products improve real football decisions	Product / Club / Market	Davis et al. (2024); Robertson et al. (2024); Rebelo et al. (2023); Benson et al. (2020)	Trust deficit in the market; entrepreneurs must show rigorous validation, transparency, and practical usefulness rather than just technical sophistication
Ethical and AI Governance Concerns	Privacy, fairness, transparency, accountability, unclear responsibility for AI-driven decisions, and weak reporting of AI risks	Cross-Level	Kim et al. (2025); Elstak et al. (2024); Qi et al. (2024)	Adoption may stall unless ventures can explain models, protect sensitive data, and demonstrate responsible governance

Organisational Resistance and Conservative Culture	Clubs and football institutions can be risk-averse, slow to change, and hesitant to integrate unfamiliar tools into established routines	Club / Federation	Qi et al. (2024); Samuel et al. (2020); Hammerschmidt et al. (2024)	Even strong products need internal champions, phased implementation, and change-management support
Ecosystem and Legitimacy Barriers	New ventures often lack trusted relationships, legitimacy, and institutional backing needed to secure pilots and commercial entry	Ecosystem	Ratten & Thompson (2020); Hammerschmidt et al. (2024)	Market entry depends heavily on network-building, credibility, and collaboration with established actors
Integrity Risks Linked to Betting Technologies	Match-fixing risks, information asymmetries, and reputational threats tied to betting-related technologies in football	Industry / Governance	Forrest (2012); Stadler Blank et al. (2021)	Ventures operating near betting/data markets face additional scrutiny around integrity, monitoring, and reputational risk
Implementation and System Fit	New technologies often do not fit existing workflows, stakeholder roles, or institutional processes inside clubs and leagues	Club / League / Federation	Samuel et al. (2020); Beiderbeck et al. (2023)	Commercial success depends not only on invention, but on how easily the product fits real football operations

Summary of barriers noted in literature review. Table created by the authors

Appendix B. Thematic Analysis

Organization 1

Participant	Quotes	Initial Code	Theme
Organization 1	"Our main customers are recreational players who either do sports themselves, are fans or just watch football from TV"	Broad consumer base beyond elite football	Current innovation trends
Organization 1	"We ask feedback from our customers, follow trends in the industry and also try to be creative ourselves"	Demand-led innovation process	Entrepreneurial practices & barriers
Organization 1	"Customers who try to abuse our sportsbook and lower level football has match fixing cases"	Integrity risks as market barrier	Entrepreneurial practices & barriers
Organization 1	"Match information reaches fans first before our trading teams"	Information asymmetry as structural challenge	Technology adoption dynamics
Organization 1	"Football federations and leagues are very cooperative — they sign contracts with live streaming providers"	Governing bodies as commercial enablers	Technology adoption dynamics
Organization 1	"On match fixing cases information is shared well between operators, federations, clubs, regulatory bodies and police"	Cross-institutional collaboration on integrity	Technology adoption dynamics
Organization 1	"Live data is one topic where federations, leagues and streaming providers can level up"	Live data infrastructure as growth opportunity	Future opportunities
Organization 1	"Our players want to see more of it while watching live streams"	Fan demand driving product development	Future opportunities

Organization 2

Participant	Raw Extract	Initial Code	Theme
Organization 2	"Tactical data combines event and tracking data — it captures off-the-ball behaviour along with on-the-ball actions to understand the relationship of the player within team dynamics"	Integrated tactical data as next frontier	Current innovation trends
Organization 2	"Isolated events do not provide enough information to truly understand a player or team's performance"	Limitations of traditional event data	Entrepreneurial practices & barriers
Organization 2	"Our staff is made up of both football and technology experts combined with discussions we are having with professional teams to inform our roadmap"	Domain expertise and club proximity driving innovation	Entrepreneurial practices & barriers
Organization 2	"Our semantic layer ensures analysts can use company data in a format that is right for them, making sure we integrate with existing workflows"	Workflow integration as product design principle	Entrepreneurial practices & barriers
Organization 2	"Football clubs do not buy services and technology all year round — there is a small window when new services are procured"	Seasonal procurement cycles as adoption barrier	Technology adoption dynamics
Organization 2	"The foothold gained by larger organisations who have built over the past 15 years is significant"	Incumbent advantage limiting new entrant diffusion	Technology adoption dynamics
Organization 2	"The allowing of technology pitchside on the bench was significant for those offering a live match analysis tool"	Regulatory permission as adoption enabler	Technology adoption dynamics
Organization 2	"Access to technology, tools and resources will play a key role in levelling the playing field globally, whereby we could come into a World Cup with 15+ teams having a realistic opportunity"	Technology democratisation as global development opportunity	Future opportunities

Organization 3

Participant	Raw Extract	Initial Code	Theme
Organization 3	"We are moving from data collection to predictive analytics — injury forecasting and tactical simulations"	Shift from descriptive to predictive technology	Current innovation trends
Organization 3	"The shift is toward the 'Invisible Wearable' — sensors embedded in the fabric and the ball"	Hardware miniaturisation as next wave	Current innovation trends
Organization 3	"Startups are now our R&D departments... we provide the standards and let them fill the space"	Ecosystem co-innovation between incumbents and startups	Entrepreneurial practices & barriers
Organization 3	"Missing the pre-season procurement window means waiting another year for a sale"	Seasonal buying cycles as structural market barrier	Entrepreneurial practices & barriers
Organization 3	If a tool isn't intuitive enough for a coach to grasp quickly, it simply won't get used.	Usability as critical adoption threshold	Technology adoption dynamics
Organization 3	"Culture is the 'Innovation Killer'... coaches still trust their own eye over data-driven tools."	Cultural resistance limiting technology diffusion	Technology adoption dynamics
Organization 3	"IFAB rule changes act as catalysts — a new market for specific tech opens overnight"	Regulation as both barrier and market creator	Technology adoption dynamics
Organization 3	"We need interoperability mandates — it should be illegal to lock data into silos"	Data fragmentation as ecosystem-level barrier	Future opportunities
Organization 3	"Tracking a player from age 8 to the pros via a 'Data Passport' is a billion-dollar gap"	Longitudinal player data as untapped commercial opportunity	Future opportunities

Organization 4.

Participant	Raw Extract	Initial Code	Theme
Organization 4	"We help rights holders and brands understand social media, understand the performance of their social media channels, and understand basically what's the value being generated"	Social media analytics as core product for rights holders	Current innovation trends
Organization 4	"Fan engagement in terms of understanding what's the value that you can bring and can generate from fans in all the touchpoints"	Fan engagement as dominant commercial innovation area	Current innovation trends
Organization 4	"We thought the current players in the market were not doing a good enough job… the rationale of there has to be a better way to do this"	Market dissatisfaction as entrepreneurial motivation	Entrepreneurial practices & barriers
Organization 4	"Clubs are so unsophisticated that they don't use it… we can have a great product, but then you have nobody on the other side to kind of use it and champion it"	Client unsophistication as adoption barrier	Entrepreneurial practices & barriers
Organization 4	"It's an industry that relies a lot on third party. There's very little innovation coming from the clubs themselves"	Third-party dependency for innovation	Technology adoption dynamics
Organization 4	"Some of them have tech hubs… my perception is it's pretty much a brand play… they do very little beyond offering a space where startups can test their product"	Club incubators as branding rather than genuine innovation	Technology adoption dynamics
Organization 4	"Going below a certain level doesn't make any sense because there's just no money whatsoever to invest on third party tools"	Financial threshold limiting addressable market	Technology adoption dynamics
Organization 4	"These teams still don't fully understand that the majority of their consumers and fans are not in their local markets anymore"	Globalization of fan base as untapped commercial potential	Future opportunities
Organization 4	"I'm on a high AI train. I believe it's going to change a lot of stuff… a lot of products based on AI"	AI as transformative force for future product development	Future opportunities

Appendix C. Process roadmap

Stage	What happens in football tech entrepreneurship	Main friction / risk	What moves the process forward
1. Opportunity recognition	Ventures identify unmet needs in club operations, performance analysis, fan engagement, live-stream products, betting-related systems, or lower-tier football. In your thesis this comes from customer feedback, domain expertise, market trends, and observing friction in football practice.	Weak ecosystem access, poor understanding of real football needs, building solutions that are technically interesting but not context-relevant.	Close contact with practitioners, football-specific expertise, demand-led product discovery, and identifying concrete pain points.
2. Data access and ecosystem entry	The venture tries to access the data, environments, and relationships needed to build and test its product. This includes club, federation, tracking, event, biometric, or live-data access.	Fragmented or closed data, lack of standardisation, commercial restrictions, and difficulty entering trusted networks.	Data-sharing agreements, federation/league infrastructure, interoperable systems, and trusted partnerships.
3. Product development and translation	Raw technological capability is turned into an actual football product such as explainable analytics, tactical-data tools, wearables, commercial fan systems, or integrity tools.	Building something sophisticated that does not match football workflows, decision routines, or user capability.	Product design that translates technical outputs into usable insight, semantic layers, API-first systems, and workflow-compatible tools.
4. Validation and trust-building	The venture has to prove that the product works in real football settings and produces interpretable, decision-relevant value.	Weak evidence, overclaiming, poor validation, low interpretability, and trust deficits created by past vendor failures.	Rigorous validation, transparency, explainability, and practical usefulness rather than just technical sophistication.

5. Governance and organisational fit	Clubs, federations, and other actors evaluate whether the product is acceptable within real operating conditions. This includes privacy, fairness, accountability, procurement timing, and integration with existing routines.	Ethical concerns, unclear data rights, organisational resistance, seasonal procurement cycles, incumbent advantage, and poor system fit.	Clear governance frameworks, player-data rights, interoperability standards, internal champions, phased implementation, and products that fit existing workflows.
6. Adoption and pilot use	The product is trialled or adopted by clubs, federations, or adjacent actors like streaming or betting operators. At this point, proof-of-value has to survive real football conditions.	Conservative club culture, lack of implementation capability, low willingness to switch, and difficulty fitting into day-to-day operations.	Easy onboarding, modular products, plug-in style integration, procurement-friendly design, and support during implementation.
7. Scaling across the ecosystem	The venture expands beyond a single pilot, club, or niche segment into broader football markets such as elite clubs, lower-tier clubs, federations, or fan-facing mass markets.	Elite clubs already have internal capacity, lower-tier clubs lacking budget, fragmented infrastructure, and sector-wide trust barriers.	Lower-tier SaaS, modular pricing, federation-level coordination, interoperable infrastructure, and broader consumer-facing products such as live-data and streaming-linked services.

Resümee

Tehnoloogiline ettevõtlus jalgpallis: praeguste suundumuste uurimine ja spordiala innovatsiooniprobleemide lahendamine
Khalid Ismayilli, Ismat Mammadov

Käesolev magistritöö käsitleb tehnoloogilist ettevõtlust jalgpallis, keskendudes innovatsioonitrendidele, ökosüsteemis tegutsevate tehnoloogiaettevõtjate väljakutsetele ning tulevikuvõimalustele. Uurimus tugineb kvalitatiivsele, uurimuslikule uurimisdisainile, kombineerides kirjanduse ülevaate ning poolstruktureeritud intervjuud nelja professionaaliga, kes esindavad jalgpalli tehnoloogiaökosüsteemis struktuuriliselt erinevaid rolle.

Tulemused osutavad, et jalgpalli iseloomustab ulatuslik kommertsialiseerumise ja andmepõhise innovatsiooni staadium, kus tehisintellekt, andmeanalüütika, kantavad monitoorimistehnoloogiad ning digitaalne fännide kaasamine moodustavad ettevõtlusaktiivsuse keskse tuuma. Samas ilmneb neli omavahel seotud struktuurset väljakutset: piiratud ligipääs ja killustunud andmehaldus, finantsiline ebavõrdsus eliit- ja madalama taseme klubide vahel, nõrk empiiriline tõendusbaas koos usaldusdefitsiidiga ning organisatsiooniline vastupanu koos eetiliste dilemmadega.

Lisaks tuvastab uurimus mitmed tulevikusuunad, sealhulgas seletatav tehisintellekt, kulutõhusad lahendused madalama taseme klubidele, liigatasandi andmetaristu, vastutustundlik andmehaldus ning fännianalüütika arendused. Töö pakub välja protsessipõhise teekaardi, käsitledes tehnoloogilist ettevõtlust jalgpallis etapiviisilise trajektoorina, mis kulgeb võimaluse tuvastamisest valideerimise, juhtimisraamistikega kooskõlastamise ning skaleerimiseni.

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