

Increasing User Engagement in Online FIA WRC Broadcasts

How can Interactive Technologies be Leveraged to
Increase User Engagement in the FIA World Rally
Championship Online Broadcasting Platform?

Christophe Berbec

Berch730@gmail.com

Abstract

This thesis explores how interactive technologies can be leveraged to increase user engagement in the FIA World Rally Championship (WRC) online platform. Through a comparative analysis of WRC and eSports broadcasting, the study examines the potential of interactive innovations in enhancing fan experience. Using ethnographic methods and user experience evaluations, the research identifies key fan needs and preferences, leading to the development of speculative low-, mid-, and high-cost solutions for interactive broadcasts. Prototypes are created and refined based on user feedback, focusing on features like on-demand camera angles, customizable interfaces, and live data overlays. The findings suggest that while advanced technologies offer significant engagement potential, their implementation must balance cost, accessibility, and user demands. This work provides a roadmap for integrating interactive media into sports broadcasting, aiming to enrich the WRC viewing experience and attract a broader audience.

Acknowledgements

I want to thank all candidates for their time, effort, and proactive participation, without which this paper would not be possible. I also want to thank my thesis supervisor David Kadish for his time, insight, and helpfulness.

Table of Contents

1	Introduction	5
1.1	Research Questions	6
2	Background	7
2.1	Introduction to the FIA World Rally Championship	7
2.2	Evolution and Impact of Technologies in Sports Broadcasting	9
3	Methodology	10
3.1	Overarching Methodology	10
3.2	Ethnographic Studies for Fan Behaviour	11
3.3	Methodologies for Fan Engagement Studies	12
3.4	User Experience Evaluation	13
3.5	Prototyping Interactive Technologies	14
3.6	Speculative Design for Future Fan Engagement	16
4	Design Process	17
4.1	Introduction	17
4.2	Discover: Identifying Fan Needs	17
4.3	Define: Framing the Engagement	27
4.4	Develop: Creating Solutions through Prototyping	29
4.5	Deliver: Implementation and Testing Solution	32
5	Discussion	37
5.1	Interpreting the Findings	37
5.2	Answering the Research Questions	37
6	Contributions	38
7	Conclusions	40
8	References	42

1 Introduction

In the evolving landscape of global sports, the quest for deeper fan engagement has propelled the adoption of new media technologies that reshape how audiences interact with sporting events. The World Rally Championship (WRC) and eSports, two vastly different arenas, offer unique vantage points to examine this transformation. The former, steeped in the rich tradition of motorsports, contrasts sharply with the digital-native realm of eSports, yet both are bound by the common challenge of enhancing fan experience amidst the digital revolution.

This thesis seeks to explore the relationship between technology and fan engagement, investigating how innovations in interactive media are leveraged to foster more immersive experiences. The rapid integration of augmented reality (AR), virtual reality (VR), and second-screen solutions has not only expanded the boundaries of how fans engage with sports content but has also posed critical questions about the effectiveness of these technologies in sustaining interest and enhancing the fan experience.

The main approach of this study lies in its comparative analysis, drawing parallels between the traditional motorsports fan engagement exemplified by WRC and the inherently digital engagement found in eSports. This comparative analysis allows for a comprehensive understanding of how traditional sports can learn from digital-first disciplines, particularly in terms of technological adoption and fan engagement strategies. The research is guided by the following questions: How do interactive technologies alter fan engagement in WRC and eSports? What can these two distinct fields learn from each other to drive future innovations?

This paper's research process acknowledges the importance of ethical design, particularly concerning data privacy, the impact of immersive technologies, and the socio-economic implications of digital engagement strategies. By ensuring all data is collected following General Data Protection Regulations (GDPR), this study aims to ensure that the research in fan engagement is responsibly conducted, promoting a sustainable future for sports viewership.

The following chapters will delve deeper into the comparative analysis, supported by a holistic methodological framework. From the analysis of existing technologies to their definition, development, and delivery within the context of fan engagement in sports will be critically examined, drawing upon various case studies and openly accessible empirical data. Ultimately, this thesis will contribute to the discussion on sports technology, offering insights and practical guidelines for stakeholders aiming to develop deeper, more attractive fan experiences.

1.1 Research Questions

This paper's research questions strive to explore the topic of how emerging technologies can influence fan engagement in sports broadcasting. It uses the highly interactive world of eSports to analyse the potential effectiveness of interactive media in enriching fan experiences in the traditional broadcasting realm of WRC.

This thesis aims to ask a series of questions designed to understand how emerging technologies influence fan engagement within the World Rally Championship (WRC) and eSports. These questions aim to analyse the current effectiveness of interactive media in enriching the fan experience and to identify principles that might benefit both domains in the future. The research is structured around the following inquiries:

1. **What is the current effectiveness of interactive technology applications in enhancing fan engagement within sports broadcasting?**
 - The first question evaluates how new interactive broadcasting technologies are currently being used across sports broadcasting. The study will provide insights into whether these technologies have successfully deepened fan involvement and enriched the overall viewing experience.
2. **What are the comparative advantages and challenges of implementing these technologies in eSports versus WRC?**
 - Given the distinct nature of WRC and eSports—remote location motor racing versus digital competition—this question explores how each sector adapts to technological innovations. It considers the operational, cultural, and technological differences that define the potential foreseeable future direction of this research and field of study.
3. **Can the lessons learned from the digital-native eSports industry improve fan engagement strategies in traditional sports such as WRC?**
 - This inquiry looks at cross-pollination opportunities between the highly digital eSports and the more traditional WRC. It focuses on the transferability of engagement practices, aiming to identify strategies that could be adapted to enhance WRC's approach to interactivity.
4. **What future trends in fan engagement could emerge from the current use of interactive technologies?**
 - This question of speculative nature attempts to anticipate the evolution of fan engagement practices as new technologies mature and new ones are introduced. It seeks to predict

changes in fan behaviour and expectations, providing a perspective on the sports media's future directions.

By addressing these questions, the thesis intends to provide a methodologically and structurally sound understanding of the future of innovative technologies on fan engagement.

Ethics

Ethical considerations are key when conducting research, and this paper's process adheres to the GDPR guidelines as well as the respective ethical concerns of the studied domains. Implementing data protection measures that comply with GDPR is obligatory. Transparency in data collection and ensuring user consent are fundamental to maintaining trust and integrity.

While these technologies offer enriched viewing experiences, it is crucial to balance innovation with the traditional enjoyment of sports. The ethical integration of these tools aims to fulfil an educated understanding of WRC's fan experience. Access to new viewing enhancements should be equitable. Ensuring that all fans, regardless of economic or physical barriers, can enjoy these innovations is a critical ethical obligation. This inclusivity supports a broader, more engaged fan base, fostering a unified community spirit among viewers.

While the design process is user-centred, it is important to realize that people are trying to make WRC broadcasting profitable. These people are the same ones who are eventually going to be asked to invest in such changes to broadcasting technologies and thus, it is useful for this thesis's scope and credibility to respect these stakeholders' interests.

2 Background

2.1 Introduction to the FIA World Rally Championship

Rallying is a motorsport that unfolds on remote, mixed-surface public roads. The top-flight division of this sport is the World Rally Championship (WRC), governed by the FIA (Fédération Internationale de l'Automobile), the same organization that oversees Formula 1. In WRC, drivers, along with their copilots, navigate purpose-built vehicles at astonishing speeds through various terrains, including gravel, mud, tarmac, ice, and snow, aiming to complete timed stages, known as "Special Stages," as quickly as possible. A typical rally consists of 15-25 stages, covering up to 350 kilometres over a four-day weekend. The team that completes all stages in the shortest cumulative time wins the rally. A full WRC season generally includes 13 rallies across four continents.

Special Stages are conducted on closed public roads, where participants drive through a timed section one after another with a three-minute interval between each team, unlike most motorsports where cars race side by side. Between these stages, teams drive on open public roads to reach the starting point of the next stage. Additionally, every few stages, cars are allowed a limited time (usually 15 minutes in the morning, 30 minutes at lunch, and 45 minutes later in the day) in “Service Parks,” where engineers and mechanics repair any damage from previous stages and prepare the car for upcoming ones. Teams are penalized for exceeding the time limits in these Service Parks.

Although rallying has a dedicated fan base, the sport seems to have peaked in popularity during the famous 1980s “Group B” era. Today, rallying is somewhat of a niche sport, attracting fewer manufacturers each year, likely due to high development costs and diminishing returns. Formula 1, the FIA’s most successful racing competition, faced similar challenges over the past few decades as it lost its mainstream appeal. However, by rethinking its organization and media presence, the FIA managed to revitalize Formula 1.

At the time of this writing, the FIA is committed to reshaping WRC similarly to how it revitalized Formula 1. The governing body issued a survey to its fanbase, receiving responses from 11,000 fans. While most questions focused on technical regulations, the following insights are relevant to this work:

Only 29% of respondents who attended WRC events did so in the last 12 months, with distance and cost being the main barriers (FIA WRC, 2024).

87% favour onboard cameras to enhance TV coverage (FIA WRC, 2024).

97% want to see more manufacturers involved (only three in the 2024 WRC season) (FIA WRC, 2024).

94% believe the driver’s skills are as crucial to success as the car’s performance, with 92% agreeing that the WRC stands out due to the teamwork between drivers, co-drivers, and engineers (FIA WRC, 2024).

87% of those who watch WRC events have done so in the last three months, but lack of access was a barrier for 50% of non-viewers (FIA WRC, 2024).

Just over half (53%) are satisfied with the amount of TV/online coverage, and fans desire expanded WRC coverage, balancing free and paid content (FIA WRC, 2024).

Rallying’s dynamics offer a visceral live experience for many fans, but this excitement often fails to translate effectively to screens, where most fans watch. Riding shotgun in a rally car is unforgettable for many but watching it on TV can quickly become monotonous. This paper will explore solutions to potentially revitalize the online viewer experience by driving engagement through interaction.

2.2 Evolution and Impact of Technologies in Sports Broadcasting

The landscape of sports broadcasting has continuously evolved, driven by technological advancements that have reshaped how sports are consumed and experienced. From the early days of radio, which provided live audio feeds of events, to the introduction of television which brought visual dimensions to sports, each technological leap has broadened audiences and deepened fan engagement. The 1936 Berlin Olympics marked a significant milestone as the first-time sports were broadcasted on television to the public, followed by the first televised motor race in 1937 at the Crystal Palace Circuit (Guinness World Records, 1937).

The advent of the internet brought another major transformation, enabling live streaming and on-demand sports content accessible on personal devices. This shift increased accessibility and flexibility for viewers, allowing fans to watch events from virtually anywhere and at any time. Digital platforms have since become integral to sports broadcasting, offering new ways to engage with content and connect with fellow fans (Hutchins & Rowe, 2012).

Technological innovations such as augmented reality (AR), virtual reality (VR), and second-screen applications have aimed to further enhance the sports viewing experience. These technologies promise to provide more immersive and interactive experiences, enabling fans to access real-time statistics, view events from unique perspectives, and engage in communal viewing environments through additional digital content. (Immersiv.io, 2018)

Despite the potential benefits, the adoption of these advanced technologies has faced significant challenges. The digital divide, characterized by disparities in access to high-speed internet and digital tools, remains a barrier to universal adoption (Salovaara et al., 2006). Moreover, the high costs and technical complexities associated with producing and implementing these technologies have tempered their widespread use. Issues such as user discomfort, particularly with VR, and the potential for digital enhancements to disrupt traditional viewing experiences further complicate their integration (Hartmann, Stuke, & Daschmann, 2008; Kim, Sung, Noh, & Lee, 2022).

Economic considerations are also crucial. The costs associated with developing and implementing new technologies must be balanced against the added value they provide in terms of fan engagement and potential revenue streams, such as advertisements and subscriptions (Hassan & O Connor, 2009). Broadcasters must carefully craft monetization strategies that enhance the viewing experience without detracting from it.

3 Methodology

3.1 Overarching Methodology

This thesis employs a mixed-methods approach tailored to exploring fan engagement through interactive technologies in sports broadcasting. This approach integrates qualitative methods with the analysis of publicly available data, aligning with Muratovski's (2016) advocacy for a pluralistic methodological approach. This method bridges theoretical frameworks with practical, real-world applications by integrating various data sources.

Central to this methodology are small-scale user interviews and usability testing as means of qualitative analysis. Drawing on the principles laid out by Koskinen et al. (2011), this ethnographic approach provides detailed insights into how fans interact with technologies, highlighting real-world applications and user perceptions. The user-centred design (UCD) framework will guide these interactions, ensuring that the development process remains focused on user needs and experiences.

To complement the qualitative insights, this study will utilize existing online data to understand broader trends and patterns in user behaviour and expectations. This data-driven approach will help contextualize the qualitative findings within larger industry trends, providing a comprehensive view of fan engagement.

The research is structured around the double diamond design process (). This model includes the phases of discover, define, develop, and deliver, guiding the iterative refinement of engagement strategies based on the gathered insights and data. This process ensures a systematic approach to addressing the research questions, facilitating a comprehensive exploration of interactive technologies in sports broadcasting.

Integrating these methodologies provides a robust framework for examining how interactive technologies can enhance the fan experience in sports broadcasting. This approach ensures that findings are deeply rooted in user experiences while being contextualized within broader industry trends, allowing for both detailed insights and generalizable conclusions.

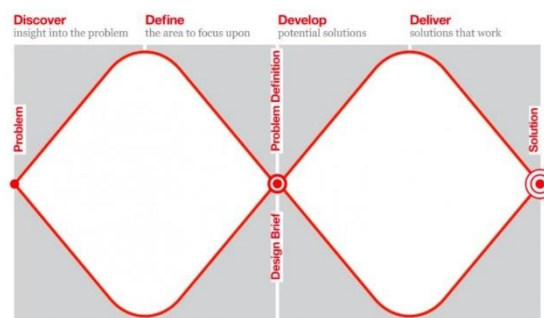


Figure 1: Double Diamond Process coined by British Design Council.

3.2 Ethnographic Studies for Fan Behaviour

Understanding fan behaviour in sports broadcasting requires a nuanced approach that combines traditional ethnographic techniques with modern digital methodologies. This research aims to explore how fans of the World Rally Championship (WRC) and eSports engage with their respective broadcasting platforms. By capturing a comprehensive view of fan interactions, preferences, and behaviours, we can inform the design of interactive technologies that enhance the viewing experience.

The primary objectives of this ethnographic research are to observe and document the behaviours and interactions of WRC and eSports fans across different digital platforms, identify key factors influencing fan engagement and satisfaction, understand the cultural and social dynamics within these fan communities, and gather qualitative data to inform the design and development of interactive broadcasting technologies. This study employs a mixed-methods approach, integrating traditional ethnography with digital ethnography. This allows for a comprehensive understanding of fan behaviour in digital spaces (Hallett & Barber, 2014)

Data Collection

The data collection will take place entirely on Microsoft Teams. This includes exploring online communities such as forums, social media groups, and fan websites dedicated to WRC and eSports. It also involves analysing interactions on streaming platforms like Twitch for eSports and RallyTV for WRC and monitoring live chat, comments, and other forms of digital interaction during broadcasts.

To achieve a thorough understanding of fan behaviour, this study will employ several data collection methods. Participant observation will be used to engage in both covert and overt observation within online fan communities. This includes observing how fans interact with each other and the content during live streams and in online discussions, as well as participating in forums and social media groups to understand digital fan behaviour and community dynamics. Semi-structured interviews will be conducted with fans to gather in-depth insights into their viewing habits, preferences, perceptions of current broadcasting technologies, and desired features for future broadcasts. Digital ethnography methods will be utilized to capture the online fan experience. This involves analysing user-generated content such as posts, comments, and live chat interactions, tracking the use of interactive features on streaming platforms, and conducting online surveys to gather quantitative data on fan engagement (Hutchins & Rowe, 2012).

Ethical Considerations

Ethical considerations are paramount in conducting ethnographic research. This study will adhere to the guidelines of obtaining informed consent from all participants, ensuring they are aware of the research purpose and their

rights. Privacy and confidentiality will be protected by anonymizing data and securing personal information. Transparency will be maintained with participants about the research objectives and data usage, and all data collection and storage practices will comply with the General Data Protection Regulations (GDPR).

Data Analysis

The data analysis will utilize thematic analysis to identify recurring themes and patterns in the qualitative data. This involves coding the data to categorize different types of fan interactions and behaviours and analysing the coded data to uncover key themes related to fan engagement and technology use. A comparative analysis will be performed between the WRC and eSports fan communities to highlight differences and similarities in engagement strategies and behaviours, as well as cross-pollination opportunities for engagement practices between traditional sports and digital-native sports.

The findings from the ethnographic research will be integrated into the design process. The insights will be used to inform the development of interactive features that cater to fan preferences, ensuring that design solutions are user-centred and enhance the overall fan experience. The ethnographic research is expected to yield a rich understanding of fan behaviour in both WRC and eSports contexts, providing actionable insights into how interactive technologies can be designed to enhance fan engagement. Recommendations will be made for broadcasters on leveraging digital platforms to create more immersive and interactive viewing experiences. By employing a robust ethnographic methodology, this study aims to bridge the gap between traditional sports broadcasting and the digital expectations of modern fans, ultimately contributing to the evolution of fan engagement strategies in sports media.

3.3 Methodologies for Fan Engagement Studies

The study of fan engagement in sports broadcasting finds echo in the extended Technology Acceptance Model (TAM2) as proposed by Venkatesh and Davis (2000). This further enriches our understanding of how social influence and cognitive instrumental processes affect technology adoption and use directly applicable to the fan engagement technologies that we are looking to develop.

First, the TAM2 focuses on perceived usefulness and, consequently, on usage intentions as being influenced by social influence processes and cognitive instrumental processes (Venkatesh & Davis, 2000). This means that subjective norms from fan communities and, at an individual level, an assessment of the relevance of the technology to their needs—for instance, ease of access to content and the features of interactivity—are important in stimulating fan engagement.

While the social influence processes, like subjective norms, voluntariness, and image, play a vital role in determining the value that fans attach to sports technologies, the reason can perhaps be the social nature of sports in which fans are deeply rooted in their peer community. When the technologies are deemed popular or endorsed by influential figures in that community, the chances of them being taken up are increased with the result that it will serve to improve fan engagement.

Cognitive instrumental processes are based more on individualistic assessment, such as job relevance (in the context of sports, how the technology enhances fan experience), output quality, and results demonstrability. These ensure that the technology is relevant and ensures high-quality delivery, which then means more satisfaction and deeper engagement.

The above, therefore, would presume that methodologies through which fan engagement is studied follow the line of surveys and observational studies of these processes among the fans. Surveys can, therefore, help in quantifying the perception of usefulness and ease of use in determining the willingness to adopt new broadcasting technologies for sports content. The attitude with which these processes have developed over time can therefore be established in observation studies, more so given changes in the technology and the cultural landscape of sports media consumption.

3.4 User Experience Evaluation

What makes User Experience (UX) evaluations important in the design of sports broadcasting platforms is that they provide insights into how users interact and react towards technological products. In dynamic fields like eSports and World Rally Championship (WRC) broadcasting, UX is important for improvement in engagement and satisfaction. The methodology of UX evaluations in the current study has been based on known frameworks that are informed by the most relevant academic literature.

This study uses evaluation methods such as usability testing, emotional response evaluation, and aesthetic judgment evaluation. Usability testing is one of the most essential methodologies for UX research because it checks the ease and effectiveness of the users within a particular platform. Specific methods employed in this study include task analysis, where users are observed as to how they go through specific tasks on the platform, think-aloud protocol, where users tend to verbalize their thoughts during interaction with the platform, and heuristic evaluation, where experts assess the platform based on established usability principles. Key metrics in usability testing include efficiency, effectiveness, and satisfaction. Efficiency is the metric measured in time; effectiveness measures accuracy and completion of a task; satisfaction measures surveys and feedback (Brooke, 1995).

It is essential to evaluate emotional reactions in analysing the impact of the platform on the feelings of the users. The techniques used to assess the emotional response will be observational. For example, it incorporates the use of self-report questionnaires in which the users provide ratings of emotional reactions to the various aspects of the platform.

Aesthetic judgment in this research shall be assessed through a question on visual appeal, where respondents shall describe aesthetic judgment, and a question on the focus groups, whose scope of data collection is on the design of the platform and accomplished by group discussion. Aesthetic judgment metrics include but are not limited to, visual appeal, consistency of design, and overall pleasantness.

This is important for the iterative design process to synthesize findings from UX evaluations. Insights from usability testing will be integrated into the design and development phases to take care of identified problems. For instance, if it is found through task analysis that navigation is difficult for the user through the platform, then the design will be changed to simplify the navigational structure. Emotion data allows for improvements to engagement and enjoyment aspects. If self-report surveys identify an area with high levels of stress for an interaction, that area will be redesigned to reduce user frustration.

Aesthetics will be enhanced based on the findings of the evaluation, which will be integrated into the visual design process through user feedback. For instance, if focus groups indicate that the colour scheme is not harmonious to the eye, adjustments are made to get the visual balance and consistency. These steps guarantee that the solutions are user-centred in design and will enhance the overall user experience.

3.5 Prototyping Interactive Technologies

The methodologies by Muratovski (2016) and Koskinen et al. (2011) give great insights as to how prototyping can be used to effectively innovate and hone technologies under development. Koskinen et al. (2011) postulate that prototyping can be used as a method of inquiry and validation through its use in "Research through Design" in which the prototypes are not steps toward a final product but a way of doing research. Prototypes in this sense are not just built to be part of a product but built to think more broadly (Koskinen, Zimmerman, Binder, Redstrom, & Wensveen, 2011, p. 58). Through this, designers and researchers may think about a problem through the tangible prototype, offering a concrete way of testing theories and hypotheses with its stakeholders.

On the other hand, Muratovski (2016) advances the application of prototyping in user-centred design by suggesting that this is iteratively used to align technological development with strategic research outcomes. According to him, prototyping must be used iteratively so that the alignment

between the user's needs and the objective of the business is optimized. That way, every stage brings the final product a step closer to realizing stakeholder expectations. Prototyping in this manner then becomes a strategic tool used in the validation and alignment of design decisions to the strategic objectives of the organization (Muratovski, 2016, p. 102).

With the WRC and eSports, prototyping interactive technologies means creating iterative models tested in various fan engagement situations. Such activity entails the building of models of various fidelities to first test principles and then refine the process of development through iterations for guidance and validation. Koskinen et al. (2011) and Muratovski (2016) observe that in the prototyping, user feedback must be included to help in making the final product technology sound and resonate well with the users.

The incorporation of a feedback loop in the prototyping process is an assurance that the prototyping for the prototype is dependent on the feedback given by the users. It precedes as detailed below:

User Testing and Collection of Feedback: Every phase of the prototyping process is subjected to user tests. These are crafted to facilitate the generation of qualitative and quantitative feedback. Different forms of data collection such as think-aloud protocols, surveys, and even direct observations are utilized to generate insights from the users (Väänänen-Vainio-Mattila et al., 2008).

Analysis and Synthesis of Feedback: The collected feedback is analysed to draw a summary of the common points, pain areas and suggestions for improvement. Therefore, the analysis is used to plan for the next prototype. Koskinen et al. (2011) posit that there is a need for a systematic approach to analysing feedback from the users to be assured that the evidence is clear enough to necessitate some design changes.

Iteration and Refinement: From the analysed feedback the prototype is refined, and new versions developed. This precedes continually in the form of iteration until such a time that the prototypes meet the desired usability and engagement standards. Venkatesh and Davis (2000) conclude that iterative refinement based on user feedback is key to creating a high degree of user acceptance and satisfaction.

It is noted for the issues and considerations; this paper takes the rabbit hole to the size of a wallet that finances it. This means that the final prototype will be guided by the cost-effectiveness of the different interactive solutions and try to focus on the attainable, small-scale solutions that can be achieved without a complete restructuring of the broadcasting industry. It must, therefore, ensure that the already existing and rich media environment that is the WRC is optimized to the fullest potential.

Development of the low-fidelity prototypes is evaluated through initial user semi-structured surveys that gave feedback regarding the basic

functionalities and the expectations of the users. Based on the feedback, the prototypes are further made into mid-fidelity versions with more detailed features and design elements included. All the iterations are evaluated using methods of usability testing such as task analysis and the think-aloud protocol that ensure the improvements are based on the wants and preferences of users (Brooke, 1995; Nielsen & Molich, 1990).

The technological feasibility of the prototypes is to be evaluated based on the technology's current infrastructure and resources. Possible challenges such as its compatibility with the existing systems and the technical complexity of the implementation of the interactive features are pointed out at an early stage of the process. In an attempt to arrive at a solution, two users from the semi-structured survey are made to work together. This then ensures that the prototypes are feasible but at the same time practical. The process includes regular review and adjustments to the prototypes so that ambitious design goals can be balanced with technical constraints and thereby arrive at user-friendly interactive technologies (Koskinen, Zimmerman, Binder, Redstrom, & Wensveen, 2011).

Prototyping, guided by the frameworks of Muratovski (2016) and Koskinen et al. 2011 is a crucial stage in the process of the development of interactive technologies that are to drive user engagement in the traditional sports broadcast. In this fashion, developers would have an opportunity to create technologies that boost the fan's experience in WRC by consistently refining prototypes with strategic alignment and user feedback. The whole process of making such iterative technology is going to help bring quality and effectiveness up to the maximum, making it adaptive to the changing needs and expectations of sports fans.

3.6 Speculative Design for Future Fan Engagement

Speculative design for future fan engagement involves envisioning innovative concepts that could shape the future of sports broadcasting. This process has been chosen for its strong relation to the already-gathered research material, the resources available, and the general scope of this paper. Speculative design, as discussed by Auger (2013), provides a framework for exploring the out-of-reach future of fan engagement in sports broadcasting. This approach crafts plausible scenarios that not only propose new technologies but also provoke thought about their implications.

The author emphasises that speculative design's strength lies in its ability to create detailed and plausible visions of the future. These visions help stakeholders in sports broadcasting to visualise and critically assess the potential impacts of emerging technologies on fan engagement. For instance, speculative design can explore the eventuality of widespread adoption of AR/VR to create immersive fan experiences, such as allowing fans to virtually experience games from the viewpoint of their choice, thereby transforming their interaction with the sport.

One of the key contributions of speculative design is its role in stimulating dialogue about future technological trends and their ethical, cultural, and social implications. By presenting speculative scenarios, designers can challenge current assumptions and encourage stakeholders to consider broader impacts. The findings and insights are compiled into a speculative design report. This report should highlight the most promising concepts, potential benefits, and foreseeable challenges, serving as a strategic guide for future development. As Auger (2013) points out, a speculative design report should stimulate reflection and dialogue about the potential future of fan engagement technologies.

4 Design Process

4.1 Introduction

This chapter describes the design process employed to investigate and build fan engagement technologies in sports broadcasts. It follows the structure of the double diamond design process, which is split into four distinctive phases: Discover, Define, Develop, and Deliver. The process is intended to iteratively build on the insights and outputs from the previous, thus ensuring a development process that is both reflective and future-oriented. One of its benefits is the proven capability to handle evolutive design challenges that demand both deep user understanding and innovative solutions. It offers a means to organisationally sound exploration of both the problem and solution, crucial in the development of technologies that resonate with sports fans and their dynamic needs. In taking this structured approach, the thesis seeks not only to fill the existing lack in fan engagement practices but also to be a pioneer in the development of new avenues for interaction and enjoyment. The chapter will further take this opportunity to illustrate the application of the methodologies described in Chapter 3, and how qualitative insights and quantitative data are used to inform each phase of the design process. Strategic alignment will ensure that the developed solutions are firmly rooted in the actual user experiences supported by data collected in various ways.

4.2 Discover: Identifying Fan Needs

The chapter intends to identify the needs and preferences of fans concerning the World Rally Championship (WRC) and eSports. Through previous ethnographic research methods and user experience evaluations in the previous chapter, this chapter will build a holistic perspective on what it is that fans value in their sports-viewing experience. This framework will, in

turn, be used to design and develop interactive technologies that increase fan engagement.

4.2.1 Literature Review

The literature review for this thesis aims to explore some of the key trends and technologies that inform fan engagement in sports broadcasting with a special emphasis on the World Rally Championship and the eSports contexts. The review looks at the transformative potential of augmented and virtual reality, gamification, and interactive design along with the integration of second-screen experiences and the building of parasocial relationships. This review also looks at some of the potential challenges and limitations posed by these technologies.

Recent research underscores the substantial role played by AR and VR in an immersive environment, and accordingly, it also enhances fan engagement. Rynarzewska (2018), for instance, discusses the potential and challenges of AR in sports marketing while underlining the possibility of layer digital information over the real world, hence, giving the viewing experience real-time data and interactive elements. However, this technology use implies investing a lot of money both in the technology and infrastructure needed, which becomes a drawback in its massive implementation. Likewise, Pickman (2023) explains the ability of VR to offer fans new perspectives and unique experiences such as 360-degree views and attending live events without leaving the house, hence building a virtual presence. However, the accessibility of this technology is questioned by the high price of VR headsets and the necessity of using powerful hardware to enjoy it.

For eSports, interactive live streaming platforms such as Twitch, in turn, have become the new gold standard of fan engagement based on gamification and real-time interaction. Suh, Wagner, and Liu (2018) demonstrate that such gamification features as leaderboards, achievements, and rewards massively drive user engagement on streaming platforms. These features foster continuous participation and create a competitive setting where viewers are always invested in the game. However, the success of gamification lies in maintaining users' interest without bombarding them with multiple notifications and rewards. Jodén and Strandell (2022) discuss in more detail how interaction rituals on Twitch, such as live chats, viewer polling, and community events, create a sense of belonging for the viewers. "While they increase the engagement, the same features need a strong moderation to avoid toxicity and guarantee a positive user experience".

The literature further stresses that second-screen experiences are essential for fan engagement. Anstead, Benford, & Houghton (2016) looked into user practices when designing and evaluating a multiscreen television application named MarathOn Multiscreen. MarathOn Multiscreen is a multiscreen application that enables users to watch, share, and curate amateur and professional video footage concerning a local marathon event. The study

shows ways in which multiscreen configurations can enable users to augment their engagement during participatory viewing practices. For example, when sorting and ranking the footage, significant differences were found in user practices and user collaboration while viewing collaboratively and alone, which underlines the importance of understanding other users' practices. This specific concept can be transferred to WRC broadcasts, given that the understanding of the collaborative user practices could be augmented if real-time data are introduced, besides the backstage content and the interactive features, to keep the fans engaged. However, the second-screen experience can only be successful if the same is seamlessly integrated with the primary broadcast and offers valuable and unobtrusive content.

Another factor that contributes to positive fan engagement involves building positive parasocial relationships with the athletes. Hartmann et al. (2008) discuss how good parasocial relationships with drivers and riders can be positively impacted by suspense. These relationships enable fans to have a deeper connection with the athletes, and thus more emotional investment in the event. However, building these relationships must be pursued with constant and genuine engagement between drivers and fans, which is time-consuming and challenging to manage. Hassan and O'Connor (2009) further outline the social-economic impact of the FIA World Rally Championship and describe how creating memorable fan experiences leads to the sustainability of the economic benefits. Therefore, there must be a fine balance between commercial interests and genuine efforts towards fan engagement.

The fan engagement strategies that have been used in motorsports, especially the FIA World Rally Championship, have been discussed by several researchers. Naess and Tickell (2019) offer a particularly critical overview of fan engagement in motorsports, focusing on the FIA World Rally. They consider the need for tailor-made fan engagement strategies to meet the unique requirements of motorsport fans. Naess (2016) agrees with this and explores spectator experience management at WRC events. He concludes that the spectator experience is of vital importance to fan satisfaction and loyalty among spectators. However, developing these strategies calls for a sound understanding of the fan's needs and agility to rapidly adapt to new and dynamic trends.

The scope of the above study on WRC is that WRC broadcasts need to integrate both AR and VR technologies. This way, WRC will facilitate viewer experiences that are immersive and that provide the fans with perspectives and features. For example, AR can overlay data in real-time on the screen to provide relevant information such as the car's speed or the stats of the driver to the fans for additional context. VR will enable fans to be transported to the centre of the rally, where they will enjoy a 360° view from the car's interior or on the racetrack. This will make them feel like they are part of the experience. As these immersive technologies increase fan engagement, they also bring in new audiences based on how innovative and interactive their viewing

experiences are. Still, the high cost and technical requirements of AR and VR might limit the mass use thereof, making scalability an issue that should be addressed.

This includes gamification and interactivity features, seen on platforms like Twitch, that can be included in WRC broadcasts to make them more interesting and community-oriented. Such facilities can create a feeling of community between fans, and so drive these communities into interaction with each other and the content. Such features will keep viewers engaged and make the viewing experience dynamic, active and, finally, fully participatory. On top of that, the inclusion of such gamification features as leaderboards and rewards would provide a guarantee of constant participation and growth in viewer loyalty. However, these features must be designed in a way where they can keep users interested instead of being overwhelmed over time.

Second-screen experiences are another feature that will help in enhancing fan engagement in WRC broadcasts. Such a multi-screen approach will make the experience more in-depth while providing fans with much more information and ways of interacting with the event. For instance, fans might be able to use a second screen to track their favourite drivers, get their favourite drivers' statistics in real-time, or participate in interactive polls and discussions. This increases the involvement of fans and gives new approaches for advertisers and sponsors to get access to such a highly involved audience. But the trick is always in developing useful second-screen content that works in harmony with the main broadcast.

The development of positive parasocial relations between fans and drivers is another highly valuable strategy for the further increase of fan engagement. Strong bonds between fans and drivers will create a robust audience emotional investment in WRC. This can be achieved through various means, such as behind-the-scenes content, driver interviews, and interactive features that allow fans to get to know the drivers on a more personal level. For example, Hartmann, Wirth, and Schramm (2008) point out that such relationships affect the overall viewing experience. On that account, the authors state that "those spectators with closer emotional relationships with the drivers are more likely to be engaged, involved, and loyal to the event product." The difficulty is to manage to keep these interactions authentic and consistent to resonate with the fans.

From the above, it is clear that the literature review supports the argument that a combination of existing and emerging technologies and innovative strategies should be employed in sports broadcasting to enhance fan engagement. By combining the use of AR and VR with gamification and other interactive features, together with second screen and the creation of parasocial relationships, WRC can make the viewing experience more immersive and interactive, as well as give fans a more personalized service. These not only fulfil the digital expectations of this century's audiences but also help in driving higher engagement and loyalty; thus, benefiting the

sport's economic sustainability. Continuing to support and develop a dedicated fan base will take place if emerging trends are adopted in the future of sports broadcasting. At the same time, possible challenges and limitations that can be associated with these technologies need to be addressed.

4.2.2 Ethnographic Research

Ethnographic research reveals deep insights into fan behaviours, preferences, and interactions in the context of sports broadcasting. Self-immersion and semi-structured interviews are chosen as methods to collect qualitative data on fan engagement with the World Rally Championship (WRC) and eSports. Participants actively use platforms like Twitch and services for streaming services offered by WRC. Semi-structured interviews offer opportunities for participants to capture unique and informative features of their fan experience. These results are deep in giving insight into how fans interact with sports content and open opportunities to enhance engagement.

Self-Immersion in Fan Platforms

The necessity of self-immersion was satisfied by watching eSports streams on Twitch, and regularly spectating events of WRC on various platforms. This way, firsthand views of the user experience were provided—that is, the content itself and any interactive features and community dynamics. Interacting with the content in the same manner as ordinary fans served to gain insight into the affordances of the platform and the user behaviour to be expected on the platform. On Twitch, it was quite obvious with real-time interaction using chat functions, viewer polls, and community events. Such interactivity contributes to a bright and vivid space in which instant sharing of thoughts and reactions by fans can be made. As an example, the chat made during the biggest eSports tournaments is filled with predictions, reactions, and discussions of the gameplay strategies that are being employed, hence giving a sense of shared community between the viewers (Church, 2022; Suh, Wagner, & Liu, 2018; Taylor, 2018). On the other hand, the WRC streaming platforms showed live telemetry data, onboard cameras, and real-time driver stats. The interaction, however, is less present than Twitch, where there is less possibility for direct fan interaction. This further demonstrated how the WRC could improve a facet of their broadcast by making the platform more interactive for fans' better viewing experience.

Semi-Structured Interviews

Semi-structured interviews with a mixed group of WRC and eSports fans were conducted to gain deeper insight into their viewing habits, preferences, and engagement. A flexible guide allowed the interviews to go in-depth regarding a specific subject while maintaining a conversational character. Transcripts from these interviews can be found in the appendix of this thesis and represent a valuable source of qualitative data.

4.2.3 Key Insights from Interviews

Viewing Habits and Preferences

Most eSport fans reported watching streams on Twitch several times a week, especially during major tournaments. They were drawn to the platform by the prospect of live interaction with the community while watching high-level gameplay. Fans typically used laptops or tablets for convenience, with some connecting to external monitors for a better viewing experience. WRC fans, on the other hand, often watched highlights on YouTube or live broadcasts on TV. What usually grabbed the attention of the fans was the excitement of driver skill and extreme conditions, from which the technical aspects of the cars that were manifesting the thrill of speed in an attempt to obtain a win followed. Most of the time, fans would watch by themselves and in straightforward ways, such as turning on the TV or finding the best recap videos online.

Engagement and Interaction

Features such as chat functions, subscriber-only modes, and interactive polls made it engaging for viewers to watch while streaming on Twitch. These gave the viewer a sense of community around the viewing experience. It would otherwise be common to enjoy live videos using these interactive features, which also include voting in a poll or using the chat.

However, most of the fans showed less interaction with the broadcasts, where most never even made use of the advanced functions and consumed content mainly via YouTube and TV. Other users, while reporting to enjoy interaction with community comments on YouTube, never took community interaction at the centre of events, as in the case with eSports fans. It therefore implies that WRC content needs to be more interactive as a factor fuelling fan engagement.

Technological Aspects

Both eSports and WRC fans flagged several key areas for improvement that would help support technology-assisted viewing. Fans of eSports have the highest request in live streaming formats with less buffering, better video quality, and capable of being used in a mobile application. Frustrations can often be technically related such as buffering and chat disconnections.

WRC fans recommended improvements like on-demand multi-camera angles, improved camera coverage of the track, real-time interactive maps, and driver stats. A couple of people added that this could be integrated with VR experiences, which would make the viewer feel like they were the co-driver and thus get them more involved with the event. Technical issues, such as disruption in transmissions and poor audio quality, could as well have been witnessed, though this often did not present a significant deterrent to the enjoyment.

Hopes and Aspirations for the Future

In their vision, as that of an ESports enthusiast of the WRC, they were looking forward to a more interactive and immersive experience. Requirements from the eSports fans included VR integration and new content types beyond just gaming. They suggested features like syncing their watch parties to view streams at the same time with friends and content recommendations.

WRC fans wanted more access, better quality, and greater immersion. Ideas included an ability to follow exclusively one driver throughout the whole race, real-time car tech breakdowns, and VR experiences to get closer to the race. Interaction with teams was also a big wish.

Implications for WRC

There are several findings from the ethnography on how some improvements in fan engagements with WRC broadcasts would have been shaped into more engaging community experiences: live data overlays, live chats, and viewer polls. A well-integrated second screen will enrich the primary broadcast with additional content and interactive features. These promising technologies full of personalization and immersion have to be looked at through the lens of pragmatics and accessibility to make sure they will only enhance the experiences but not ruin them.

For instance, overlays of real-time data provide viewers with important information while the race is on, including live statistics of car performance and driver positions. Live chat and audience polling maintain this sense of community, prompting viewers to express thoughts as they watch the broadcast. Second-screen experiences can bring more insights and behind-the-scenes content to the primary broadcast, without overloading the viewer. These will feed personal preferences and keep fans engaged with highlight reels and suggested personal content.

4.2.4 Comparative Analysis

This paper takes a comparative approach to analysing the affordances of RallyTV and TwitchTV to find out how they can, or cannot, replicate excitement similar to being at the venue of WRC events. The study relies on insights from semi-structured interviews with WRC and eSports fans, and findings from the related literature. Some key areas of the discussion include access and quality, fan loyalty, technological integrations, and community building.

RallyTV and TwitchTV offer the following affordances.

RallyTV and TwitchTV have innovative features for fan engagement. RallyTV offers more in-depth coverage in TV style with multiple camera angles, in-depth telemetry data, and professional commentary. What it lacks is the innovation in the online platform that has made eSports platforms, including TwitchTV, succeed.

The strength of RallyTV is the curated, high-quality broadcast that exposes the whole event. The structure supports in-the-moment transmission of edited footage, so viewers do not miss crucial moments. However, an overreliance on a single, curated feed limits the scope to which a viewer can personalize their experience or engage interactively.

Today, TwitchTV is no longer confined to video games; it is known for its live-casting system, which uses chat features, live polling, and ways viewers can participate and all these features are highly integrated to create a lively viewing experience that cultivates a sense of belonging among the viewers themselves. These features do help in varying streams one can watch and relate with streamers and other fans to cement the community and engagement. (Jodén & Strandell, 2022)

Access and Quality

Among both platforms, access and quality are the two most valuable aspects. WRC followers have stated accessibility issues with live events, thereby requesting the broadcasters to increase the availability by more accessible platforms or, probably, cheaper subscription models. On the other hand, eSports followers, especially those on Twitch, emphasize the stability and quality of the stream. A better stream can significantly change the overall user experience and retain high interest during live events.

WRC fans are more inclined to TV broadcasts and YouTube highlights, so this is an area where RallyTV could potentially extend its online audience. TwitchTV is a platform where a lot of those concerns are being taken care of, such as a stable feed quality; however, problems with buffering and technical troubleshooting through busy periods are just some of the problems to be ironed out.

Human Behaviour

Fans are loyal on both platforms, but there is quite a lot of difference. WRC viewers either have strong connections with a specific driver or constructors, which can be capitalized on with the development of driver-centric content. This may involve interactive features like live telemetry data, exclusive interviews, and in-depth analysis that deepens fans' engagement (Næss & Tickell, 2019). On the other hand, overall loyalty to different games and players in the esports industry creates a possibility for Twitch to delve even deeper into its community-focused offerings. Advanced stream capabilities for community engagement, such as those including advanced chat features or community events, have the potential to be as personally engaging as fans find streamers and tournaments today (Jodén & Strandell, 2022).

It follows in the wake of just how important personal connections are to sports broadcasting: loyalty to particular drivers and teams is pretty obvious amongst the WRC fan community. The personal appeal of the streamers -

many of whom interact with their viewers in real-time - on TwitchTV gives the streaming service the ability to capitalize on loyalty and community.

Technological Integration

Both are technologically integrated to the extent of their respective. RallyTV has high-definition imagery, multiple camera angle features, and real-time telemetry to provide a better viewer experience. However, it lacks interactivity and personalization, both of which are robust on TwitchTV (Naess, 2016). By integrating the chat functionality, live polling and interactive overlays, TwitchTV's offering becomes a more interactive and engaging one. Enhanced viewer EXPERIENCE PARTAKING.

Technological capabilities on each platform affect the way fans can interact with content. For the most part, broadcasts of WRC races should be able to benefit from including more interactive features, whereas TwitchTV still has a lot of work to do in terms of enabling real-time feedback and community-driven content.

Community Building

Community building is the most important part of the fan engagement process, and both of these platforms can benefit from this. RallyTV could develop features that can give the viewer an impression of the at-venue atmosphere through the use of digital "fan zones" and virtual grandstands (Næss & Tickell, 2019). This will allow fans to interact with one another and share experiences to create a community feel.

What will make TwitchTV even more compelling to fans, more of whom will feel belongingness, is the features developed that are even more dynamic in terms of allowing the fan to interact with either the content creator or other fans. This includes features that have the capability of co-streaming and are fully integrated with social media, which makes the platform more inclusive to the larger audience and engages more with the audience (Jodén & Strandell, 2022).

4.2.5 Synthesis of Findings

Identification of Typical Fan Values

The following needs are being synthesized from the literature review, ethnographic research, and UX evaluations, which provide only a few of the main needs and preferences of WRC and eSports fans:

Fans all care about high-quality streams with good stability, which are also easily accessed.

Both fan bases appreciate interactive features that bring the offering to life for better engagement. WRC fans find overlays with real-time data and telemetry valuable, while eSports fans like chat functions, live polls, and community interaction.

Fans are looking for personalized content that is directed to their interests. WRC fans are immensely loyal to individual drivers and teams. This fact implies the need for content that is driver-centred. eSport fans would prefer personalized recommendations combined with a watching experience that could be personalized (Næss & Tickell, 2019).

Viewers must have a feel of belongingness within the community. The WRC spectators have digital "fan zones" and virtual grandstands, and the eSport spectators have chat interactivity where socializing is quite common and done from within the Twitch application (Jodén & Strandell, 2022; Næss & Tickell, 2019; Taylor, 2018).

Human-Centred Design

These core needs have design implications for developing interactive technologies in the following actionable way:

Accessibility Enhanced: Build high-tech, yet user-friendly WRC broadcast platforms. Develop viable, cost-effective subscription models and boost our digital footprint. Ensure stable, high-quality streams, thus appealing to the expectations of eSports fans.

Interactive Enhancements: Add real-time data overlays, live telemetry, and multi-camera angles to WRC broadcasts to make them engaging and informative. Continue adding chat functions, live polls, and interactive overlays for interaction in real time for eSports.

Personalized Content: Custom highlight reels, recommended content, and dashboards tailored and customizable to both WRC and eSports platforms. That is driven by driver-specific content to serve WRC fans and game/player-specific content for eSports fans.

Community Features: Develop digital "fan zones" and virtual grandstands for WRC that provide users with a feeling of being there during a live event. Enhance participation within the communities through advanced in-chat features, co-streaming functionalities, and social media tools on the eSports platforms.

Friction Points

Literature Review vs. Ethnographic Research: The literature review indicates that there is a lot of potential in AR and VR technologies (Rynarzewska, 2018; Pickman, 2023), while ethnographic research seems to suggest that these may not be practical for widespread use among WRC fans due to challenges with access and cost of live events.

Although the literature indicates broad acceptance of interactive features in eSports (Suh, Wagner, & Liu, 2018; Taylor, 2018; Jodén & Strandell, 2022), ethnography shows that WRC fans would prefer simpler and more data-

intensive broadcasts. This suggests high interactive features in eSports that can be misplaced by traditional sports fans.

As literature has shown the importance of community features for eSports (Jodén & Strandell, 2022), the ethnographic research has shown that WRC fans may not be so active with digital community tools; they may prefer to have a more traditional setup to follow races. This establishes the need for such a customized approach that respects the viewing habits of different fan bases.

The literature suggests that the need for personalization of the produced content is high with both WRC and eSports, but how it is practically carried out sometimes varies. Ethnographic work has shown that with the fans themselves, while WRC fans are loyal to the drivers and their crews, the fans of eSports are interested in game- and player-specific content. This would require different strategies for catering to the different sets of fans.

4.3 Define: Framing the Engagement

The goal of this comparative analysis is to enhance the level of engagement of the audience in World Rally Championship (WRC) broadcasts by learning from the strong strategies employed in eSports platforms like TwitchTV. By defining the strength of TwitchTV and combining it with the users' expectations and needs of WRC fans, the possibilities for improvement in the experience of RallyTV will be opened up. This section identifies the main problems of WRC broadcasts and proceeds to take possible solutions from eSports practices to assess their advantages and disadvantages.

4.3.1 Accessibility

One of the issues faced by the users is the question of accessibility and paywall. WRC is broadcast for free in several countries. People from countries where the spectacle is broadcasted do not have a strong incentive to subscribe to RallyTV and nationals from countries where the sport is not broadcasted need to pay 120 euros a year for the subscription. This leaves the fans of WRC quite frustrated and consequently fed through mostly the summaries and television transmissions of the events post-competition. This model has reduced overall engagement and satisfaction. In contrast, TwitchTV models improved accessibility as it has a reliable online streamlining model that maintains quality, and stable streams expected by the viewers. Indeed, as Hutchins and Rowe (2012) assert, the web and other digital media can provide considerable improvements to the accessibility of sports broadcasts. An even more advanced online streaming platform similar to TwitchTV could further improve accessibility for fans of WRC. This would require huge investments in the digital infrastructure with continuous maintenance to provide quality and stability of the broadcast. Cheap subscription models on live broadcasts could attract a bigger audience, hence escalating viewership and the kind of engagement.

However, even if they are lower, subscription costs may remain out of reach for many fans, and managing multiple tiers can potentially overcomplicate the user experience. Another solution could be strong partnerships with existing mainstream streaming platforms, like YouTube or Twitch, which have pre-existing infrastructure, to which most of the audience already has subscriptions, thus reducing WRC's heavy investment in developing a majority of its digital infrastructure. However, these partnerships are likely to face some challenges related to TV rights and exclusivity agreements that can limit the scope and flexibility of the broadcast.

4.3.2 Interactivity

One of the main shortfalls of the current WRC broadcasts through RallyTV is that they do not have the interactive attributes that would allow fans to get engaged in real-time. The model is dulling and less involved. On the other hand, the TwitchTV model with its real-time chat features, live polling, and viewer participation mechanisms furnishes the viewers with a highly involving viewers' environment. According to Jodén & Strandell, (2022), Taylor, 2018. In-broadcast real-time data overlays could be applied to provide the viewer with an enhanced view of the action, including live telemetry data and driver stats, for an informative and engaging experience. This highly relies on developed technology, making it an easy integration without, at the same time, overburdening the viewer with too many details. More than one camera view allows the fans to switch between them, making the engagement enhanced when the viewer is in control of the view. Technically, deployment of these features would be intensive and may even result in user experience complexity. The interactive polling and live chat features will help in creating some form of real-time interaction among fans, hence making their engagement with these broadcasts interesting and dynamic. Moderating chat functions is often challenging for a positive user experience, especially when the event generates a lot of traffic.

4.3.3 Personalising Content

WRC fans exhibit high loyalty towards individual drivers and teams, but the current broadcasts have little access to customized content based on such loyalty. Personalized content such as coverage of a specific driver, exclusive interviews, behind-the-scenes, and personalized highlights, will boost the engagement of fans to high levels. The provision of content on specific drivers will increase fan engagement from general levels to astronomically high levels because fan interests are catered for specifically.

However, the development and maintenance of a broad spectrum of personalized content can be expensive. It is also in such moves as allowing fans to customize view dashboards with favourite driver stats, team updates, and race metrics that this personal experience can be created. Even if it enables a customizable interface, this needs advanced design, and the user experience can get more complex.

Content recommendation systems should be built to suggest content based on the history of views and preferences, hence increasing value to the discovery of new content likely to be relevant for fans. This will have to involve robust algorithms in handling and managing data.

4.3.4 On-Platform Community

One of the major areas of concern for the fans of WRC is that there is not a sense of community to imitate attending the event. Digital media and technology cannot create an in-person event feel. On the other hand, the distinct purpose of TwitchTV is to create and succeed using communities with features like chat and social integration, creating a community feeling for the viewers (Jodén & Strandell, 2022; Taylor, 2018). Virtual grandstands or digital "fan zones," in which they can interact with one another, share their experiences, or even discuss topics, can bring this feeling of community to a live event. In turn, this means that an engaging fan zone has to be constantly kept on top of. Co-viewing features, which allow fans to watch the races together, sharing live chat and reactions, would enhance the feel of community.

The technical nuts and bolts of the co-viewing features are intense, and it is tough to program the synchronization of the same view across various devices and internet speeds. These social media tools implemented on the viewing platform allow the sharing and interaction of fans with a larger community to keep connected. Overreliance on social media, however, can detract from the primary viewing experience and thereby introduce other privacy and moderation concerns. 4 In summary, it identifies the specific issues the WRC broadcasts face and outlines a couple of solutions, driven by the already successful practices of eSport platforms. More accessible platforms with the ability to be interactive and give a much more personalized experience through content also represent development in community building—the next level in how to engage fans of RallyTV.

An approach based on the best practices of eSports platforms, such as TwitchTV, that is user-centred would be fundamental in making WRC broadcasts engaging and satisfying for fans. That approach would set up user-friendly sports broadcasting technologies which would respond to the changing expectations of audiences and hence improve their engagement and satisfaction levels.

4.4 Develop: Creating Solutions through Prototyping

The development phase is where theoretical insight is then translated into concrete design solutions toward the goal of more engaged fans experiencing and interacting with the WRC broadcasts. A systematic prototyping process informed by methods and user feedback will create, test, and improve

innovative design solutions to integrate user-centred design principles with interactive features inspired by successful strategies from eSports platforms like TwitchTV.

4.4.1 Prototyping Phases

The two main prototyping phases are low-fidelity (Figure 2) and mid-fidelity (Figure 3) prototypes. Each is supposed to incrementally develop and validate the design solutions based on the continuous feedback from the end users. In this paper, if it delved into creating a fully functional high-fidelity prototype for live events, that would consume too much time, resources, and knowledge.

In this paper, it does not seem that a high-fidelity prototype would give more results than a few targeted mid-fidelity prototypes anyway. The research will therefore proceed to focus on creating speculative scenarios developed using the findings of this research process. In contrast, the low-fidelity phase is supposed to look generally at ideas and basic functionality. A prototype at this stage will be basic in the form of sketches and wireframes used in the visualization of a general structure of the platform and its flow. Techniques such as wireframing and storyboarding are used to create these rudimentary prototypes. User feedback, mainly through informal interviews and usability testing, is used to identify major issues and ways for improvement.

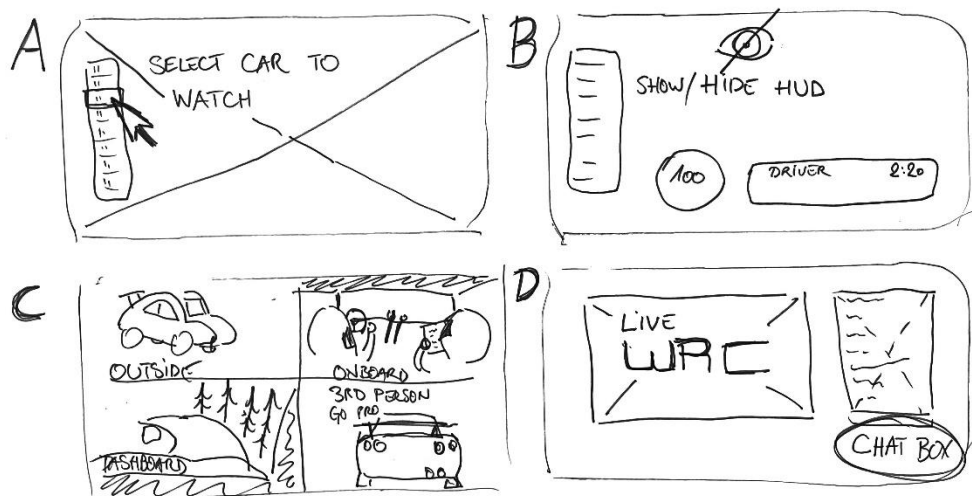


Figure 2: Low-Fidelity Prototype

In the initial phase, the need for early prototyping is stressed by Koskinen et al. (2011) for fast testing of ideas on an iterative basis without much investment of time and other resources in the development of ideas. The purpose of the mid-fidelity phase will be to refine the design and functionalities based on the feedback from the low-fidelity prototypes.

Mid-fidelity prototypes are much more detailed and developed in Adobe XD (Figure 3). These were used in creating clickable prototypes that simulate the interaction and creativity of users. Testing on broader usability gives far more detailed feedback on specific features and their interaction. Väänänen-Vainio-Mattila et al. (2008) observe the value of mid-fidelity prototypes for clarification of user interaction and design element fine-tuning before moving on.

4.4.2 Key Features Tested in Prototypes

The interface prototype is designed to be more interactive and includes six major features that will enable the live broadcast process:

Driver Focus On-Demand: Here, viewers can just pick and choose the driver they want to view in an on-demand format, so they just need to click on the name from the required driving order table on the left-hand side of the current UI to view a race on their terms.

On-Demand Camera Angles: Navigate between several camera angles with ease using a convenient widget located at the top-right corner of the overlay: TV View, On-Board View, and Focus View.

Hide-able HUD: A button in the top right overlay gives the viewer the possibility to remove the Heads-Up Display (HUD), allowing a cleaner and more immersive visual experience.

Interactive split times board: Running at the bottom of the screen, viewers can click on any given sector to retrieve a split time of the current sector, adding to the overall depth of information given during the broadcast.

Hide/Show Telemetry Overlay: Allows the viewer to hide or show the speedometer according to their preference.

Minimize Hide Running Order: A running order table for rallies can be minimized or hidden to clean the screen.

Live Chat Box with Emoji Reactions: An overlay on the right-side permits community interaction during the event, therefore making the viewing experience social and engaging.

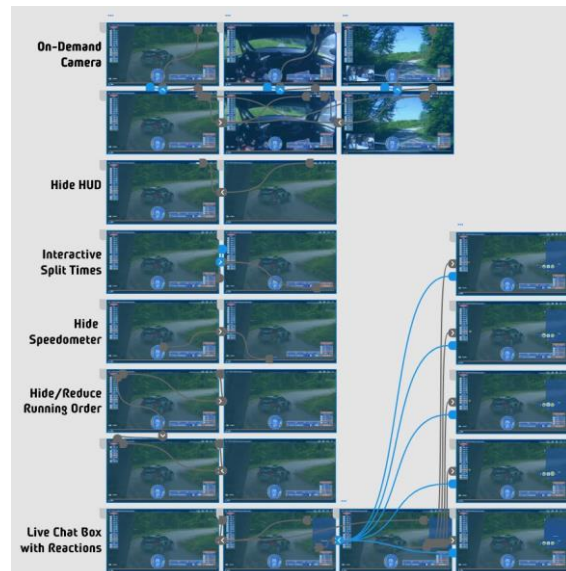


Figure 3: Mid-Fidelity Prototypes

Development of User Flows

The design is careful with attention to detail regarding the navigation paths within the interactive player. It gently guides the user from a basic broadcast interface with low interaction to a more advanced player using an oversized button labelled "Watch Interactive Live". At the advanced player, there is a brief tutorial to explain to users how to fully use the new tools.

4.4.3 Feedback Integration and Prototype Refinement

First-stage testing with the WRC fans is critical to ensuring necessary user feedback on each of the features: usability and enjoyment. Such feedback informs iterative refinements of the prototype, focusing on the most popular features, those to be refined, and reworking or disposing of the less popular ones. This continuous loop of feedback and adjustment fine-tunes the prototypes to meet the expectations and preferences of the target audience.

Key learnings from the feedback sessions: Intuitiveness and accessibility in interactive features are important.

Both users commented that they enjoyed the amount of customization they could make to their viewing experience, such as with the on-demand camera angles and interactive HUD. However, they and some other users have commented on how certain features, like the live chat box, were rather distracting during a race's more intense moments. This resulted in the chat feature being updated to allow both minimization and the ability to hide the chat entirely during important moments in the broadcast.

Each phase of prototyping is a gradual process of testing, gathering feedback, and improvement, finally allowing us to arrive at a solution that will resonate with fans, and increase the level of their interest and pleasure in watching WRC broadcasts. This part of the development process is key to setting a good foundation for the final interactive product to be user-friendly and thrilling. The end goal will be to bring a more interactive, engaging, and personalized feel to WRC broadcasts, using the latest UI/UX design trends to create an allure that resonates and keeps a global audience.

4.5 Deliver: Implementation and Testing Solution

The Deliver phase will focus on the implementation of design solutions developed through the prototyping process to enhance fan engagement for WRC broadcasts. This phase brings the speculative design together with feasible tactics, contemplates various investment levels, and engages insight from user experience reviews and TAM2, mentioned in earlier chapters. The demand for personal and interactive content continues to rise every day.

The integration of a part of the features does not require substantial new infrastructure but can be built upon existing platforms, thereby minimising the financial barriers to entry. This approach is further validated by Yoshida

et al. (2014), who argue that even minor enhancements in user interaction can lead to significant improvements in user satisfaction and engagement.

4.5.1 Low-Cost Solutions

The low-cost solutions aim at enhancing the WRC broadcast experience with only minimal investment through the use of current technologies and platforms.

Enhanced social media integration is one such approach in this category, which may offer increased access with higher interactive features, and which is cost-effective and effective in meeting the dynamic requirements of the modern sports fan. Using these technologies, broadcasters will be able to enhance the experience of their existing viewers with more vibrant and personalized viewing experiences, setting up the official viewing platform improved and more organized user experience, such that it is most likely driving the user to visit RallyTV more often. We can enhance user engagement using social media tools in conjunction with broadcasting by allowing the fans to share experiences and engage with larger communities.

This can be done with minimal investment by utilizing already existing social media sites. Integration into social media helps bring the urge for greater engagement and interaction with communities. Basic functionalities like sharing, liking, and commenting on live events can increase user engagement enormously (Hutchins & Rowe, 2012). As highlighted by the TAM2 model, perceived ease of use here is also an important factor since the users are more inclined to adopt a feature that is perceived to be naturally fit and easy to use to one's accustomed habits (Venkatesh & Davis, 2000). Added simple interactivity features also include live polls, simple chat functions, and reaction buttons that can be clicked during the actual live broadcast, which can appear on the side of the screen as a graphic. These are features that can be implemented on the existing platform at low costs. Interactive features make broadcasts more usable and more enjoyable because, with immediate feedback, the viewer feels part of the event. User experience evaluations clearly show these features are valued by users and increase engagement (Väänänen-Vainio-Mattila et al., 2008). Increasing perceived usefulness by enabling users to directly interact with the content, will raise their engagement and satisfaction. Basic content personalization can be added, such as viewers being able to access WRC's already advanced data analytics at any time, not just when WRC has decided what to display.

This could be combined with an interactive overlay that allows viewers to selectively view desired statistics and data insights in live events. Such a feature is a means of data collection to shift control to the viewer and elicit greater engagement through personalization.

As supported by Naess and Tickell (2019), the fans are essentially engaged with the sport when these real-time game analytics help them know these

intricate game dynamics beyond what is presented through the broadcast narrative. Personalization brings about a huge difference in the content delivered to users based on their preferences, leading to a considerable increase in user satisfaction.

From the point of view of TAM2, personalization improves the perceived relevance and, therefore, the attractiveness of the platform, giving intention to use by the user. The advantages of these low-cost solutions are that they are economically efficient and offer lots of potential for engagement: no need to reinvent the wheel, but to build something on top of existing platforms that will make the experience richer. The cons are that a deeper interaction will be unfeasible and that the solution could distract attention from the main content. Furthermore, while focusing on low-cost solutions, we are poised to bring serious improvements in the WRC broadcast experience with no major financial commitment but using existing technologies and platforms to boost fan engagement and satisfaction.

4.5.2 Mid-Cost Solutions

Mid-range solutions require moderate investment and are developed to increase interactivity and user engagement by using more sophisticated functionalities.

Although viewer-selected camera angles would arguably be one of the highest forms of interactivity that could be introduced, its technical application in the case of such sports as the World Rally Championship, which takes place in remote areas, might be cumbersome because of logistical and technical constraints. The feasibility of these types of features would be dependent on the signal transmission capabilities in those areas. But perhaps something lighter, such as offering viewers only a limited number of alternative angles that are pre-set and controlled by a smaller number of cameras positioned at strategic locations could do some ways to make the viewing experience better, and without breaking the bank. To give a concrete example of this, with the format of the WRC, there are some stages where there are not more than 2 to 3 drivers on at any time.

Fans have also insisted that the preferred camera angle is the On-Board wide angle, in which the camera is placed in between the driver's head and that of the co-driver, so one would lock the footage into that single angle. Technically, that would reduce the quantity of information being transmitted and therefore avoid the need for overly complex transmission equipment upgrades. The on-demand driver focus feature may raise other solution that includes an interactive rewind feature.

The solution itself is simple, but at the same time, it's innovative in the sense that no current platform has an embedded affordance that does that. What this affords is for the user to backtrack the last 10 seconds of action by clicking

a back arrow situated at the bottom left of the screen. Rewind on a minimized screen takes place atop the running live feed.

Users can comment on their rewinds or other people's using text or emojis. In the event of a high incidence of a certain moment being rewound, it is highlighted to the broadcaster who can then bring it to the live TV. This feature makes it more interesting since it is an instant replay of an exciting moment that has just been seen and whose fans would like to express their reactions emotionally. TAM2 suggests that users are satisfied, and hence continue to use it because they perceive viewing and interacting with key moments as enjoyable (Venkatesh & Davis, 2000). In addition, strong chat functions, co-viewing features, and digital fan zones that can be packaged in advanced ways can create an interactive, community-like viewing experience.

These features breed interaction in real-time among fans and thus have a feeling of belonging to a community, which is important in bringing about continued use. Social interaction and support features have the potential to develop perceived ease of use and usefulness toward user adoption. Personalization of viewing dashboards with desired driver stats, team updates, and race metrics can be done by the user. This means coming up with a more sophisticated interface that is adaptable to several preferences of the fans, especially in improving user control and fulfilling fans' interests by making available what fans desire most (Naess, 2016). Through customisation, perceived control and personal relevance are built, thus enhancing user experience and satisfaction with advanced engagement capabilities (Yoshida, Gordon, Nakazawa, & Biscaia, 2014). The strong points of mid-level solutions are the moderate level of cost and high engagement potential because the available features are somewhat sophisticated to enhance the fan experience.

But at the same time, there are also the cons associated with it that there will be development required and integration that would be needed, including the content moderation overhead that might be faced. Hence, by spending a moderate amount of money and concentrating on the mid-cost solutions, the WRC broadcast can be considerably enhanced as well, providing more interactive and customized features to increase fan satisfaction.

4.5.3 High-Cost Solutions

High-cost solutions go with big investments and are aimed at providing an immersive and interactive viewing experience at a high cost.

The advanced real-time data overlays would be combined with the provided live telemetry data, driver stats, and interactive maps to be impressive concerning the visuals. This can only be made possible with heavy investment in technology and infrastructure. The real-time data overlays help in the presentation of information in such a way that meaning can be given or that context can be created for both added informational content and engagement

(Hutchins & Rowe, 2012). According to TAM2, increased perceived usefulness and informativeness would further increase user adoption and satisfaction (Venkatesh & Davis, 2000). Providing different camera angles that users can interchange, coupled with VR integration for immersive experiences, will greatly increase engagement. The latter requires a heavy investment in technology and content creation to make it more realistic and engaging. Multi-camera angles with an overlay of VR integration will provide flexibility and immersion in the viewing that will maximize emotional engagement and enjoyment (Jodén & Strandell, 2022). The novelty and immersion of VR can increase perceived enjoyment and intention to use (Venkatesh & Davis, 2000).

The creation of an all-encompassing, comprehensive community ecosystem can effectively deliver integrated social media, advanced chat functions, co-viewing capabilities, and digital fan zones.

This requires huge amounts of investments in platform development and content moderation to achieve a great user experience. A robust community ecosystem nurtures a strong community feel and engagement, meeting social requirements (Næss & Tickell, 2019). Features that facilitate social interactions and community development help users feel the system is easy and useful, which encourages use (Yoshida et al., 2014). To go even further, though, if on-site fans could share their device-filmed highlights out via the RallyTV app, it'd be a dynamic and community-driven content ecosystem. Now, footage can be geolocated and timestamped, meaning it can be used to create a rich database of user-generated content. This means it can create movies following a particular driver's performance through the eyes of the fans or movies about a single-track portion. This feature exploits fans' enthusiasm and creativity, increasing the community involvement and variety of the content (Hutchins & Rowe, 2012).

User-generated content enhances perceived usefulness and engagement through unique, authentic content that resonates with the fan community. High-cost solutions give back the maximum pros of engagement and the level of immersion with the available sophisticated features that are up for the fans. It also has cons in the form of huge financial investment and the possibility of facing technical integration issues and moderating the content. The approach to high-cost solutions is what should be taken up to realize a revolutionary change in the WRC broadcast experience, with a high amount of financial investment, to bring in features that are immersive and highly interactive and thus provide more satisfaction for the fans.

5 Discussion

This work has sought to take inspiration from successful esports like TwitchTV to improve fan engagement within WRC broadcasting. We followed a structured design process identifying key areas for improvement, and through that process, we developed a set of prototypes that embodied these improvements. Key insights relate to accessibility, interactivity, personalization, and community building to enhance the fan experience.

5.1 Interpreting the Findings

This provides an insight into how interactive technologies can make a difference in increasing fan involvement in WRC broadcasts. It is in this light that the incorporation of features such as live polls, chat functionalities, and the interactive re-wind function gave hope for improvement of user engagement and satisfaction, as proposed in the TAM2 framework by Venkatesh and Davis (2000). The limitations, therefore, were towards a full assessment of the long-term impact and practical feasibility of these technologies in real-world settings.

5.2 Answering the Research Questions

The research questions posed at the beginning of this thesis aimed to guide the investigation into enhancing fan engagement in WRC broadcasts. Here, we revisit and address each question based on the findings and outcomes of this study.

What is the current effectiveness of interactive technologies in enhancing fan engagement within sports broadcasting?

The study demonstrated that interactive technologies could enhance fan engagement by providing opportunities for real-time interaction and feedback. Features such as live polls and chat functions were shown to be effective in creating a sense of community and engagement. However, the effectiveness of these technologies was primarily assessed through user feedback and prototype testing, which may not fully capture the complexities and challenges of large-scale implementation. Additionally, the reliance on self-reported data and a relatively small sample size limits the generalisability of the findings (Väänänen-Vainio-Mattila et al., 2008).

What are the comparative advantages and challenges of implementing these technologies in eSports versus WRC?

The study highlighted that eSports platforms, being digital-native, have a significant advantage in integrating interactive features and community tools seamlessly. In contrast, WRC broadcasts face unique challenges due to their remote and dynamic nature, which complicates the implementation of similar technologies. While the study proposed potential solutions, such as

advanced real-time data overlays and customisable viewing dashboards, these require substantial investment and technological infrastructure. The comparative analysis suggests that while eSports can serve as a model, the unique context of WRC necessitates tailored approaches to overcome operational and technological barriers (Hutchins & Rowe, 2012; Næss & Tickell, 2019).

Can the lessons learned from the digital-native eSports industry improve fan engagement strategies in traditional sports such as WRC?

The study found that several engagement strategies from eSports can be adapted to enhance WRC broadcasts. Interactive features like community-building tools and real-time feedback mechanisms can be beneficial. However, the transferability of these practices is not straightforward and requires careful consideration of the different contexts. While eSports strategies offer valuable insights, the distinct operational challenges of WRC broadcasts mean that direct implementation may not always be feasible. Tailored adaptations and incremental integration are necessary to ensure these strategies effectively enhance fan engagement in traditional sports (Jodén & Strandell, 2022; Næss & Tickell, 2019).

What future trends in fan engagement could emerge from the current use of interactive technologies?

The study speculates that future trends in fan engagement could include greater use of augmented reality (AR) and virtual reality (VR) to create immersive viewing experiences, enhanced personalisation through AI-driven content recommendations, and expanded community interaction features. However, these predictions are speculative and based on current technological trajectories. The actual adoption and impact of these technologies will depend on various factors, including technological advancements, cost considerations, and user acceptance. Longitudinal studies and continuous user feedback will be essential to validate these trends and adapt to evolving fan behaviours and expectations (Pickman, 2023; Rynarzewska, 2018).

6 Contributions

This paper attempted to apply the existing Technology Acceptance Model (TAM2) to WRC broadcasts and gives a model for the understanding of how fans are being engaged by the sports media. Therefore, this stresses the principles of accessibility, interactivity, personalization, and community building as a complement to the ecosystem of fan experience (Venkatesh & Davis, 2000). Although the findings represent theoretical contributions, at

the same time, they prove the necessity of further research to implement and refine them in adaptation to the strategies of eSports within the framework of the WRC.

This holds broader implications for sports broadcasting in general and WRC in particular, regarding how these kinds of interaction and personalization of content with community-building tools might increase fan engagement. Implementation of features is always guided by investment and infrastructure, but at the same time, a balanced position between cost and benefits must be found for broadcasters. The provided insights can help develop more user-centric broadcasting platforms for broadcasters, helping to improve the revenue and views they generate.

This multimodal thesis combined literature review, ethnography, and users' experience evaluations with iterative prototyping. Such a methodology is implemented to inquire and satisfy users' needs in sports broadcasting. This study places an appreciable emphasis on iterative feedback and continuous redesign based on the actual user experiences. Future research, thus, needs to exactly replicate this methodology with larger and more diverse samples and with the incorporation of objective measures of user engagement.

The results are socially broad, as they provide community and social aspects among fans, with features such as advanced chat functions, co-viewing capabilities, and digital fan zones that bring out a sense of belonging. This is where the proposed user-generated content feature comes in, which will empower fans to contribute to the broadcasts in whichever manner they see fit, therefore creating a participatory media environment. However, this gives rise to some challenges, notably with content moderation and quality control.

In addition to this, the field needs inquiry on the study of long-term effects on fan engagement brought about by interactive and immersive technologies, research on the economic implications, and broadening the ethnographic research base to other sports and demographics. Comparisons across different sports and under different cultural contexts could help in identifying universal principles and nuances that are associated with a particular sport in fan engagement. This can be achieved by developing advanced analytics tools that would measure and assess fan engagement in real-time.

This dissertation has theoretical, practical, methodological, and social value in the context of sports broadcasting. At hand is a study that presents a prototype based on user-centred design and innovative solutions, which can help support the engagement of fans during a WRC broadcast and beyond. These contributions now represent one step further, not only in academia but also in the industry, and an open way to further research and practical developments in sports media.

7 Conclusions

This thesis aims to explore emerging ways in which technology may further change fan engagement in sports broadcasting, specifically in the context of the World Rally Championship. By adopting a proactive and conceptual perspective anchored in the highly interactive world of esports, the study explores how interactive media can positively enrich the fan experience of traditional sports broadcasting. The four overarching research questions of this study related to the current effectiveness of interactive technologies in the domain of sports broadcasting, the comparative advantages, and challenges in eSports vs. WRC, potential cross-pollination of engagement strategies between these two domains, and future trends in fan engagement.

Some of the interactive technologies that have worked to keep fans engaged in sports broadcasting include live polls, chat functions, and interactive rewind. Real-time interaction and feedback between viewers are developed, creating a sense of community and more involvement. However, the effectiveness of such technologies in large-scale applications remains questionable and therefore should be further investigated.

This research has found interesting benefits and challenges that occur when implementing interactive technologies in eSports and, contrastingly, WRC. Esports platforms are natively digital, which means interactivity and community tools can be embedded more easily. However, WRC broadcasts are by nature remote and dynamic and thus they face operational and technological challenges. While insightful on esports strategy, direct implementation in WRC needs careful adaptation to overcome these contextual differences.

Lessons from the eSports industry can certainly help to provide the strategies that will inform and enhance fan engagement for the traditional sport of WRC. These strategies should involve tools for community building, real-time feedback mechanisms, and personalized content, which can be replicated to boost WRC broadcasts. However, adaptations need to be sensitive to the uniqueness of WRC to be effective.

Future trends in fan engagement are presumed to see increased AR- and VR-based personalization, enriched community interaction features, and more personalization through AI-based content recommendations. Trends are toward increasing the level of immersion and, respectively, the level of interaction in the viewing experience. Of course, this is technology-dependent and based on further acceptance by users.

Drawbacks and Limitations

However, the informative study also comes with several limitations: self-reported information, associated bias, and a relatively small sample for usability testing. Finally, predicting such trends is speculative by nature, so

that in this moment, the real impact and feasibility of the presented innovations are uncertain.

Future research could address the implications for investment and technological infrastructure, as such technologies would involve significant investments and technological infrastructure. Future Research Directions

In this light, future research may also now focus on the long-term impacts of such interactive and immersive technologies on fan engagement. Longitudinal studies on sustained use and impact would bring out the intensive effectiveness of the technologies. Further research can look at the economic implications of such implementations in terms of possible cost-benefit dynamics and revenue models for broadcasters. The scope of the ethnographic study should now extend across more sports and fan demographic groups. The development of advanced analytic tools for measuring and evaluating fan engagement in real-time will enhance the feedback loop to ensure that the fan expectations are up to date all the time on the engagement platforms.

Final Thoughts

It is in this connection that this thesis has added to the understanding of fan engagement with sports broadcasting by incorporating user-centred principles in the development of advanced technologies. It not only supports the idea that the broadcaster may be able to develop more engaging and fulfilling platforms through the utilization of interactive media to enhance user experience but also provides a framework within which to do so. While promising, these developments require further research and practical experimentation to truly realize the potential of these innovations and adapt to a landscape of sports media in constant flux. This process of understanding the traditional approach toward sports broadcasting with the application of insights gained from eSports strategies underscores the necessity of interdisciplinarity in learning and adaptation for the future. Technological change is transforming adaptation in a media environment; therefore, the broadcast should open ways to respond to the fans' needs and preferences dynamically.

8 References

- Anstead, E., Benford, S., & Houghton, R. (2016). *MarathOn Multiscreen: Group Television Watching and Interaction in a Viewing Ecology*. doi:10.1145/2818048.2820003
- Auger, J. (2013). Speculative design: crafting the speculation. *Digital Creativity*, 24(1), 11–35. doi:10.1080/14626268.2013.767276
- Brooke, J. (1995). SUS: A quick and dirty usability scale. *Usability Eval. Ind.*, 189–194.
- Church, E. &. (2022). *Game-swinging on Twitch: an affordances perspective*. *Electron Markets*. 32. doi:10.1007/s12525-022-00574-8
- FIA WRC. (den 7 March 2024). *World Rally Championship Fan Survey Helps Shape Working Group Recommendations on the Future of WRC*. Hämtat från FIA: <https://www.fia.com/news/world-rally-championship-fan-survey-helps-shape-working-group-recommendations-future-wrc>
- Guinness World Records. (1937). *First televised motor race*. Hämtat från Guinness World Records: <https://www.guinnessworldrecords.com/world-records/714223-first-televised-motor-race>
- Hallett, R. E., & Barber, K. (2014). Ethnographic Research in a Cyber Era. *Journal of Contemporary Ethnography*, 43(3), 306–330. doi:10.1177/0891241613497749
- Hartmann, T., Stuke, D., & Daschmann, G. (2008). Positive Parasocial Relationships with Drivers Affect Suspense in Racing Sport Spectators. *Journal of Media Psychology: Theories, Methods, and Applications*, 20, 24–34. doi:10.1027/1864-1105.20.1.24
- Hassan, D., & O Connor, S. (2009). The socio-economic impact of the FIA World Rally Championship 2007. *Sport in Society*, 12(6), 709–724. doi:10.1080/17430430902944134
- Hutchins, B., & Rowe, D. (2012). *Sport beyond television: The Internet, digital media, and the rise of networked media sport*. Routledge. New York: Routledge.
- Immersiv.io. (February 2018). *Immersiv.io*. Hämtat från Immersiv.io: <https://www.immersiv.io/portfolio/formula-1-tf1-ar/>
- Jodén, H., & Strandell, J. (2022). Building viewer engagement through interaction rituals on Twitch.tv. *Information, Communication & Society*, 25:13, 1969–1986. doi:10.1080/1369118X.2021.1913211

- Kim, K., Sung, H., Noh, Y., & Lee, K. (2022). Broadcaster choice and audience demand for live sport games: Panel analyses of the Korea Baseball Organization. *Journal of Sport Management*, 36(5), 488-499. doi:10.1123/jsm.2020-0311
- Koskinen, I., Zimmerman, J., Binder, T., Redstrom, J., & Wensveen, S. (2011). *Design research through practice: From the lab, field, and showroom*. Elsevier.
- Muratovski, G. (2016). *Research for designers: A guide to methods and practice*. . Sage.
- Naess, H. (2016). Spectator experience management at FIA World Rally Championship events. *CHOREGIA*, 12, 49-60. doi:10.4127/ch.2016.0112 (not working on 17 May 2024)
- Næss, H., & Tickell, S. (2019). Fan Engagement in Motorsports: A Case of the FIA World Rally Championship. *The Journal of Media Innovations*. 5. doi:10.5617/jomi.6289
- Nielsen, J., & Molich, R. (1990). Heuristic evaluation of user interfaces. *n Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '90)* (ss. 249–256). New York, NY, USA: Association for Computing Machinery. doi:10.1145/97243.97281
- Pickman, D. (2023). The Use of Virtual Reality and Augmented Reality in Enhancing the Sports Viewing Experience. *International Journal of Arts, Recreation and Sports*. 1, 39-49. doi:10.47941/ijars.1516
- Rynarzewska, A. (2018). Virtual reality: a new channel in sport consumption. *Journal of Research in Interactive Marketing*. 12, 472-488. doi:10.1108/JRIM-02-2018-0028
- Salovaara, A., Jacucci, G., Oulasvirta, A., Saari, T., Kanerva, P., Kurvinen, E., & Tiitta, S. (2006). Collective creation and sense-making of mobile media. *SIGCHI Conference on Human Factors in Computing Systems (CHI '06)* (ss. 1211-1220). New York, NY, USA: Association for Computing Machinery. doi:1211–1220. <https://doi.org/10.1145/1124772.1124954>
- Suh, A., Wagner, C., & Liu, L. (2018). Enhancing User Engagement through Gamification. *Journal of Computer Information Systems*, 58(3), 204–213. doi:10.1080/08874417.2016.1229143
- Tang, A., & Boring, S. (2012). #EpicPlay: crowd-sourcing sports video highlights. *In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '12)* (ss. 1569–1572). New York, NY, USA, : Association for Computing Machinery. doi:10.1145/2207676.220857

- Taylor, T. L. (2018). *Watch Me Play: Twitch and the Rise of Game Live Streaming*. Princeton University Press.
doi:<https://doi.org/10.2307/j.ctvc77jqw>
- Väänänen-Vainio-Mattila, K., R. V., & Hassenzahl, M. (2008). Towards practical user experience evaluation methods. *International Workshop on Meaningful Measures: Valid Useful User Experience Measurement (VUUM)*, (ss. 19-22). Reykjavik, Iceland.
doi:10.1016/j.ijhcs.2007.11.001
- Venkatesh, V., & Davis, F. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*. 46, 186-204.
doi:10.1287/mnsc.46.2.186.11926.
- Yoshida, M., Gordon, B., Nakazawa, M., & Biscaia, R. (2014). Conceptualization and Measurement of Fan Engagement: Empirical Evidence From a Professional Sport Context. *Journal of Sport Management*. 28, 399-417. doi:10.1123/jsm.2013-0199.

Figures

- Figure 1: Double Diamond Process coined by British Design Council. 10
From Jens Pedersen's Class Material (2022)
- Figure 2: Low-Fidelity Prototype..... 30
The author of this thesis made this image.
- Figure 3: Mid-Fidelity Prototypes..... 31
Adobe XD Frames, using openly available WRC footage for Fair Use. All rights reserved to the owner of the footage.