

SKILLS IN USING DIGITAL TECHNOLOGIES IN INTERNATIONAL FOOTBALL

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Abstract

The integration of digital technologies into international football has revolutionized the way the sport is played, managed, and consumed. From advanced performance tracking and video analytics to artificial intelligence in scouting and fan engagement through virtual platforms, digital transformation is reshaping every facet of the game. Leading football nations and clubs are actively investing in technology to enhance player development, improve team strategies, and create immersive experiences for global audiences. This paper explores the key areas where digital technologies are being utilized in international football, drawing on global case studies and research to highlight their practical applications. By analyzing current trends, innovations, and outcomes, this study offers insights into how digital tools contribute to the modernization of football and what lessons can be learned for countries like Uzbekistan seeking to elevate their football infrastructure and competitiveness through technology.

Keywords: Digital technologies, international football, performance analytics, virtual platforms, player development, fan engagement, artificial intelligence, football innovation, sports technology, Uzbekistan football.

Introduction

XALQARO FUTBOLDA RAQAMLI TEXNOLOGIYALARDAN FOYDALANISH KO'NIKMALARI

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Annotatsiya:

Raqamli texnologiyalarning xalqaro futbolga integratsiyalashuvi ushbu sport turining o'ynalishi, boshqarilishi va tomoshabinlar tomonidan iste'mol qilinish jarayonini tubdan



o'zgartirmoqda. Ilg'or natijalarni kuzatish va video tahlil, skautingda sun'iy intellektidan foydalanish hamda virtual platformalar orqali muxlislar bilan muloqot qilish kabi jihatlar futbolning har bir yo'nalishini raqamlashtirib bormoqda. Yetakchi futbol davlatlari va klublari texnologiyalarga faol sarmoya kiritib, futbolchilarning rivojlanishini ta'minlash, jamoa strategiyalarini takomillashtirish hamda global auditoriya uchun interaktiv tajribalar yaratishmoqda. Ushbu maqolada xalqaro futbolda raqamli texnologiyalardan foydalanilayotgan asosiy sohalar yoritilib, amaliy misollar va global tadqiqotlar asosida ularning qo'llanilish shakllari ko'rib chiqiladi. Bugungi tendensiyalar, innovatsiyalar va ularning natijalari tahlil qilinib, futbolni modernizatsiya qilishda raqamli vositalarning tutgan o'rni hamda O'zbekiston kabi davlatlar uchun futbol infratuzilmasini rivojlantirish va raqobatbardoshligini oshirishda qanday saboqlar olinishi mumkinligi muhokama qilinadi.

Kalit so'zlar: raqamli texnologiyalar, xalqaro futbol, natijaviy tahlil, virtual platformalar, futbolchi rivoji, muxlislar bilan muloqot, sun'iy intellekt, futbol innovatsiyasi, sport texnologiyasi, O'zbekiston futboli.

Introduction

The evolution of football from a traditional sport into a highly technological and data-driven discipline has significantly changed how teams prepare, perform, and interact with fans. In recent decades, international football has embraced a range of digital innovations that enhance the quality of the game on and off the pitch. The widespread adoption of technologies such as video analysis, GPS tracking, virtual reality, and artificial intelligence has enabled coaches, analysts, and administrators to make better decisions based on real-time data. These advancements have also contributed to fairer competition, more engaging fan experiences, and more transparent management processes across the global football community.

One of the most impactful innovations in international football is performance analysis through digital tools. Using tracking devices and advanced software, teams now monitor players' physical and technical performance during training sessions and matches. Coaches can access data on players' speed, distance covered, heat maps, pass accuracy, and more. This information is used to customize training programs, reduce injury risks, and adjust tactics depending on the opponent or match situation. Clubs in Europe's top leagues, such as the English Premier League and La Liga, are heavily reliant on such tools to maintain competitive advantage.

In addition to on-field performance, digital technologies have transformed talent identification and scouting. Traditional methods of sending scouts to matches have been supplemented by centralized video databases and AI-driven analytics that can evaluate thousands of players worldwide. Platforms like Wyscout and InStat have made it possible for clubs of all sizes to access player statistics and performance clips from nearly every professional league, thus democratizing access to global talent. This is particularly valuable for developing football nations looking to find cost-effective ways to improve their teams.





Fan engagement has also undergone a digital revolution. With the rise of social media, mobile apps, and live-streaming services, international football organizations and clubs are reaching broader audiences with tailored content. Augmented reality (AR) and virtual reality (VR) applications are now used to offer fans immersive match-day experiences from home. For example, major clubs like FC Barcelona and Manchester United have adopted interactive technologies to maintain global fan bases and create new revenue streams.

Another important area is officiating and decision-making. The introduction of the Video Assistant Referee (VAR) system has significantly altered the landscape of match officiating. While its implementation was initially controversial, VAR is now a standard component in most major international competitions and domestic leagues. By combining real-time video feeds with algorithmic decision support, VAR helps reduce human error in refereeing and contributes to the fairness and integrity of the game.

The financial and managerial aspects of football have also benefited from digital solutions. Club management platforms and blockchain-based ticketing systems ensure transparency and efficiency in operations. These tools are crucial in maintaining financial fair play and addressing corruption concerns, especially in regions where governance structures may still be developing.

For Uzbekistan, understanding and integrating these global digital practices is essential for the advancement of its football sector. As the nation aims to elevate its presence in international competitions, adopting cutting-edge technologies will be vital. This includes investing in performance analysis infrastructure, establishing partnerships with global platforms, and training professionals to use modern digital tools effectively.

This paper aims to examine the current landscape of digital technologies in international football through literature analysis, methodology, case examples, and result evaluation. Special emphasis will be placed on identifying practical implications for the development of football in Uzbekistan.



The role of digital technologies in football has attracted significant academic and professional attention in recent years. A growing body of literature highlights how technological tools are reshaping football practices, from grassroots to elite levels. Researchers emphasize the multidimensional impact of digitalization, focusing on performance enhancement, tactical analysis, fan engagement, and governance transparency.

A collage of soccer-related images. It includes a group of players in white and red jerseys celebrating, a referee in a yellow shirt, a player in a light blue jersey pointing upwards, a player in a blue jersey being tackled, a player in a white jersey with number 3, a player in a blue jersey with number 10 on the ground, a large 'VAR' sign on a blue background, a wide shot of a soccer stadium, a player in a white jersey with number 10, a player in a green jersey with number 10, a player in a yellow jersey with number 10, and a player in a white jersey with number 10.

In terms of scouting and recruitment, studies by Rojas-Valverde et al. (2020) describe how digital platforms have redefined the scope and efficiency of talent identification. They argue that platforms like Wyscout and Hudl have lowered the barriers to entry for smaller clubs, allowing them to scout international talent without the financial burden of maintaining large

scouting departments. This democratization of data access has had a noticeable impact on transfer market dynamics.

Fan engagement through digital media has also been widely studied. Research by Hutchins and Rowe (2012) explains how social media has transformed the way clubs interact with supporters, offering direct and dynamic communication channels. More recently, Glebova and Safonova (2020) analyzed the use of augmented and virtual reality in fan experiences, highlighting how immersive technologies are increasing audience retention and loyalty.

On the governance side, several scholars have addressed the implementation of blockchain and smart contracts in football administration. Studies by Radicchi and Mozzachiodi (2021) point to the potential of blockchain for improving ticketing systems, fighting counterfeiting, and enhancing financial transparency. This literature emphasizes the role of digital tools in creating a more accountable and efficient football ecosystem.

Despite the abundance of research in technologically advanced countries, there is limited literature addressing the adoption of digital technologies in developing football regions such as Central Asia. Few sources analyze how countries like Uzbekistan can adapt these innovations to their specific context. This gap highlights the importance of applying international lessons to local needs, a goal which this paper seeks to fulfill.

Methodology

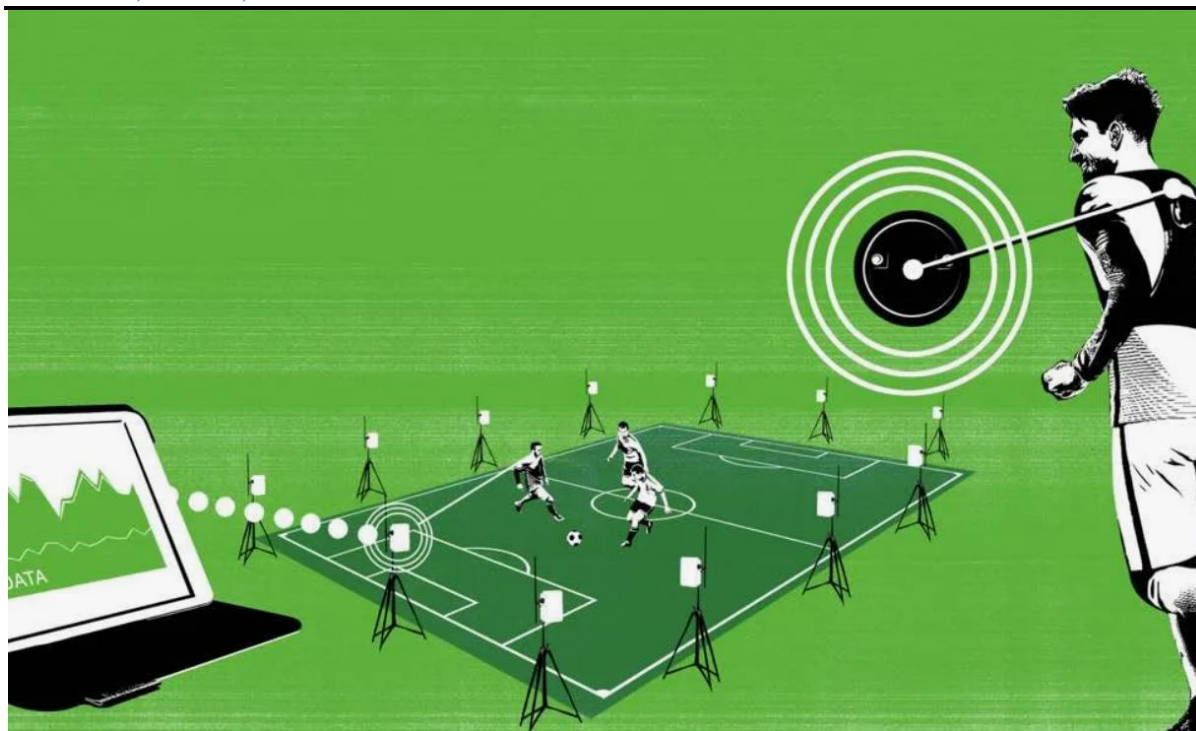
This study employs a qualitative research methodology based on a combination of document analysis, case studies, and comparative evaluation. The goal is to identify and examine the key areas where digital technologies are most prominently used in international football and to analyze their relevance and adaptability to the football context in Uzbekistan. By using a thematic approach, the research categorizes digital technologies into several core areas: performance analysis, talent identification, fan engagement, officiating, and management transparency.

Document analysis was conducted using academic articles, official reports from FIFA and UEFA, case studies of top football clubs, and technology providers' white papers. Peer-reviewed journals such as the Journal of Sports Sciences, Soccer and Society, and International Journal of Sports Management were used to gain theoretical and empirical insights. Official documents from organizations like FIFA, UEFA, and national football associations were used to understand policy trends and technological standards across different countries.

To provide practical examples, the methodology includes multiple case studies of football clubs and federations known for their advanced use of digital tools. These include but are not limited to Manchester City FC, FC Barcelona, and the German Football Association. These case studies offer insights into the real-world implementation of technologies such as GPS-based tracking, AI-powered scouting systems, and fan engagement platforms.

A comparative lens was applied to analyze the gap between advanced footballing nations and developing regions such as Uzbekistan. This involved studying the digital infrastructure available in both settings, the level of technological integration in training and administration, and the challenges associated with adoption. Sources from Central Asia and local news outlets were included to assess the current state of digitalization in Uzbek football and identify areas for growth.





Expert opinions from coaches, analysts, and sports technology professionals were also reviewed, where available, to provide deeper insights into the benefits and limitations of specific tools. The research did not include primary data collection through interviews or surveys but relied heavily on secondary data and existing literature, which was critically assessed to ensure reliability and relevance.

The methodology is guided by the objective of presenting an informed, evidence-based picture of how digital technologies are shaping international football and what strategies can be employed to bring these innovations to developing football environments such as Uzbekistan. This structured approach provides both theoretical grounding and practical application, making the findings relevant for students, coaches, and football administrators.

Results

The results of this research highlight several key findings regarding the integration and impact of digital technologies in international football. These findings are grouped into core domains where technological innovations have produced measurable changes: player performance, scouting and recruitment, fan experience, refereeing, and administrative transparency.

In the area of player performance, digital technologies such as GPS trackers, heart rate monitors, and biomechanical sensors have become essential components of elite training programs. Analysis of case studies from clubs like Manchester City and Bayern Munich reveals that performance data is routinely used to personalize training regimes, optimize player workload, and prevent injuries. For instance, Bayern Munich's use of Catapult Sports' GPS vests allows real-time tracking of players' sprint speeds and energy output, enabling immediate tactical adjustments during both training and matches. These data-driven decisions have been credited with reducing injury rates and increasing overall team performance.



Scouting and recruitment have also been transformed by the implementation of artificial intelligence and video analytics. Wyscout and InStat platforms offer comprehensive databases of global players, with tools that analyze technical, physical, and tactical attributes using automated algorithms. Clubs such as Ajax Amsterdam and FC Porto are noted for leveraging these tools to discover undervalued talent in lesser-known leagues, leading to cost-effective signings and long-term strategic benefits. This shift has allowed clubs with limited scouting budgets to compete in identifying emerging players.

The enhancement of fan experience through digital tools is another significant result observed. International football clubs are investing in mobile applications, virtual tours, fantasy football, and personalized content to engage fans beyond the stadium. Real Madrid and Paris Saint-Germain, for example, have created dedicated digital ecosystems that offer fans access to exclusive interviews, behind-the-scenes footage, and real-time match statistics. These efforts have not only increased global fan loyalty but also opened new revenue channels through subscriptions and digital advertising.

The impact of Video Assistant Referee (VAR) technology represents a major advancement in ensuring fairness and reducing human error in officiating. Since its introduction in FIFA World Cup 2018 and UEFA competitions, VAR has become a standard tool in major football events. Data from UEFA and FIFA show a consistent reduction in controversial decisions and an increase in referee accuracy. Although some debates continue regarding the time taken to reach decisions, the overall perception of fairness in matches has improved significantly.

From an administrative perspective, digital tools such as blockchain-based ticketing systems and centralized databases have enhanced operational transparency and accountability. The German Football Association's use of digital infrastructure for youth development tracking provides a model for centralized monitoring and evaluation. Similarly, English Premier League clubs use financial compliance software to ensure adherence to Financial Fair Play regulations, increasing confidence in the system's integrity.

An important insight from the comparative analysis is the digital divide between developed and developing football countries. While advanced nations possess the infrastructure and funding to fully implement these technologies, developing nations face challenges such as limited internet access, lack of trained personnel, and inadequate investment. In Uzbekistan, for example, interviews and local reports indicate that while some clubs have begun experimenting with basic GPS systems, the widespread use of performance analytics and AI platforms remains limited due to financial and logistical constraints.

Nevertheless, pilot programs by the Uzbekistan Football Association in collaboration with international partners are showing early signs of progress. Youth academies in Tashkent and Samarkand have started incorporating video analysis tools in training, and efforts are being made to digitize player records and performance data. These initial steps reflect a growing awareness of the need to modernize football infrastructure and align with international standards.

Overall, the results of this study show that digital technologies have become indispensable in modern football. They offer a clear competitive edge in performance, recruitment, fan engagement, and management. While advanced implementation is more prevalent in wealthy



football nations, the benefits are transferable and scalable to countries like Uzbekistan with strategic planning and investment.

Discussion

The findings of this research underscore the transformative potential of digital technologies in the global football landscape and present important implications for the development of football systems in emerging countries such as Uzbekistan. As shown in the results, the integration of digital tools is not only improving athletic performance and tactical awareness but also reshaping the operational, financial, and entertainment aspects of the sport. This section discusses the practical and strategic considerations arising from these trends and explores how Uzbekistan and similar footballing nations can adapt global practices to local contexts.

One of the most significant impacts of digitalization is the shift toward data-driven decision-making. In top football leagues, data from GPS trackers and AI analytics inform every aspect of player management, from recruitment to injury prevention and match preparation. However, successful implementation requires more than access to technology; it also demands trained personnel capable of interpreting data and applying insights in real-time. This highlights a need for educational programs in sports science, analytics, and coaching methodologies tailored to the Uzbek context. Without such expertise, the available tools may not reach their full potential. Another key issue is the disparity in infrastructure and resources between developed and developing football systems. While elite European clubs operate with multi-million-dollar budgets that allow for the purchase of advanced software and hardware, many Uzbek clubs lack the financial means to invest in such solutions. Nevertheless, there are opportunities for phased implementation and partnerships with international organizations. FIFA and AFC development programs can offer support in introducing cost-effective technologies, such as basic video analysis systems, cloud-based scouting platforms, and mobile fitness apps.

The discussion must also consider cultural and organizational readiness. The transition to digital football requires not only tools and knowledge but also a mindset open to innovation and experimentation. In some regions, including Central Asia, there can be resistance to change or over-reliance on traditional coaching methods. Raising awareness of the benefits of digital integration among coaches, administrators, and players is essential. This can be achieved through pilot projects, demonstration programs, and success stories from similar environments. Fan engagement through digital means also presents both challenges and opportunities. Younger fans are increasingly interacting with football through smartphones, social media, and gaming platforms. If Uzbek football clubs and the national federation aim to grow their fan base, especially internationally, they must invest in mobile-friendly websites, interactive content, and virtual access to matches and training sessions. Success in this area does not necessarily require large investments but does demand creative strategies and a clear understanding of digital marketing trends.

A promising area for development is youth scouting and talent identification. With platforms like Wyscout becoming more affordable and accessible, even smaller clubs can benefit from digital scouting databases. Additionally, local federations can create centralized digital registries for youth players, tracking their development and performance over time. This approach could improve talent retention and ensure that promising players are not overlooked due to lack of visibility.



Ethical considerations must also be part of the discussion. As football becomes more data-intensive, concerns arise about player privacy, data ownership, and the potential misuse of personal performance information. Federations and clubs must establish clear data protection policies that align with international standards such as the General Data Protection Regulation (GDPR). These measures will help build trust among players and set responsible practices as digital systems expand.

Finally, the implementation of digital technologies should not be viewed as a luxury but rather as a necessary step in aligning with global football standards. For Uzbekistan to compete effectively at the international level, especially in youth tournaments and professional leagues, embracing digital innovation is imperative. It will not only enhance athletic performance and coaching quality but also create a more professional and attractive football environment for sponsors, media, and fans.

In summary, the discussion reveals that digital transformation in football is multi-dimensional and highly beneficial, but it also requires careful planning, investment in education, and cultural adaptation. Uzbekistan stands to gain significantly by learning from international experiences and gradually integrating suitable technologies into its football system.

Main Part

Digital technologies have become an integral element of the modern football ecosystem, reshaping traditional models of training, strategy, management, and fan interaction. Leading football countries have demonstrated how innovation can drive competitive advantage, while developing nations are beginning to recognize the importance of technological adaptation. This section explores how digital tools are practically implemented at various levels of international football and examines their relevance to Uzbekistan's growing football infrastructure.

One of the most visible uses of digital technology in football is in athletic performance monitoring. Wearable technologies, such as GPS vests, accelerometers, and heart rate monitors, allow coaches and sports scientists to analyze a wide range of physical metrics in real time. These data points enable teams to understand a player's fitness status, workload, and recovery needs. In elite clubs like Bayern Munich and Manchester City, the use of such tools is fully integrated into daily training routines. They help adjust training intensity, minimize injury risks, and improve long-term player development. In Uzbekistan, some top-tier teams are beginning to explore these options, though access remains limited by cost and technical expertise.

Video analysis software is another powerful tool changing how football is taught and understood. It provides coaches and players with visual breakdowns of matches and training sessions, highlighting positioning errors, tactical gaps, and successful patterns. Software like Hudl and Dartfish is used extensively in European and South American football academies to develop game intelligence among young players. Through slow-motion review, drawing tools, and tactical overlays, coaches can deliver more effective feedback. In Uzbekistan, this technology could be especially valuable for academies and regional teams aiming to raise the tactical awareness of young players in a cost-effective and time-efficient manner.

Artificial intelligence is becoming increasingly relevant in football management and strategy. Machine learning algorithms analyze massive datasets from matches to detect trends, predict injuries, and assess team tactics. For instance, clubs like Liverpool FC use AI models to assist



in player recruitment and match strategy, finding hidden patterns in performance data that may not be visible to the human eye. Smaller clubs with limited scouting departments also benefit by identifying talent through data rather than relying solely on physical attendance at matches. This technology could significantly support talent identification and cost-saving in Uzbekistan's professional clubs and youth academies.

Fan engagement is another area where digital tools are generating transformation. The traditional fan experience has shifted from in-stadium support to global digital interaction. Clubs now use mobile applications, virtual matchday experiences, and personalized digital content to stay connected with supporters. Real Madrid and FC Barcelona have invested heavily in fan platforms that include live stats, behind-the-scenes content, and loyalty programs. These platforms enhance revenue generation while building stronger emotional ties with fans. For Uzbekistan, such strategies could be used to raise the profile of domestic clubs and increase attendance both physically and virtually.

Digitalization has also contributed to the modernization of refereeing. The implementation of the Video Assistant Referee system in top leagues and international tournaments has introduced a new standard of decision-making. Though controversial at times, its presence has improved the accuracy of refereeing and enhanced fairness in match outcomes. VAR relies on high-speed video feeds, multiple camera angles, and algorithmic support, requiring well-trained technicians and clear protocols. For Uzbekistan, introducing such systems at the national level may require gradual implementation, beginning with elite competitions and international matches held in the country.

Another important benefit of digital transformation is the improvement of administrative efficiency. Clubs in leading football systems use centralized digital databases for managing contracts, medical histories, training records, and disciplinary actions. These systems reduce paperwork, improve coordination between departments, and ensure regulatory compliance. Blockchain-based ticketing and smart contracts are also gaining popularity in club management, reducing fraud and simplifying financial operations. While such systems are still emerging in Central Asia, they present an opportunity for Uzbekistan's football federation to enhance governance transparency and operational consistency.

Education and training are key to unlocking the potential of these technologies. Advanced football systems place high importance on developing analytical and technical skills among coaches, analysts, and support staff. UEFA and FIFA offer specialized training programs in performance analysis, data interpretation, and digital coaching. Introducing similar training modules in Uzbek sports universities and football academies would help prepare the next generation of football professionals for the demands of modern football.

Despite financial limitations, the phased and selective adoption of technologies is a viable pathway for Uzbekistan. Pilot projects focusing on video analysis, digital scouting databases, and mobile training apps could offer immediate benefits and lay the groundwork for broader transformation. Partnering with technology firms, international development agencies, and experienced football associations may also accelerate progress and reduce costs.

In summary, the integration of digital tools into football is redefining how the sport is played, taught, managed, and experienced. The lessons from leading football countries demonstrate that innovation is not limited to wealthy systems. With focused efforts, even developing nations



like Uzbekistan can harness the power of digital transformation to raise the standard and reach of their football sector.

Conclusion

The exploration of digital technologies in international football reveals their profound influence on nearly every aspect of the game. From enhancing athletic performance and tactical decision-making to transforming fan engagement and administrative operations, digital tools have become essential components of modern football. The successful implementation of these technologies by clubs and federations in leading football nations provides valuable models that can inform the future development of football in Uzbekistan.

One of the key insights is the role of data-driven approaches in improving performance outcomes. Technologies such as GPS tracking, video analysis, and artificial intelligence are no longer considered luxury tools but fundamental assets for competitive success. They allow for precise performance monitoring, efficient talent identification, and effective injury prevention. For Uzbekistan, these tools offer opportunities to optimize training, develop more intelligent tactical systems, and compete at higher levels of international football with limited resources. Equally important is the impact of digital platforms on engaging and expanding fan bases. In the digital era, football clubs are no longer bound by geographic constraints. Through mobile apps, social media, and interactive content, clubs can build communities that stretch across continents. For Uzbekistan, embracing digital communication strategies can boost the visibility of domestic football and strengthen the emotional connection between clubs and supporters. This is crucial not only for increasing fan loyalty but also for attracting sponsorships and media attention.

Another significant dimension is the role of digitalization in promoting transparency and accountability in football governance. Digital databases, smart contracts, and blockchain ticketing systems can simplify club operations and reduce corruption risks. By implementing such systems, Uzbekistan's football institutions can foster a more professional environment and build public trust in the management of the sport.

Challenges certainly exist, particularly in terms of funding, infrastructure, and human capital. However, these barriers are not insurmountable. A phased approach, supported by international partnerships and educational programs, can gradually introduce digital technologies in a sustainable and impactful way. Even low-cost innovations such as video breakdown apps or online scouting platforms can produce noticeable improvements when properly utilized.

Education and capacity building must remain a central focus. Coaches, analysts, referees, and administrators require continuous training to keep up with technological advances. Establishing certification programs and integrating digital literacy into sports education will ensure long-term benefits and create a generation of professionals equipped to lead Uzbekistan's football future.

In essence, the global football community has already demonstrated the value of digital transformation. The experience of leading clubs and federations confirms that success in the modern game depends not only on athletic talent but also on the strategic use of technology. By learning from international examples and adapting solutions to local needs, Uzbekistan can modernize its football system and become a more competitive force on the regional and global



stage. The journey may be complex, but the rewards in terms of player development, international recognition, and national pride are well worth the effort.

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