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REBOOT
EUROPEAN FILM COMPETITIVENESS

The Experimental Study of the Reception Practices of Content in Mixed Reality by Young Audiences

Project: Reviving, Boosting, Optimising and Transforming European Film Competitiveness - REBOOT

Grant Agreement: 101094796 - HORIZON-CL2-2022-HERITAGE-01

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Reviewer(s): Katharine Sarikakis (UNIVIE)

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	competitiveness of European cinema. A comparative analysis of incentive policies across various European and non-European countries highlights the fragmented and insufficient support for this sector in Europe. In response, the UCA team conducted an experimental study employing eye-tracking methods to examine how audiences engage with Mixed Reality content, particularly in relation to perception and spatial information processing. These findings aim to support the hypothesis that *cinema / XR* hybridisation may present a distinct, and potentially superior, cognitive model compared to traditional cinema. From a media-induced social cognition perspective, the results suggest that strengthening Europe's film competitiveness requires investment not only in hybrid production practices and XR-focused education, but also in the development of individual and collective viewing spaces offering immersive, interactive, and reality-blending experiences targeted at younger audiences.
Keywords	Mixed Reality - XR technologies, cinema / XR hybridisation, social cognition induced, incentive policies, eye-tracking method
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CONTENTS

TABLE OF FIGURES 8

TABLE OF TABLES 9

1. PROJECT DESCRIPTION 10

2. EXECUTIVE SUMMARY 11

3. INTRODUCTION 12

4. PRESENTATION OF WORK 14

5. AUDIOVISUAL CONTRIBUTIONS 17

5.1. VR-BASED ARTISTIC WORKS (WP7.8) 17
5.2. VIDEOS FOR COGNITIVE STUDIES (WP5.3) 17

6. CINEMA AND EMERGING TECHNOLOGIES: TOWARDS THE HYBRIDISATION OF TWO WORLDS 18

6.1. PRELIMINARY STATEMENT 18
6.2. THE RATIONALE BEHIND THE HYBRIDISATION OF CLASSICAL CINEMA AND XR TECHNOLOGIES 18
6.2.1. THE EMERGENCE OF XR TECHNOLOGIES IN THE CURRENT MEDIA LANDSCAPE 18
6.2.2. THE IMPACT OF XR TECHNOLOGIES ON SOCIAL COGNITION 19
6.2.3. THE POTENTIAL ISSUE OF SOCIAL COGNITION DISPARITIES ARISING 20
6.3. TOWARDS A HISTORICAL AND PROSPECTIVE HYBRIDISATION OF CLASSIC CINEMA AND XR 21

7. EUROPEAN POLICY SUPPORT FOR THE HYBRIDISATION OF CINEMA AND XR 26

7.1. INTRODUCTION 26
7.2. RESEARCH HYPOTHESES 27

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7.3. RESEARCH DESIGN 27
7.4. SAMPLING 27
7.5. LIMITATIONS 28
7.6. EU POLICIES AND FUNDING INITIATIVES IN THE AUDIOVISUAL AND FILM SECTORS 28
7.7. STATE FUNDING MECHANISMS FOR THE AUDIOVISUAL AND FILM INDUSTRIES 32
7.8. THE BELGIAN FILM INDUSTRY 32
7.8.1. MAPPING THE FILM FUNDING LANDSCAPE IN BELGIUM 33
7.8.2. CRITICAL ANALYSIS 35
7.9. THE FRENCH FILM INDUSTRY 36
7.9.1. ARCHITECTURE OF NATIONAL SUPPORT SCHEMES AND INSTITUTIONS 36
7.9.2. CRITICAL ANALYSIS 39
7.10. THE GERMAN FILM INDUSTRY 40
7.10.1. PRESENTATION OF FUNDING BODIES AND SCHEMES 41
7.10.2. CRITICAL ANALYSIS 43
7.11. THE ITALIAN FILM INDUSTRY 44
7.11.1. PRESENTATION OF FUNDING BODIES AND SCHEMES 45
7.11.2. CRITICAL ANALYSIS 48
7.12. THE LUXEMBOURG FILM INDUSTRY 49
7.12.1. PRESENTATION OF FUNDING BODIES AND SCHEMES 50
7.13. CRITICAL ANALYSIS FOR EUROPE 51
7.13.1. FUNDING CRITERIA 52
7.13.2. CULTURAL CRITERIA 58
7.13.3. SUSTAINABILITY AND INNOVATION CRITERIA 61

8. INTERNATIONAL POLICIES AND FUNDING SCHEMES IN THE AUDIOVISUAL / FILM SECTOR 73

8.1. THE CANADIAN FILM INDUSTRY 73
8.1.1. PRESENTATION OF FUNDING BODIES AND SCHEMES 74
8.2. THE SOUTH KOREAN FILM INDUSTRY 81
8.2.1. PRESENTATION OF FUNDING BODIES 82
8.2.2. CRITICAL ANALYSIS 85
8.3. CONCLUDING REMARKS 87
8.4. RECOMMENDATIONS FOR NEW POLICY 90

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

9. EMPIRICAL STUDIES AS AN ARGUMENT FOR THE GROWTH OF 'CINEMA / XR' HYBRIDISATION 91

9.1. COMPARISON OF SOCIAL SPATIAL COGNITION INDUCED BY CINEMA AND BY 'CINEMA / XR' 91
9.2. MAIN HYPOTHESES OF EMPIRICAL RESEARCH 91
9.2.1. HYPOTHESIS I 91
9.2.2. THE HYPOTHESIS COROLLARY 92
9.2.3. HYPOTHESIS II 92
9.3. THEORETICAL FRAMEWORK: SPACE IN FILM STUDIES 93
9.3.1. CONDITIONS FOR THE POSSIBILITY OF THE COMPARISON 93
9.3.2. ROLE OF SPACE IN THE MEDIA 93
9.3.3. SPATIAL APPROACH IN CINEMATOGRAPHIC STUDIES 94
9.3.4. SPACE AS THE COMMON DENOMINATOR OF CINEMA AND 'CINEMA / XR' 95
9.4. METHODOLOGICAL FRAMEWORK: EYE-TRACKING APPLIED TO EXTENDED FILM STUDIES 96
9.4.1. WHY IS EYE-TRACKING USEFUL IN FILM STUDIES? 96
9.4.2. PLACE OF EYE-TRACKING IN THE STUDY OF 'CINEMA / XR' HYBRIDISATION 97
9.5. COMPONENTS OF AN EXPERIMENTAL SETUP 102
9.5.1. VR HARDWARE SET 102
9.5.2. SOFTWARE 103
9.5.3. PC HARDWARE 104
9.5.4. EYE-TRACKER: XR HEADSET AND ENVIRONMENTAL GLASSES 105
9.5.5. CABLE MANAGEMENT 105
9.5.6. DISPOSABLE HYGIENE PROTECTORS 106
9.5.7. DEVELOPMENT OF AN IT SOLUTION FOR RESEARCH 106
9.5.8. TRAINING AND COOPERATION WITH SPEEDERNET AND TOBII 108
9.6. EXPERIMENTAL PROTOCOL 109
9.7. DATA CORPUS COLLECTION 110
9.7.1. DATA OF 03/07/2025 EXPERIENCE AT CHÂTEAU DE LA NAPOULE 110
9.7.2. DATA OF 03/14/2025 EXPERIENCE AT CHÂTEAU DE LA NAPOULE 114
9.7.3. DATA OF 04/01/2025 EXPERIENCE AT MSHS SUD-EST 117
9.7.4. DATA OF 04/01/2025 EXPERIENCE AT MSHS SUD-EST 121
9.8. PARTIAL CONCLUSIONS - INTERPRETATION OF RESULTS METHOD 123
9.9. PARTIAL CONCLUSION - SPEED OF TASK EXECUTION 125
9.10. PARTIAL CONCLUSION - COLLECTIVE STATISTICS 125

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

9.10.1. Results - Group VR - Duration Plot (Oculus 3 headsets, room: atelier) 126
9.10.2. Fixation Heat Map 127
9.10.3. Attention Heat Map 128
9.10.4. Attention Scan Path 129
9.10.5. Opacity Map 131
9.10.6. Results - Group CC - Duration Plot (Tobii Pro Glasses 3, room: atelier) 131
9.10.7. Fixation Heat Map 132
9.10.8. Attention Heat Map 133
9.10.9. Attention Scan Path 134
9.10.10. Opacity Map 135
9.10.11. Comparison 136
9.11. Partial Conclusion Based on VR Eye-tracking Results 137
9.11.1. Introduction: The Eye in the Labyrinth 137
9.11.2. Recall of the Theoretical Framework: Cartography of Attention 137
9.11.3. General Observations on VR Gaze Patterns 138
9.11.4. Technical Considerations: Eye-tracking Metrics and Cognitive Load 138
9.11.5. Understanding Spatial Encoding 139
9.11.6. Participant Case Studies: P1 to P10 Analysis 140
9.11.7. Preliminary Discussion 145
9.11.8. Implications and Future Directions 146

10. PERSPECTIVES OF EXPERIMENTAL RESEARCH IN THE 'CINEMA / XR' 147

10.1. Emergence of the New Hybrid Cinematographic Culture since 2023-25 147
10.2. Foreshadowing of the 'Master Cinema-XR' Training 148
10.2.1. Program Structure (2 Years / 120 ECTS) 148
10.3. Research on the New Industrial Offer for Hybrid Cinema 149

11. GENERAL CONCLUSION AND RECOMMENDATIONS 151

12. REFERENCES 155

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TABLE OF FIGURES

Figure 1: European Audiovisual Observatory Report 2024 53

Figure 2: European Audiovisual Observatory Report 2024 54

Figure 3: European Audiovisual Observatory Report 2024 55

Figure 4: Share of women in the workforce 60

Figure 5: Fields of vision as a function of the extent of the spherical cap 98

Figure 6: VR Sketch Sheets 99

Figure 7: Central visual anchoring in 2D screen viewing 100

Figure 8: Attentional points distributed in spherical vision 101

Figure 9: Photos of the device and the experiment 102

Figure 10: Varjo XR-4 VR Eye Tracking System (left) & HTC VIVE Focus 3 VR Eye Tracking System (right) 102

Figure 11: Photos of the experiment 104

Figure 12: Photos of the experiment 104

Figure 13: Tobii Pro Glasses 3 105

Figure 14: Teleportation from one scene to another 108

Figure 15: Snapshot of the workshop scene 126

Figure 16: Duration of interval - Group VR 127

Figure 17: Fixation Heat Map of the workshop scene - Group VR 128

Figure 18: Attention Heat Map of the workshop scene - Group VR 129

Figure 19: Attention Scan Path of the workshop scene - Group VR 130

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Figure 20: Opacity Map of the workshop scene - Group VR 131

Figure 21: Duration of interval - Group CC 132

Figure 22: Fixation Heat Map of the workshop scene - Group CC 132

Figure 23: Attention Heat Map of the workshop scene - Group CC 133

Figure 24: Attention Scan Path of the workshop scene - Group CC 134

Figure 25: Opacity Map of the workshop scene - Group CC 135

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TABLE OF TABLES

Table 1: EU states' funding bodies and mechanisms 57

Table 2: Financial Support and Immersive Funded projects 62

Table 3: Screen Brussels Report (2023) 63

Table 4: CNC Report 2023 64

Table 5: Italian Ministry of Culture Annual Report 2023 67

Table 6: Venice Gap-Financing Market Report 2023 69

Table 7: Film Fund Luxembourg Annual Report 2023 70

Table 8: Data of 03/07/2025 experience 114

Table 9: Data of 03/14/2025 experience 117

Table 10: Data of 04/01/2025 screen experience 121

Table 11: Data of 04/01/2025 VR experience 123

Table 12: Speed of Task Execution 125

Table 13: Participant 1 Case Studies 140

Table 14: Participant 2 Case Studies 141

Table 15: Participant 3 Case Studies 142

Table 16: Participant 4 Case Studies 143

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1. PROJECT DESCRIPTION

This report is part of the Horizon Europe REBOOT project (Reviving, Boosting, Optimising and Transforming European Film Competitiveness), which focuses on the European audiovisual sector and its film industry. The REBOOT project aims to connect their strengths, identify and overcome weaknesses, and plan for future competitiveness in the fields of policy, practices and experiences. More concretely, the project's objectives are, on the one hand, to explore the long-standing strengths and pervasive gaps in European audiovisual competitiveness and policies for competitiveness, including ways of 'measuring', 'analysing' and 'evaluating' the impact of policies and strategic pathways. The project aspires to focus attention on actively preparing for the future by exploring audience preferences and how these are generated, as well as modes of film content production.

The latter are elements which today's youth will carry and engage with in the coming decades as makers and consumers, as well as industry and policy leaders. The project therefore interrogates the 'what is', but also the 'what has been' and 'what will be' through fresh lenses. REBOOT aims to provide a holistic overview of the European film industry, focusing on maximising its existing strengths while developing strategies and tactics to optimise the potential of European youth audiences, both as emerging viewers and as engaged citizens. Specifically, the project's goals combine several dimensions, which reinforce each other but are listed separately (and in no particular order) for analytical purposes: a) increasing support intended to increase young people's engagement with European film; b) strengthening the position of the European Union (EU) in the global audiovisual economy, particularly in light of the rise of video-on-demand; c) supporting cultural diversity in the EU film industry; d) addressing the need for a different understanding of competitiveness and relevant indicators in this context; and e) recognising and supporting the importance for the EU of film and, more broadly, of the cultural and creative sector as a geopolitical asset.

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2. EXECUTIVE SUMMARY

This report presents the findings of research conducted by the Université Côte d'Azur (UCA) as part of the Horizon Europe REBOOT (Reviving, Boosting, Optimising and Transforming European Film Competitiveness) project. It explores the relationship between cinema and Mixed Reality media technologies (XR - encompassing VR, AR, and MR), with a focus on how the hybridisation and convergence of these domains could represent a key strategy for enhancing the attractiveness and competitiveness of European cinema. The study combines comparative policy analysis of state support mechanisms across a selection of European and non-European countries, in order to assess current incentive frameworks and identify gaps and opportunities for promoting innovation in the audiovisual sector.

To further investigate this convergence, the UCA team undertook an experimental study using eye-tracking technology, analysing how users perceive and process spatial information when engaging with XR content. The results suggest a distinct mode of cognitive engagement within immersive environments, pointing to a potential cognitive advantage over traditional film formats. These findings demonstrate how emerging technologies are reshaping youth engagement, attentional dynamics, social interaction, and immersive cognitive experiences. In this context, the ability to influence and structure interactive media consumption becomes a critical determinant of global competitiveness.

Building on these findings, the report recommends a series of policy measures to support the integration of immersive technologies in the cultural and audiovisual sectors. These include expanded funding for XR-based content creation and education, with particular emphasis on involving younger generations in creative production processes. The report also calls for the harmonisation and standardisation of public and private funding frameworks across Europe. Establishing a more coherent regulatory and financial ecosystem would facilitate the development of immersive storytelling, promote interactivity and narrative innovation, and strengthen Europe's position within the evolving global media landscape.

3. INTRODUCTION

Since the early 2000s, cinematographic production has undergone a major global redistribution. The United States has gradually lost its dominant position to the benefit of emerging economies, particularly in Asia and Africa. European countries have managed to maintain a strong position, but only when considered collectively.

This phenomenon has been further amplified with the advent of smartphones and the proliferation of web-based video content, particularly in the domain of mobile formats. Since 2007, a noticeable shift in cinematic practices has come to the fore. The focus has expanded from traditional film to video-film, with increasing attention to the cognitive experiences these productions generate in audiences.

A new phase of evolution, if not a revolution, is now being observed, characterised by the appearance and democratisation of 3D video and 360° spherical imaging. This transformation has compelled the cinema industry to rethink its technological options, notably, departing from conventional 3D and 360° models, encumbered by cumbersome 3D glasses, towards more lightweight and autonomous devices such as autostereoscopic screens, virtual reality (VR) and augmented reality (AR) headsets, and immersive domes.

Asian media industries, particularly those in China and Korea, have embraced these innovations with considerable conviction. In contrast, Europe remains more cautious, reflecting a hesitation between tradition and innovation. This divergence manifests itself in two different approaches: Asian cinema has been observed to blend classical cinematographic techniques with video game interactivity and alternative narratives, whereas European cinema explores new storytelling modes with a view to establishing a thriving genre of 3D and 360° video-film production.

Nevertheless, considerable challenges persist. Although technological tools and broadcasting platforms are increasingly available, access to personal immersive equipment among the general population remains limited.

The hypothesis advanced in this study is twofold. Firstly, younger generations must be progressively acculturated to immersive imagery. Secondly, new narrative forms should be developed that move beyond the traditional frontal, mono-screen projection. Instead, the central creative principles should be the management of attention within the immersive environment and the facilitation of spectator-driven interactions, based on individual informational needs. This dual evolution points towards the

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establishment of a new creative and spectatorial paradigm. Thus, by fostering the adoption of interactive technologies and empowering the next generation of creators and audiences, Europe can play a decisive role in shaping the future of the audiovisual and film sector. Enhancing its capacity to innovate in production, narrative form, and audience engagement is essential to maintaining its cultural, technological, and economic influence. Strengthening these dimensions will help ensure that Europe remains a competitive and influential actor within the global innovation landscape.

4. PRESENTATION OF WORK

In addressing the reception of Mixed Reality practices, and of related technologies more commonly referred to under the umbrella term Extended Reality (XR) — encompassing Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) — this study first examines the emergence of these technologies within the contemporary media landscape. Over the past two decades, XR has asserted an increasingly prominent presence, progressively permeating not only the media industries themselves but also a wide array of sectors where the media structures play a critical role. This sustained expansion has had a profound effect on media consumption practices at large and is now exerting a growing transformative impact on both the film industry and the broader entertainment sector.

Building upon the work of numerous scholars, this study recognises that emerging media technologies are exerting a notable influence on the social cognition of audiences, particularly among younger generations. The evolving relationship between cinema and Mixed Reality technologies is most evidently manifested in the phenomenon of their hybridisation. This report offers a historical account of this process, tracing its origins to the early 1970s, when initial attempts at hybridisation were observable both through the development of innovative technologies in their prototype forms and through experimental practices within cinematic production.

The initial hybridisations of classical cinematic techniques and Mixed Reality technologies began to materialise in the early 2000s through the development of industrial formats. These innovations introduced a third dimension to the cinematic spectacle, expanded and multiplied the visual fields, incorporated spatialised sound systems, and integrated multisensory installations — including vibrational effects, pressure sensations, olfactory stimuli, optical illusions, and other sensory enhancements — within the architectural design of movie theatres. Furthermore, the widespread adoption of Video on Demand (VOD) services since 2007, propelled by the ascendancy of major streaming platforms, has significantly contributed to the desertion of traditional cinemas by audiences. This shift has been compounded by the fact that cinemas frequently find it challenging to offer a viewing experience that can adequately compete with the privacy and convenience afforded by home-based media consumption. Consequently, the cinematic landscape — and, more specifically, the processes of hybridisation between cinema and XR technologies — has become increasingly fragmented and differentiated across diverse national models.

Hybridisation subsequently emerged as a vehicle for the dissemination of widely distributed major productions; however, it did not supplant traditional cinematic formats. In the multiplexes constructed

over the past decade, theatres employing hybrid formats coexist alongside those maintaining conventional projection methods.

In response to this increasingly complex situation, we sought to analyse the incentive and financing policies supporting the hybridisation of cinema and XR technologies across different national contexts. To this end, we conducted a comparative analysis of policies implemented in five European countries and two non-European countries.

The findings reveal that the hybridisation between cinema and XR technologies remains inadequately supported across European countries, characterised by significant disparities, a lack of harmonisation, and minimal integration of creative education initiatives, where traditional training models continue to predominate. In contrast, the policies adopted in Canada and South Korea appear to be more coherent, structured, and sustained in their support for hybrid creative practices. This observation, grounded in a detailed quantitative and qualitative study, highlights the need to articulate arguments in favour of enhancing the attractiveness of European cinema by promoting both the production and the consumption of audiovisual works emerging from the hybridisation between cinema and XR technologies.

Acknowledging the evolving modes of social cognition induced by the massive use of media incorporating elements of XR technologies in their devices and recognising the risk that the creative and spectatorial ergonomics of cinema might remain constrained by creative and spectatorial models rooted in the 1970s, we initiated an experimental study focused on the cognitive factor underpinning all media experiences, namely spatial cognition. Informed by the recommendations of early twenty-first-century film theorists, we reconnected with the research traditions established, following David Bordwell's seminal contributions, by the Psychocinematics school, particularly the work of Arthur Shimamura and Tim J. Smith, employing the eye-tracking method in our cognitive experiments to investigate the relationship between both classical and hybrid audiovisual formats and spatial orientation.

In collaboration with the CoCoLab technological research support platform of the Maison des Sciences de l'Homme et de la Société Sud-Est (MSHS Sud-Est) at Université Côte d'Azur (now UniCA), we developed an original experimental workstation, based on the Varjo and Tobii matrix systems, designed to study the perceptual behaviours of users engaging with both classical and hybrid cinema formats.

This study aimed to investigate the potential benefits associated with the integration of XR technologies within both classical cinema and hybrid cinema / XR products. The experimental results revealed substantial advantages in terms of spatial orientation, indicating a promising direction for future research and development in this domain. Eye-tracking data demonstrated a measurable

enhancement in spatial orientation among users engaging with hybrid formats compared to traditional cinematic experiences. These findings suggest that revitalising audiovisual consumption in Europe will require the mobilisation of financial and structural resources, including the reinforcement of creative education, to support the production of innovative formats capable of offering a competitive alternative to traditional VOD platforms. Two complementary strategies are envisaged: firstly, the revalorisation of multiplex spaces through increased immersion, interaction, and the blending of physical and virtual realities; and secondly, the advancement of XR technologies aimed at promoting greater economic accessibility and ergonomic refinement in next-generation VR and XR devices.

Through this renewed competitiveness, cinema may reclaim its position as a major medium within the global media landscape, fulfilling its historical role both as a driver of technological innovation and as a catalyst for the renewal of social bonds within viewing communities. This revival encompasses not only the architectural revalorisation of multiplex spaces but also the development of immersive sensory environments that blend in-person and remote experiences, thereby fostering new forms of collective cultural consumption.

Accordingly, our recommendations centre on the redesign and harmonisation of European funding mechanisms to support the creation and distribution of hybridised cinema integrating XR technologies, as well as on the investment in creative film education that explicitly incorporates XR. To illustrate this approach, we have developed a conceptual model for an innovative training programme within this emerging sector.

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5. AUDIOVISUAL CONTRIBUTIONS

Apart from our study, we have developed within the framework of REBOOT Programme several audiovisuals' contributions, classic and XR, as part of WP7.8 and WP5.3.

5.1. VR-Based Artistic Works (WP7.8)

The following three videos, along with the immersive scenario developed by Sara Tirelli, are provided for illustrative purposes (when viewing on a computer, it is recommended to select a higher resolution (preferably 1080p HD or 2160p 4K) and to prioritise activation of the '360° / 3D' mode).

- '43° 43' 23.7972' / 7° 21' 32.3022' - https://www.youtube.com/watch?v=NcBpqH_fhJ8
- 'LOOKING FOR AGNÈS' - https://www.youtube.com/watch?v=vOMG0dmcXqc
- 'FATHOMING' - https://www.youtube.com/watch?v=jZi5iOfLNf0

5.2. Videos for Cognitive Studies (WP5.3)

The following audiovisual resources were developed as part of cognitive testing protocols related to induced cognition in spatial orientation:

Classical content is intended to support conventional cognitive evaluations related to spatial orientation skills.

- *La Napoule Art Foundation CC* - https://vimeo.com/1034496770

Virtual Reality (VR) content was specifically designed to enable cognitive assessment under immersive conditions, targeting both spatial orientation perceptual mechanisms and processing.

La Napoule Art Foundation VR - https://www.youtube.com/watch?v=jFchzlQQPNs

6. CINEMA AND EMERGING TECHNOLOGIES: TOWARDS THE HYBRIDISATION OF TWO WORLDS

6.1. Preliminary Statement

In order to enhance the appeal and global competitiveness of European cinema, the EU's incentive policy in the film production sector must define, ponder, and implement a coherent strategy focused on the hybridisation of classical cinema and XR creative technologies.

This necessity stems from a rapidly evolving media environment, in which immersive experiences, interactivity, and new storytelling formats are reshaping audience expectations and global market dynamics. In the absence of strategic adaptation, European cinema risks losing ground/faces the prospect of relinquishing its competitive advantage to other industries that demonstrate a greater agility in integrating technological innovations. Prominent among these are the video game industry and the emerging audiovisual sectors in Asia and North America, which have already achieved a more rapid and systematic adoption of immersive technologies.

Strengthening Europe's position in this new competitive landscape demands proactive support for hybrid cinematic forms, fostering both innovation and cultural distinctiveness. Therefore, a coherent strategy for integrating XR technologies is critical to ensure not only the pursuit but the renewed global competitiveness of European film industries.

The present study aims to shed light on the reasons behind this strategic necessity and proposes pathways for boosting European cinema’s capacity for technological and artistic innovation.

6.2. The Rationale Behind the Hybridisation of Classical Cinema and XR Technologies

6.2.1. The Emergence of XR Technologies in the Current Media Landscape

A thorough analysis of the prevailing trends within the contemporary media landscape has revealed a substantial proliferation of Extended Reality (XR) technologies, encompassing Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), over the span of at least two decades (Rauschnabel et al., 2022).

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The applications of XR technologies have been identified across a broad array of sectors, including various domains of environmental media such as urban and peri-urban scenography, individual and collective mobility media, 360° and 3D geo-localised navigation, museology, the exhibition and event sector, performing arts, immersive telepresence, immersive e-commerce, social and mercantile metaverses, teaching and knowledge dissemination, as well as recreational and entertainment environments.

As of 2025, the publication of a comprehensive volume has offered a broad survey of the diverse applications of XR technologies, highlighting their profound influence on media practices and on a wide range of professional and educational disciplines (Vohra, ed., 2025).

Finally, In the field of media research, XR technologies provide access to highly valuable opportunities for data visualisation. Notably, the use of multimodal data collection within XR, such as eye-tracking (see further), which enables researchers to gain a deeper insight into the cognitive processes underlying the interactions between the viewer/creator and their environment.

6.2.2. The Impact of XR Technologies on Social Cognition

The production and use of media are giving rise to a new dimension of the so-called social cognition, evolving under the influence of the broader digital media ecosystem, in areas that are pivotal to the lifestyle of current generations around the world.

In the theory established by the renowned Canadian psychologist Albert Bandura from 1986 onwards (cf. Bandura, 1989), the concept of social cognition is delineated as the evolution of an individual's cognitive processes - such as perception, communication, language, thinking, memory, and problem-solving - all of which shaped by social and environmental factors.

A considerable proportion of this social cognition is determined by the use of various media, as well as by the appropriation and creation of the content they convey.

Since the development of this theory, the media landscape has undergone continuous transformation. The transition from the mass media of the late 1980s - such as print, cinema, radio, and television - to the digital media of the late 1990s marked a pivotal shift. Initially, digital media influenced and reconfigured traditional formats through the process of digitalisation. Following the advent of the smartphone in 2007, media consumption increasingly shifted towards mobile-based digital platforms, paving the way for the emergence of XR-based media.

In the light of the growing prevalence of immersive media, the need to update the theoretical framework initially proposed by Albert Bandura has become essential. This necessity has been underscored by numerous experts, who have identified significant shortcomings within the original model (Beyea et al., 2025).

All educational applications contribute to the enhancement of social interaction within processes of knowledge transfer and the dissemination of up-to-date information. In this context, XR facilitates the creation of realistic and interactive social scenarios, supports the improvement of user practices and social competencies, particularly by fostering empathy, understanding, and awareness of social diversity. As such, XR experiences have the potential to sculpt users' social attitudes and behaviours in real-world contexts.

Beyond existing applications, the repercussions of XR technologies may extend into new domains, notably through their creative convergence with media that, until recently, evolved according to their own internal dynamics. Cinematography - central to the REBOOT project - exemplifies this emerging layer of hybridisation.

6.2.3. The Potential Issue of Social Cognition Disparities Arising

Technological media, industrialised and widely disseminated, have formed an environment governed by major trends, including the proliferation of visual and audio information sources, interactivity, and immersion. While some media adopt an avant-garde position, assuming the role of pioneers, others conform to more traditional standards. This process is driven both, from industrial and commercial pressures, as well as a societal need to adapt to the evolving landscape of cognitive development (Pajares et all, 2009).

Cinematography that fails to consider these new patterns of social cognition - along with the creative and spectatorial ergonomics of media users, which encompass immersion, interactivity, and the blending of realities - risks further exacerbating the already patent gap between general media trends and the specific dynamics of cinema. This can be attributed to the medium's intrinsic characteristics: its continued reliance on photographic and audio recording, which inherently hinders the perceptual field, on linear, goal-oriented narrative structures, its conventional modes of spectatorship experience, largely confined to traditional settings - typically structured around frontal projection in darkened classic architectures or domestic settings, both of which offer limited opportunities for social interaction.

6.3. Towards a Historical and Prospective Hybridisation of Classic Cinema and XR

Nevertheless, a prominent trend has been observable over the past two decades - namely, the hybridisation of 'classical cinema' and XR technologies - although earlier, more experimental historical precedents can be identified. This tendency is not uniformly distributed across the global cultural landscape, as it benefits from varying degrees of institutional, governmental, and private-sector support.

The integration of Extended Reality (XR) technologies together with conventional filmmaking techniques represents a multifaceted set of opportunities, while also embedding inherent challenges. Ensuring the continued appeal of European cinema remains a primary objective, and it is imperative that EU incentive policies evolve accordingly to address the ongoing process of hybridisation in the audiovisual and film sector, innovation and global competitiveness can only be sustained through the establishment of a coherent policy framework that strategically incorporates XR technologies into the creative workflow.

Historically, cinema has always been at the forefront of technological innovation, persistently engaging with emerging technologies to shape new cultural narratives and visual storytelling methods. Over the past decade, a noteworthy acceleration has occurred in the convergence between conventional cinematic practices and XR technologies - comprising augmented reality (AR), virtual reality (VR), and mixed reality (MR) - captivating, engaging and creating new audience experiences. Rather than being an isolated phenomenon, this process aligns with recurrent patterns throughout the historical trajectory of the audiovisual and film industries, wherein successive technological advancements have consistently reshaped both formal conventions and institutional structures.

The sustained integration of spherical image capture, spatialised sound, multisensory effects, interactivity, and the amalgamation of mixed realities into cinematic practices reflects a complex interplay between photorealistic imagery rendered through real-world capture, synthetic environments offering varying degrees of sensory immersion, and visual conventions rooted in naturalistic perception. This phenomenon has been recurrent within cinematic experimentation over the past several decades.

Building upon the pioneering works of Ivan Sutherland (Sutherland, 1968), John Whitney (Whitney, 1991), and Morton Leonard Heilig (Morton, 1992), the origins of experimental cinema and video can be situated in the groundbreaking endeavours of the 1960s and 1970s. From the late 1970s onwards, the field witnessed significant advancements, largely propelled by the contributions of emblematic figures such as Nam June Paik (Zurbrugg & Paik, 1990), Bill Viola (Keith, 1998), and Bruce Nauman (Lewallen & Bowen, 2019). These artists consistently drew upon concepts that challenged and reconfigured the boundaries of traditional cinema, both in terms of artistic production - such as screenwriting and recording methods - and in terms of the viewing and auditory devices utilised, including performance hall architecture and individual and collective reception or participation mechanisms.

Over the course of the two decades from 2000 to 2020, alongside artistic experimentation aimed at expanding and transcending established cinematic aesthetic standards, a discernible rapprochement between cinema and the video game industry surfaced. By 2014, the video game industry had overtaken cinema to become the world's most lucrative cultural industry, generating revenues twice those of the film industry (Vosmeer & Schouten, 2014); significantly contributing to the evolution of the global media landscape. This shift has enhanced the cinematic sphere, incorporating the individual aspect of social competition through the interactivity of man/machine and man/machine/man-adversary dynamics (Vosmeer & Schouten, 2014). The hybridisation of cinematic narrative and video game scripting (Wibowo et al. 2024) has come to define a cultural policy within the intertwined economic realms of the gaming and film industries, particularly in countries like Japan (Otmazgin, 2022) and China (Kim, 2022).

Faced with these disruptions to the genre and these transdisciplinary interpenetrations, cinema, driven by its own dynamics, has sought to propose solutions since 2007. These solutions draw on standards previously tested, such as IMAX, which has been in existence since 1971. Following the transition to 'all-digital' in 2009, when digital postproduction accounted for 70% of films, technological adaptations became widespread across the industry. From this point onward, *immersiveness*, interactivity, multisensory experiences, and mixed realities have become central to any innovation influencing both film production and distribution.

The ascent of streaming services has progressively undermined the traditional cinematic distribution model. Launched by Netflix in 2007 through subscription-based VOD offerings and accelerated by the improvements in internet infrastructures, the market expanded rapidly during the 2010s with the entry of platforms such as Hulu and Amazon Prime Video, and later Disney+, leading to a profound

shift in consumer habits towards home-based, on-demand content consumption (Lobato, 2019; Tryon, 2013).

By the late 2010s and early 2020s, this shift had culminated in a substantial transformation of audience expectations, characterised by an increased demand for immediacy, content personalisation, and flexible viewing conditions (Courtois & Dwyer, 2020). The industry consequently witnessed a paradigm shift marked by direct-to-streaming releases, the erosion of exclusive theatrical windows, and the prioritisation of original content designed specifically for digital consumption. Streaming has thus established itself as a dominant force, fundamentally altering the relationship between audiences and cinematic experiences (Curtin & Sanson, 2016).

In this context, VOD platforms exert a dual influence: they compete directly with traditional production and distribution models, while simultaneously fostering new opportunities for hybridisation through the incorporation of immersive technologies. The development of dedicated platforms such as Arte 360° in Europe exemplifies this convergence between streaming services and extended reality formats. These dynamics signal not merely an adjunct to existing cinematic practices, but a redefinition of audiovisual culture itself, calling for strategic adaptation across the European film industry.

The architecture of cinema theatres has evolved in response to this trend, particularly with the proliferation of large immersive 3D theatres equipped with glasses. Noticeably, the Canadian IMAX standard saw significant expansion, reaching 1,000 screens by the end of 2015 and 1,300 theatres across 75 countries by 2017, predominantly in commercial multiplexes (Orzel, 2017). This growth has spurred the production of numerous high-profile blockbusters in stereoscopic 3D or featuring 2D/3D conversion (for example: *Dunkirk* - 2017, *Avatar: The Way of Water* - 2022, *Oppenheimer* - 2023, *Dune* - 2021 and 2024, *Civil War* - 2024).

Some of these productions also employ 'motion capture' technology to 'naturalise' 3D animation, taking another step toward refining the effect of blending realities. This is especially evident in the Chinese film industry, where 'motion capture' not only revives the traditional concept of *'suppositionality'* (*jiadingxing*) (Quah Sy, 2010) but also reinvents itself within the framework of 'virtual realism' (McGrath, 2021).

Other Asian film industries are attempting to follow the same path, both in terms of production and architectural developments, shifting the focus from 3D to the broadening and multiplying the viewer's visual fields. In 2009, the Asian group CJ 4DPLEX pioneered the 4DX room architecture, (adjustable

seats, a range of physical effects entailing vibrations, acoustics, olfactory sensations, and meteorological elements). In 2012, the ScreenX format further refined this pursuit, introducing a 270° projection spanning three screens, with a fourth a fourth added to the ceiling in 2020. Since its debut in Seoul, South Korea, in 2009, these innovations have been implemented in over 750 theatres across 65 countries. By 2019, approximately fifteen blockbusters per year were being showcased in this format, either designed especially for this format or adapted (e.g., *Alita: Battle Angel* - 2019, *Wonder Woman 1984* - 2020, *Spider-Man: No Way Home* - 2021, *Top Gun: Maverick* - 2022, *Napoleon* - 2023, *Furiosa: A Mad Max Saga* - 2024).

As evidenced, even prior to the digitalisation of the profession, and to a greater extent in its aftermath, the propensity for immersion, interactivity, multi-sensoriality, and the blending of realities has evolved from experimental phases to its consolidation in the establishment of industrial standards, thereby assuming a pivotal role in steering not only the production and architecture of films but also the economic, sociological, and cultural dimensions of cinema.

This inclination finds one of its most compelling articulations in the recent expansion of two major international film festivals: the Venice Film Festival's *Venice Immersive - Extended Reality (XR)* section, which in 2024 presented 63 projects both in and out of competition; and the Cannes Film Festival's newly established *Immersive Competition*, which featured eight VR productions in competition - including *En amour* by Claire Bardainne, Adrien Mondot, and Laurent Bardainne, exhibited at the Georges Méliès Creative Industries Campus of Côte d'Azur University in Cannes - alongside six additional works screened out of competition.

In view of the historical and increasingly evident convergence between cinema and XR technologies, it is clear that the transformation of audiovisual practices is no longer a speculative prospect but an ongoing and accelerating reality. Case studies ranging from early experimental cinema to contemporary large-scale productions demonstrate that hybridisation is reshaping not only the modes of production and experience, but also the ways in which films are distributed, consumed, and monetised. While such technological shifts are taking place globally, their integration within European cinema remains selective and uneven, lacking the support of a coherent policy framework. As the audiovisual and film sector enters a new phase of industrial consolidation and mainstream adoption, the absence of coordinated public support mechanisms risks sidelining both European institutions and creators in the global innovation race around interactive media. Against this backdrop, the following section provides a critical examination of national and international policy

responses, and evaluates their capacity to address the challenges and harness the opportunities presented by cinema - XR convergence.

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

7. EUROPEAN POLICY SUPPORT FOR THE HYBRIDISATION OF CINEMA AND XR

7.1. Introduction

In this study we examine different film funding policies, first in Europe, and then on an extra-European scale. Our criteria in this study concern the financial volumes of the aid in question and their strategies and structures, in order to arrive at contrasting results. We highlight the disparity and inequality of the aid granted separately by *five European countries* and we compare this image to *two strategies practiced on a global scale*.

These observations underscore the lack of a coherent and sufficiently ambitious European policy with regard to the integration of XR technologies into the wider ecosystem of audiovisual creative tools. In the absence of strategic and concerted investment in this area, the European Union runs the risk of being outpaced by extra-European industries - often rapidly developing - that have already embedded these technologies at the core of their innovation agendas.

Notwithstanding these advancements, a significant gap persists in the EU's policy configuration. Current support for XR technologies within the European film industry remains fragmented and inconsistent across member states. The disparities in funding allocations, coupled with the uneven and selective prioritisation accorded to XR in audiovisual initiatives, bring to the fore the pressing necessity for a more cohesive and harmonised policy approach.

This section evaluates the ways in which European policies might be more effectively aligned with the ongoing hybridisation of cinema and XR technologies. By identifying and addressing the limitations of the current policy landscape, it proposes strategic avenues for the integration of XR into the European audiovisual sector, with the dual aim of fostering innovation and safeguarding the distinctive cultural identity of European cinema.

By examining official public funding reports from five European countries (Belgium, France, Germany, Italy, and Luxembourg) alongside two non-European counterparts (Canada and South Korea), this section seeks to identify patterns, convergences, and divergences in policy approaches. It focuses on understanding how state support mechanisms contribute to fostering innovation within the audiovisual sector and to bridging the gap between traditional cinematic practices and immersive technologies. The findings aim to shed light on the underlying policy frameworks governing the

hybridisation process, whilst offering a comparative perspective intended to inform both academic inquiry and policymaking.

7.2. Research Hypotheses

Hypothesis 1: Europe's film system is characterised by significant diversity and a lack of coordination, with policies exhibiting fragmentation. This disunity warrants investigation, particularly in light of emerging trends such as the hybridisation of traditional cinema with XR (extended reality) technologies.

Hypothesis 2: No global framework or comprehensive policy currently exists to address the hybridisation between traditional cinema and immersive technologies.

7.3. Research Design

To investigate the hybridisation of cinema and XR technologies, a multiscale comparative study is employed. Comparative research is instrumental in identifying patterns, similarities, and differences across various contexts (e.g. Yin, 2018), allowing researchers to systematically appraise and interpret diverse data, thereby providing valuable insights into how state aids have influenced the hybridisation of cinema and XR technologies across different regions.

The present study undertakes a detailed documentation and categorisation of data drawn from a selection of state aid reports. Secondly, it examines the underlying principles that inform the allocation and utilisation of such aid. Finally, it scrutinises the effectiveness of these schemes with regard to public sector efficiency and their impact on fostering hybridisation between classical cinema and XR technologies.

7.4. Sampling

The careful selection of source materials is essential in qualitative research (Creswell, 2003; Flick, 2009: 131). In this study, purposive sampling is employed to identify documents that offer the most pertinent and insightful information regarding state aid schemes for film and XR technologies.

The sample under consideration comprises state aid reports from five EU member states (Belgium, France, Germany, Italy, and Luxembourg), and two extra-European countries (Canada, South

Korea). These countries were specifically identified within the REBOOT Grant Agreement (Grant No. 101094796) as key areas for comparative analysis.

Within Europe, Belgium and Luxembourg are notable for their exceptionally high rates of international co-productions, which make them central nodes in the networked structure of European film production. Their funding mechanisms and policy frameworks provide critical insight into the ways in which smaller countries can use cooperation and cross-border initiatives to stay competitive. Meanwhile, France, Germany and Italy are historically and structurally among one of the strongest film industries in Europe. As founding members of the EU, they have a mature and highly developed audiovisual sector, which is a traditional core of European film culture and political leadership. Studies reveal how large, influential players adapt to - or sometimes - resist, emerging technological shifts such as XR. Beyond Europe, Canada and South Korea's aid reports are selected. These countries are pioneers in terms of adopting multiplex theatres, innovative and interactive technologies and provide valuable comparative perspectives worldwide. The selected documents were obtained from the states' relevant public funding bodies and provide a solid basis for examining the commonalities, correlations, and links between state aid in these regions.

7.5. Limitations

This study is subject to several limitations. The primary limitation lies in the sample size, as the analysis is based on a limited selection of state aid reports, thus restraining the ability to extrapolate findings to the broader population of film funds. What's more, the observed discrepancies between national and regional data could result in disproportionate outcomes, complicating meaningful comparative analysis. Eventually, the absence of standardised data hampers the instruction of a clear and comprehensive picture of XR production across Europe. With some member states providing funding for XR / VR / AR projects while others do not, a disjointed landscape emerges, further obscuring the scope of XR production in Europe. In essence, the lack of transparency serves as a fundamental barrier to understanding the trends and challenges confronting the European XR sectors.

7.6. EU Policies and Funding Initiatives in the Audiovisual and Film Sectors

Previous REBOOT deliverables have already laid a significant foundation in the field of European policies and funding mechanisms in the audiovisual and film sector. *D2.1 (Competitiveness in*

European Law) provides a detailed analysis of the ways in which European Law establishes the legal foundation for public support mechanisms and policies aimed at enhancing competitiveness. Similarly, *D3.2 (Governance and Public Value)* examines the ways in which governance structures and public institutions contribute to the development of public value within the European film industry. This study builds on these findings but extends the focus to recent policy developments - on both European and national level - with regard to immersive technologies such as virtual, augmented, mixed and extended reality.

From, a historical perspective the European film industry has frequently been depicted as lagging behind Hollywood productions[1]. The preponderance of US films within the global cinema industry has prompted European nations to implement policies, in parallel with dedicated funding programmes and initiatives with the objective of upholding their national cinematic heritage and bolstering the production of European films.

European film policies have consistently acknowledged the contribution of films to culture, diversity, and identity. The Treaty of Rome (1957), which established the European Economic Community (EEC), primarily aimed at fostering economic cooperation, which would eventually evolve into political cooperation. While the treaty made limited reference to culture, it was the Treaty of Maastricht in 1992 that placed cultural issues at the heart of European Union priorities. Specifically, the Treaty of Maastricht, also known as the Treaty on European Union, stated in Article 128 that the community 'shall contribute to the flowering of cultures of the Member States' and support 'the culture and history of the peoples', their cultural heritage, and 'artistic and literary creation, including in the audiovisual sector'. Conversely, the Treaty of the EU (Article 92-3) was the first to recognise that state aid rules should account for cultural objectives, emphasizing that 'aid to promote culture and heritage conservation should not affect trading conditions and competition to the common interest' (Treaty of the EU, 1992:17).

In 2001, the European Commission introduced the '*Cinema Communication*', which established the assessment criteria for state support for film production and other audiovisual works. Following three significant extensions (2004, 2007, 2009), the Commission ultimately adopted new rules for film support on 15th November 2013. The Communication on State Aid for Films and Other Audiovisual

[1] Katsarova, I. (2014). *An overview of Europe's film industry* (Briefing No. PE 545.705). European Parliamentary Research Service. https://www.europarl.europa.eu/RegData/etudes/BRIE/2014/545705/EPRS_BRI(2014)545705_REV1_EN.pdf

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Works[2] outlined the parameters within which member states could provide financial assistance (in the form of grants, tax incentives, or other financial measures) for film production, provided that they met certain criteria, such as contributing to the promotion of European culture, including storytelling diversity and access to creative works. Moreover, the financial aid must be proportional to the objectives pursued and should not distort competition in the internal market.

From 1992 to 2013, substantial efforts were made to support the European film industry, with the establishment of the *Creative Europe Programme* in 2014 standing out as the most significant. This initiative, which superseded the previous MEDIA, MEDIA Mundus, and Culture 2007-2013 programmes, is dedicated to supporting the audiovisual and cultural sectors. The inaugural *Creative Europe Programme* ran from 2014 to 2020, with a total budgetary allocation of €1.8 billion, signifying a 37% increase compared to the preceding Media and Culture programmes[3]. The *programme* is structured into three sub-programmes: the *Culture Strand*, the *MEDIA* Strand, and the *Cross-sectoral Strand*.

The overarching objective of the Creative Europe Programme is to cultivate collaboration and the exchange of knowledge among cultural institutions and artists across Europe and beyond, covering areas such as cultural heritage, literature and publishing, music, and performing arts. Additionally, it aspires to promote competitiveness, innovation, and sustainability within the European film and audiovisual industries. It encourages collaborative actions, including media literacy and the development of diverse news media environments. On the whole, the programme is open to Cultural Creative Sector (CCS) organisations from EU Member States, as well as from non-EU countries under certain conditions, assisting them in adapting to globalisation, digitalisation, and transnational challenges. The European Commission oversees the overall administration and management of the *Creative Europe Programme*, developing policies, setting priorities, evaluating grant applications, monitoring project implementation, and providing guidance and support to beneficiaries.

Regarding the second area, the Commission announced the creation of a platform for structured dialogue between the European VR / AR ecosystem and policy makers, known as the *European Virtual and Augmented Reality Industrial Coalition*, with the aim to help EU media benefit from these immersive technologies and the new ways of storytelling.

[2] European Commission. (2013). Communication from the Commission on State aid for films and other audiovisual works (Text with EEA relevance). Official Journal of the European Union, C 332/1. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013XC1115(01)
[3] The Creative program replaced the previous MEDIA, MEDIA Mundus and Culture 2007-2013 programs.

The global COVID-19 pandemic posed unprecedented challenges to European cinema, prompting the co-legislators to reinforce the 2021-2027 Creative Europe Programme in 2020, increasing its budget[4] to €2.44 billion. Concurrently, the Commission adopted an *Action Plan*[5] in December 2020 to support the *recovery and transformation* of the media and audiovisual sectors. This initiative focused on three principal objectives: first, facilitating recovery from the crisis; second, supporting the sector's green and digital transitions; and third, empowering individuals and enterprises across Europe. In relation to the second priority, the Commission announced the initiation of a platform for structured dialogue between the European VR / AR ecosystem and policymakers. This initiative, known as the European Virtual and Augmented Reality Industrial Coalition, seeks to enable EU media actors to harness the potential of immersive technologies and to explore new forms of storytelling.

Two years later, on 14th September 2022, the *Virtual and Augmented Reality Industrial Coalition* was officially launched. Until 2023, it held a series of workshops, engaging over 100 participants focused on VR / AR technologies and competitiveness. Subsequently, a citizen panel convened from February to April 2023 to provide recommendations that reflected their expectations for virtual worlds, placing emphasis on fairness, safety, and societal benefit. This process culminated in the development of a new strategy for *Web 4.0 and Virtual Worlds*, highlighting the importance of Europe's Single Market, its diverse cultural heritage, creative content, industrial strength, excellence, innovation capacity, educational systems, and robust legislative framework as key factors in establishing leadership, competitiveness, and technological sovereignty in this domain.

With the publication of the *Communication on Web 4.0 and Virtual Worlds* in July 2023, the Commission formally affirmed the pivotal role of virtual world technologies in crafting the future of the creative industries within Europe. In response, the EU, through the Creative Europe Programme, allocated nearly €85 million[6] in 2023. A significant portion of this support was directed towards European cooperation projects, the circulation of European literary works, platforms promoting emerging artists, pan-European cultural entities, and networks of cultural and creative organisations. In greater detail, under the MEDIA Strand, a total of €139 million in grants was allocated for the promotion of digitalisation in the audiovisual industries and the development of immersive content within the augmented and virtual reality sectors. The following section outlines the funding schemes

[4] https://culture.ec.europa.eu/creative-europe/about-the-creative-europe-programme
[5] https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_20_2250/IP_20_2250_EN.pdf
[6] https://commission.europa.eu/strategy-and-policy/eu-budget/performance-and-reporting/programme-performance-statements/creative-europe-programme-performance_en

of five European member states, alongside their respective budgets dedicated to immersive technologies.

7.7. State Funding Mechanisms for the Audiovisual and Film Industries

European countries supply state aid not only for the development, production, and distribution of films to wider audiences, but also to support the broader audiovisual economy. This includes grants, subsidies, and fiscal incentives aimed at attracting both new and established filmmakers. Furthermore, national schemes promote cinema and protect cultural heritage. These support mechanisms vary across countries, covering all stages of film production - scriptwriting, development, production, distribution, and promotion. On top of that, they extend beyond feature films to encompass other audiovisual works, including TV series, VR / AR / XR projects, interactive media, video games, and user-generated content.

This section examines the film industries of five EU member states (Belgium, France, Germany, Italy, Luxembourg), focusing on their respective funding programs and their transition towards immersive technologies (AR / VR / XR). This transition is not merely technological; it represents a fundamental redefinition of the viewer experience, transforming EU audiences from passive consumers into active participants within hybrid physical and digital environments. It is important to highlight that this shift aligns with the European Commission's broader strategy and initiatives surrounding Web 4.0 and Virtual World Technologies.

7.8. The Belgian Film Industry

The Belgian film industry boasts a rich and dynamic history, spanning more than a century and playing a pivotal role in shaping the nation's cultural identity. Its varied cinematic output mirrors Belgium's unique multilinguistic and cultural composition. As a federal state, Belgium comprises three Communities - the Flemish Community, the French Community, and the German-speaking Community - and three Regions: The Brussels-Capital Region, the Flemish Region, and the Walloon Region. The first automatic aid schemes for film production were introduced in 1952[7]. Today, support for cinematic and audiovisual works is systematically organised at both the community and regional levels[8].

[7] https://orbi.uliege.be/bitstream/2268/322271/1/Public_funding_for_film_and_audiovisual.pdf
[8] https://rm.coe.int/mapping-film-funds-be/1680aed573

7.8.1. Mapping the Film Funding Landscape in Belgium

The *communities* lay out the main regulatory basis governing film and audiovisual funding. In particular, the *Centre du Cinéma et de l'Audiovisuel* (CCA) oversees the support policy of the French-speaking Community of Belgium. The CCA is financed through contributions from the Community itself, along with a levy system obliging television service editors and distributors to invest either in co-productions or directly into production funds managed by the Centre. The renowned public service broadcaster RTBF serves as a central partner within this ecosystem.

The CCA bestows financial support for an extensive assortment of works, covering feature films, short films, experimental projects, and television productions, as well as for distribution, promotion, and a network of specialised production workshops and training programmes. In addition, the CCA collaborates with its Flemish counterpart, the *Vlaams Audiovisueel Fonds* (VAF), through a joint feature co-production fund and reciprocal support for television documentaries.

The audiovisual industry in Flanders benefits from the support of the *Vlaams Audiovisueel Fonds* (VAF), which is funded by the Ministry of Culture of the Flemish-speaking Community of Belgium. Since 2005, the VAF has experienced a positive trend in its income. However, funding for VAF's traditional activities - such as film and television production, promotion, research and development, and training - experienced a slight decline in 2010, coinciding with the establishment of a new fund, Mediafonds. The Mediafonds was created to tackle challenges faced by local production companies, particularly the decline in broadcaster investment in independent productions. In 2011, the Mediafonds had a total budget of EUR 6.5 million, funded jointly by the Ministers for Media and Culture.

At the regional level, *Wallimage* operates as the official fund in the Walloon region. It serves as a development-oriented entity and is the only regional fund in the area. Wallimage is divided into two subsidiaries: Wallimage Coproductions, which invests in co-productions beneficial to the region, and Wallimage Entreprises, which supports innovative audiovisual companies operating locally. Since 2009, a specific initiative, *Wallimage / Bruxellimage*, has been in place, funded equally, with 50% provided by the Walloon Region and 50% by the Brussels-Capital Region. This initiative aims to invest in productions that meet qualifying spending levels in both regions[9] (p.116).

[9] http://www.catalogus.boekman.nl/pub/P19-0348.pdf

In the Flemish region, *Screen Flanders*[10] delivers capital support to audiovisual productions that earmark all or part of their budget to activities within the region. Belgian producers can apply for refundable advances of up to €400,000 to cover production expenses in Flanders, while foreign producers may access this funding by entering into co-production agreements with eligible Belgian producers. Screen Flanders also functions as the central film commission for the Flanders region, offering support and guidance to both domestic and international filmmakers regarding location scouting, incentives, and production and post-production services. The fund operates with an annual budget of €3.5 million, allocated by the Flemish Agency for Innovation and Entrepreneurship (VLAIO), and managed by the Flanders Audiovisual Fund (VAF).

Finally, *Screen Brussels*[11] is an audiovisual economic fund offering financial support to audiovisual productions in the Brussels-Capital Region. Its goal is to generate long-term innovative benefits for the region's audiovisual industry, with positive outcomes extending to European filmmakers. To qualify for funding, projects must meet specific cultural and economic criteria, such as demonstrating a minimum eligible expenditure within the Brussels-Capital Region, securing part of the required funding before applying, and/or being affiliated with a commercial production company based in Belgium. Screen Brussels operates with an annual budget of €3 million to support a range of audiovisual formats, including feature films, television series, animated films, documentaries, web series, and emerging formats like virtual reality (VR) and 360° or 180° media. Belgian producers can apply for refundable advances of up to €500,000[12] for eligible expenses within the Brussels-Capital Region, while foreign producers may access the fund by forming co-production agreements with qualifying Belgian producers. To qualify, (co-)productions must demonstrate a minimum investment of €250,000[13] in the Brussels-Capital Region.

Regarding *indirect public funding*, Belgium has implemented a robust tax shelter system, which applies across all Communities to incentivise audiovisual productions within the country. The *tax shelter* is a mechanism supervised by the federal state of Belgium that enables producers to raise funds while allowing investors to receive a small return by directing part of their tax payment directly to an audiovisual or film production. Thus, the tax shelter system serves a dual purpose: on one hand, it promotes cultural diversity by enabling the financing and realisation of numerous audiovisual

[10] https://screenflanders.be/en/about-us/
[11] https://screen.brussels/en
[12] EAO. (2019*). Mapping of film and audiovisual public funding criteria*, p.131
[13] EAO. (2019). *Mapping of film and audiovisual public funding criteria*, p.133

projects; on the other, it aims at an economic goal by raising funds, boosting the film industry, and increasing expenditure within Belgian territory simultaneously.

The tax shelter mechanism can be summarised as follows: an investment company commits to financing an approved audiovisual work from a producer, who must not be a production or broadcasting company. The investment company must either be based in Belgium or be a Belgian (subsidiary) establishment of a foreign company. This rule also applies to production companies. The commitment is formalised through an agreement, which is typically supervised by an intermediary company. The investor then has three months to pay the full amount promised, while the producer has 18 months to cover the planned expenses that will contribute to the development and production of the audiovisual work. Moreover, the investment company receives tax advantages. The investment can be deducted from the investor's taxable income, thus lowering their tax liability. Finally, the system follows a strict approval process. Only audiovisual works that meet specific criteria - such as cultural relevance, economic impact, and potential for success - are eligible for the tax shelter mechanism.

7.8.2. Critical Analysis

Belgium's public film funding model is not centralised at the national level; rather, it adopts a distinctly decentralised[14] character. This implies that various linguistic communities - Flemish, French, and German - as well as different regions - Brussels, Flanders, and Wallonia - offer distinct mechanisms for film funding. As Steele (2016) observes, public film support in Belgium emerges from a complex interplay of regional, communal, and transnational networks. More specifically, regional production subsidies such as Wallimage, while primarily aimed at fostering local talent and production, frequently engage in transnational co-productions - particularly with France - driven by both cultural affinity and strategic opportunity. The international success of Francophone Belgian cinema, especially in France and at global film festivals, often translates into tangible benefits for the regional industry, by attracting further investment and raising the profile of local filmmakers and production resources.

In addition, Belgium's internal regional divisions - both linguistic and territorial (between Wallonia and Brussels) - further complicate the concept of a unified 'national' cinema, thereby rendering the 'region' a more fitting framework through which to analyse film production and identity. As such, it

[14] Compendium of Cultural Policies and Trends. (2017). *Belgium: Cultural policy profile* (November 2017 ed.). Retrieved from https://www.culturalpolicies.net/wp-content/uploads/pdf/belgium/belgium_112017.pdf

becomes evident that both the funding and production of Francophone Belgian cinema are deeply enmeshed in transnational collaborations, chiefly with France, alongside robust regional support and the solidarity fostered by linguistic communities. Steele's (2016) 'transnational regional' perspective thus offers a valuable lens through which to understand how these intersecting dynamics shape the Belgian film landscape - from funding schemes and co-production strategies to distribution practices and the evolving definition of cinematic identity.

7.9. The French Film Industry

France has exerted a profound influence on global cinema for over a century and remains one of the world's leading film-producing nations. According to data published by *Statista*[15], 2023 marked the strongest year for French film and television exports since the onset of the pandemic. Furthermore, the CNC Report (2023) indicates that a total of 287 feature films were approved that year - including 54 documentaries and 13 animated productions - with overall investment reaching €1.18 billion.

The French film industry is heavily subsidized by a variety of funding bodies and initiatives, consisting of a complex system of subsidies, tax credits, and other funding initiatives. France has always encouraged the creative and industrial components of cinema, from production to distribution. Therefore, as cinema evolves, so do the funding systems designed to support it. As it will be shown in the following paragraphs, the French state has lately welcomed immersive technologies (virtual reality, augmented reality, mixed reality, extended reality) as critical components of its cinema industry, and has applied several related funding mechanisms, recognizing in this way their impact both on storytelling and the experiences for audiences.

7.9.1. Architecture of National Support Schemes and Institutions

France's film industry benefits from a diverse range of state aid mechanisms operating at both national and regional levels. These mechanisms play a vital role in ensuring that French cinema remains both competitive and at the forefront of innovation. The principal institution responsible for administering public support is the *Centre National du Cinéma et de l'Image Animée* (CNC), established in 1946. As the primary governmental body overseeing the French film and audiovisual sector, the CNC sustains and promotes national production through a wide array of targeted

[15] Statista Research Department. (2024). *French movies and TV shows exports - statistics & facts*. Statista. https://www.statista.com/topics/12082/french-movies-and-tv-shows-exports/

programmes. Notably, the 1992 *Décret n°91-1131* formally recognised cinema as an art form, thereby justifying its eligibility for public support. Under the authority of the Ministry of Culture and Communication, the CNC manages numerous funding schemes aimed at fostering production, distribution, technological innovation, and the integration of emerging formats such as virtual reality (VR), augmented reality (AR), and mixed reality (MR). It is also responsible for regulating and promoting the industry both nationally and internationally.

The support provided by the CNC[16] divided into two main categories: 'automatic' and 'selective' funding. Automatic support functions as a form of virtual credit based on a film's financial performance - namely box office receipts, DVD sales, and television distribution revenues. This mechanism serves as a barometer of a film's commercial success: the higher the revenue generated, the greater the available funding. Importantly, these funds are restricted and must be reinvested in future productions. In contrast, selective support is awarded to projects deemed culturally valuable, irrespective of their commercial prospects. This type of funding is typically allocated to independent producers in the form of recoupable loans. As part of the French government's broader strategy to stimulate the cultural and creative industries, two notable funding instruments have recently been introduced: the *Fonds d'aide au jeu vidéo* (FAJV), which supports video game development, and the *Fonds d'aide à la création immersive* (FACI), dedicated to the creation of works incorporating immersive technologies.

The *Fonds d'aide au jeu vidéo* (FAJV) is a selective funding mechanism designed to promote innovation and creativity within the video game sector. It primarily targets the pre-production phase, offering support to developers in the creation of non-commercial prototypes. Applications are assessed by a commission of experts, which submits its recommendations to the President of the CNC, who ultimately makes the final decision regarding the allocation of funds. The aid is capped at 25% of eligible R&D expenditure[17], defined as all pre-production costs incurred up to the development of a non-marketable prototype. For Small and Medium-sized Enterprises (SMEs), this ceiling is raised to 35%. Half of the aid is granted in the form of a repayable advance. Once approved, the aid remains valid for one year, within which the agreement between the beneficiary and the CNC must be formalised.

[16] Serra, F. (n.d.). *Management of creative business processes* (Master's thesis, Copenhagen Business School). CBS Research Portal. https://research-api.cbs.dk/ws/portalfiles/portal/58432630/francesca_serra.pdf

[17] Centre national du cinéma et de l'image animée (CNC). (n.d.). *Support Fund for Videogames*. Retrieved April 21, 2025, from https://www.cnc.fr/web/en/funds/support-fund-for-videogames_191823

The *Fonds d'aide à la création immersive* (FACI) was established in 2022 to support authors and producers - whether associations or companies - wishing to develop interactive and immersive audiovisual works. The fund offers support across various stages of the creative process, including writing, development, and production. It is open to production entities based in France, provided that their chairperson, director, or manager, as well as the majority of board members, hold French nationality. As with the FAJV, grants are awarded by the President of the CNC following evaluation by a professional committee. This committee assesses projects based on their alignment with the selection criteria specific to each scheme.

In addition to the CNC, the role of SOFICA (*Sociétés de Financement du Cinéma et de l'Audiovisuel*), public investment companies established in 1985, is also noteworthy. Their primary function is to raise private funds for audiovisual and cinematographic projects that have already received approval from the CNC. Private investors who choose to subscribe to a SOFICA can benefit from a tax reduction equal to 100% of their investment, up to a maximum of €18,000.

Regarding tax incentives, the French state provides funding for both national and international productions. For national productions, the Crédit d'Impôt Cinéma (CIC) reduces the production costs of films made in France. It offers a 20% tax credit for French production companies, applicable to 80% of the below-the-line budget. To qualify for the CIC, producers must pass a cultural test, requiring at least 38 points out of 40. Factors such as the nationality of the cast, shooting locations, and post-production activities are crucial in the evaluation process.

For international productions, the Tax Rebate for International Productions (TRIP) applies to works wholly or partly made in France by a foreign company. These productions must incorporate elements of French culture, heritage, or territory. The TRIP is selectively awarded by the CNC to the line producer in France and covers 20% of eligible film expenses incurred within the country. However, the eligible expenses cannot exceed 80% of the total film budget.

Finally, foreign production companies and/or producers can access the services provided by *Film France*[18], a network of 40 local film commissions across the country. Film France offers comprehensive information on studio facilities, locations, post-production services, crews, and suppliers.

[18] Film France. (n.d.). *About us*. Retrieved April 21, 2025, from https://www.filmfrance.net/en/about-us/

At the regional level[19] (European Commission 2019: 271), several regions, departments, and cities have established funds to support film production. Among the most significant in terms of investment are Île-de-France (the largest film production centre in France), Nouvelle-Aquitaine (a leader in developing immersive experiences), Hauts-de-France, Provence-Alpes-Côte d'Azur, Grand Est, and Bretagne. These regional funds work in conjunction with national initiatives to provide additional support to filmmakers, especially those working on projects that promote local culture, attract tourism, or incorporate immersive technologies. Most regional bodies establish their own support policies, with the cultural value of the film project being the primary factor for funding. While the majority of funding supports French-language films, some regions also welcome foreign productions.

7.9.2. Critical Analysis

France serves as a quintessential example of a highly interventionist film subsidy culture in Europe (Messerlin & Vanderschelden, 2018). The French government has long adopted a 'promotive and/or protective policy' model (Messerlin & Parc, 2014) aimed at fostering both quality and diversity within the film sector. While direct public aid, provided by the CNC and the regions, constitutes the primary source of funding, it is further complemented by tax incentives, an indirect public funding mechanism. However, as noted by Messerlin and Vanderschelden (2018), the film support system in France is complex and somewhat dysfunctional due to the blending of grants and public subsidies with tax relief for private investors. Specifically, they argue that despite the country's robust funding mechanisms, the subsidy scheme yields mixed results: while it has been successful in cultivating a strong French cinema industry (largely through the efforts of the CNC), it falls short when it comes to enhancing audience engagement and demand.

To assess the effectiveness of the subsidy system, Messerlin and Vanderschelden (2018) estimate the 'true' size of the French film industry and the subsidy rate. Their findings reveal that the 'subsidy rate' constitutes approximately one-third of the industry's value added. Notably, they identify a gap between the steady appeal of French films and the sharply increasing subsidies, suggesting that the subsidy policy has not succeeded in enhancing audience engagement. They argue that while film production has risen with the availability of subsidies, this increase can be viewed as an automatic response rather than a result of strategic policy success.

[19] Commission Européenne. (2019). Film funds: Final report (Rapport CB944929). Commission Européenne.

While the French subsidy regime has contributed to increasing the diversity of the French audiovisual industry, it has done little to boost audience demand for French films. According to Messerlin and Vanderschelden (2018), this is due to the high cost of the French film funding policy, which ultimately proves ineffective in engaging audiences. They conclude by questioning whether a non-subsidised film industry could thrive as well as one that is heavily subsidised, pointing to evidence that supports this possibility.

It is clear that the French film production system faces several challenges, which could be addressed through a comprehensive modernization process aimed at achieving global leadership and capitalizing on the opportunities presented by market internationalization and production scaling. This strategic shift towards internationalization, diversification, and adaptation is embodied in the France 2030 Plan[20], announced by President Emmanuel Macron in 2021. The plan is primarily focused on enhancing the attractiveness and appeal of France, positioning the country as a leading international hub[21] for film and digital productions. Central to this initiative is the coordination of investments in technical manufacturing resources and training to align with market trends. This integrated approach presents an opportunity to strengthen local ecosystems, bringing together top-tier studios, training, and talent, while adhering to the highest international standards in film and digital production.

7.10. The German Film Industry

After WWII and the devastation of the German film industry, German cinema has successfully transformed into one of the strongest in Europe and worldwide. According to Statista[22], the revenues of the German film industry in 2023 saw a sharp increase (929.1 million euros) compared to the three years affected by the pandemic. On a global scale, Germany consistently ranks among the top ten[23] film markets, highlighting its critical role in the international cinema landscape. This prominence is bolstered by a robust network of four federal/national and fifteen regional film funding

[20] Centre national du cinéma et de l'image animée (CNC). (n.d.). *Appel à projet France 2030 - La grande fabrique de l'image : sur les studios et la formation*. Retrieved April 21, 2025, from https://www.cnc.fr/professionnels/aides-et-financements/multi-sectoriel/appel-a-projet-france-2030--la-grande-fabrique-de-limage--sur-les-studios-et-la-formation_1672282
[21] https://www.cnc.fr/web/en/news/the-national-centre-for-cinema-and-moving-images-cnc-develops-new-means-to-promote-the-french-image-industry_1580634
[22] Statista Research Department. (n.d.). *Cinema revenue in Germany from 2003 to 2023*. Statista. Retrieved April 21, 2025, from https://www.statista.com/statistics/382665/cinema-revenue-germany/
[23] Film Distributors' Association. (n.d.). *Worldwide box office: Top 10 territories*. Retrieved April 21, 2025, from https://filmdistributorsassociation.com/the-industry/databank/worldwide-box-office/top-10-territories/

institutions that offer various support mechanisms, including grants, loans, tax incentives, and both automatic and selective funding.

7.10.1. Presentation of Funding Bodies and Schemes

The German Federal Film Board (FFA)[24] is the national film funding institution of Germany, supporting all aspects of the country's cinema. It functions both as a funding body and as the central service hub for the German film industry. Its budget is primarily funded through the film levy', a contribution collected from cinemas, the video industry, and television.

The FFA offers direct public financial support for feature films across all stages of production and exploitation, from script development and production to distribution, sales, and video distribution. Beyond film funding, the FFA plays a vital role in preserving German film heritage, promoting German cinema internationally, and supporting film education initiatives. As a central service provider for the German film industry, the FFA also analyses and publishes key market data on the film, exhibition, and video sectors within the country.

The FFA provides funding for film production in two forms[25]: a) *selective*, project-based funding and b) *automatic*, performance-based funding, known as reference film funding. Selective funding is granted based on decisions made by committees that assess the screenplay's quality, audience figures, and the project's economic viability. It is provided as a repayable loan of up to one million euros for both German film projects and international co-productions. In contrast, reference film funding is allocated according to performance indicators that measure the output at various stages of the film production and market process. This funding is in the form of grants and is primarily intended for new film productions. However, producers may use the funding either for the development of new projects or to increase the nominal capital.

The second national funding scheme is the *German Motion Picture Fund* (GMPF)[26], which aims to strengthen Germany's competitiveness and innovation as a film production hub. With an annual budget of 10 million euros, the GMPF operates similarly to the DFFF, offering automatic funding without requiring a jury review. The GMPF can be combined with other public subsidies, but the total funding cannot exceed 50% of a project's overall budget. The smallest national funding body in

[24] Filmförderungsanstalt (FFA). (n.d.). *Home*. Retrieved April 21, 2025, from https://www.ffa.de/home.html
[25] https://www.ffa.de/files/ffa/en-download/ffa_overview_englisch_2020_web-1.pdf
[26] Federal Government Commissioner for Culture and the Media (BKM). (2024). *Guidelines for the German Motion Picture Fund (GMPF)*. https://www.kulturstaatsministerin.de/SharedDocs/Downloads/DE/2024/2024-Guidelines-GMPF-EN.pdf?__blob=publicationFile&v=2

Germany is the *Kuratorium junger deutscher Film*, which receives support from the German states. This foundation focuses on promoting emerging filmmakers (talent films) and children's cinema.

Furthermore, the Federal Government Commissioner for Culture and Media (BKM) is responsible for the support, development, and production of feature films, documentaries, children's films, and short films. Overall, BKM aids the production of cultural films through several mechanisms. Firstly, the German Federal Film Fund[27] (DFFF), an indirect public support measure, aims to enhance Germany's appeal as an international film production hub. According to the DFFF report, if a feature, documentary, or animated film is produced in Germany with at least 25% of the budget spent locally, the producer may be eligible for a grant of up to 20% of the approved costs. In some cases, this grant may reach 25% depending on the amount spent in Germany. A production service provider may apply for DFFF II if the film's budget exceeds €20 million and the German production costs exceed €8 million. In such cases, a grant of up to 25% of the approved costs can be obtained. Since its launch in 2007, the *DFFF I* scheme[28] has allocated a total of €777 million in subsidies to 1,489 film productions. In 2017, *DFFF II*[29] was introduced, providing €133 million to 19 film productions. By 2023[30], these schemes had attracted €5.5 billion in investments within Germany, meaning that every euro contributed by the fund generates an additional €6 in investment. Secondly, BKM supports the production of cultural films through selective funding and awards. For example, the German Film Prize (formerly known as the Federal Film Prize) is awarded to productions with a culturally outstanding program. It is granted annually in spring or summer and is juried by members of the German Film Academy.

At regional level, film funding schemes are available in each German region. By and large, they provide grants in the form of repayable loans, to be repaid from the proceeds of the exploitation - usually after the recoupment of the producer's own costs. The main objective of these regional schemes is to promote the regional film culture and industry; consequently, territorial spending obligations constitute the main criterion used in the selection process. The main regional funds are Film- und Medienstiftung North Rhine-Westphalia (NRW), FFF Bayern, Medienboard Berlin-Brandenburg (MBB), Filmförderung Hamburg Schleswig-Holstein (FFHSH), MFG Baden-

[27] file:///C:/Users/minak/Downloads/24_DFFF_GMPF_AtAGlance_EN-2.pdf
[28] German Federal Film Board (FFA). (2024). *DFFF & GMPF - At a glance*. https://assets.ctfassets.net/22n7d68fswlw/1LoxYcnsALXEA5WsnHX7zG/f0cbb5a9320979c8df88dacf39d31480/DFFF_GMPF_AtAGlance.pdf?utm_source=chatgpt.com
[29] Federal Government Commissioner for Culture and the Media (BKM). (n.d.). *Welcome message*. DFFF. Retrieved April 21, 2025, from https://dfff-ffa.de/index.php?grusswort-bkm-engl
[30] Filmförderungsanstalt (FFA). (2024). *Spotlight on film funding in Germany 2024*. https://www.ffa.de/files/ffa/av-info-publikationen-downloads/spotlight_on_film-funding_in_germany_2024.pdf

Württemberg, Mitteldeutsche Medienförderung (MDM), operating in Saxony, Saxony-Anhalt and Thuringia, Nordmedia fonds in Lower Saxony and Bremen, Hessische Filmförderung in Hessen, and Kulturelle Filmförderung MV Mecklenburg-West Pomerania (KFF).

7.10.2. Critical Analysis

The German film industry presents a *federalist, multilevel structure* (Bomnüter, 2019), which distinguishes itself from other European governance models. A key element of the German model is that it is decentralized and involves substantial central state funding alongside extensive regional schemes of funds throughout its federal states (Länder) (Murschetz et al. 2019). The system utilizes diverse public funding schemes, including both automatic and selective ex-ante grants. Financial grants are the main tools utilized to achieve film policy objectives and are run by national bodies like the German Federal Film Board (FFA) and the German Federal Film Fund (DFFF), as well as approximately 15 regional film funding authorities. These agencies are engaged at various stages of film production, distribution, and display (Bomnüter, 2018).

According to Bomnüter (2018), Germany adopted the New Public Management (NPM) paradigm during the 1990s and it is exactly this paradigm that has contributed extensively to the formulation of German film policy. In this way, the integration of economic considerations into the organizational logics of film funding institutions was achieved, as well as traditional cultural policy goals. Thus, the current system represents a hybrid model that balances market-oriented reforms with cultural orientations (Bomnüter, 2018). Broadly speaking, German media and cultural policy aim to guarantee media freedom and diversity. Specific film policy objectives are to advance the quality and diversity of German films and support emerging talents. Federal-level funding initiatives also focus on the economic aspects of filmmaking and the promotion of culturally significant national projects.

Despite its major support from the public, the German film governance system is beset by several serious challenges. For instance, the complex and fragmented nature of its multilevel and multi-institutional funding landscape can give rise to inefficiencies, like in the field of ‘subsidy tourism’ where producers overtly navigate regional funds (Bomnüter, 2018). Furthermore, there is a weak linkage between the funding allocation processes and the non-monetary public benefits, raising concerns over the actual cultural value that gets prioritized. Apart from that, there are also concerns regarding the risk of misdirected investment, where securing state aid might overshadow the pursuit

of profitability or audience needs. Lastly, the general ambiguity in overarching policy objectives, particularly for the support of national cultural identity, can also appear very problematic.

On the other hand, it is undeniable that public funding has been crucial in the establishment and maintenance of the German film industry's image. Economically oriented funding bodies have contributed to the augmentation of domestic market shares as well as the promotion of global co-productions. In general, the growth in co-productions reflects Germany's appeal as a location for film shooting and contributes to the representation of German films at international film festivals. Nevertheless, while co-productions have augmented, the international market presence of purely German productions, particularly in film markets such as the US, is comparatively weak. Bomnüter (2018) further states that the governance system may support film production effectively, but the challenges of international distribution and market penetration remain inadequately addressed.

To conclude, the German film governance system is complex, characterized by heavy public investment and a unique federalist structure. While this governance system has been essential for the establishment of a relatively strong domestic film industry and in encouraging international co-production, the system presents some serious problems regarding its complexity, the direct correlation between funding and cultural impact, and the misallocation of funds. A possible reform of the governance structure might thus be required to improve the efficiency and efficacy of public film funding concerning both cultural and economic objectives of the German film industry (Bomnüter, 2018).

7.11. The Italian Film Industry

Italy is considered to be one of the birthplaces of cinema and the home of the Venice Film Festival, which was created in 1932. It is one of the oldest film festivals in the world and serves as a foundation upon which the Italian film industry thrives, setting amidst a wide array of showcased international films. The Italian Ministry of Culture actively supports the film industry through funding, incentives, and policies for the production and distribution of Italian films. Italian filmmakers often collaborate with international partners in co-productions and take part in various global film projects. Nowadays, Italian cinema is one of the most dynamic and influential ones in filmmaking history, from its rich cinematic heritage to the contemporary contributions that continue to take place in world cinema.

7.11.1. Presentation of Funding Bodies and Schemes

The Italian Constitution[31] recognises cultural heritage and sponsorship as fundamental rights (Article 9), making this a widely debated issue across all institutional levels of the Italian government. After the constitutional reform in 2001, the government also introduced the principle of 'horizontal subsidiarity'[32] to support cultural activities. In Italy, public funding plays a determining role in the support and promotion of investment in the film and audiovisual industry, and it can take the form of tax credits and national and regional incentives, which are regulated by Law 220/2016[33]. Nowadays, Italy has a well-established system of state aid for its creative industries, with several national and regional funding bodies playing key roles in supporting today the development of films, video games and immersive technologies.

The ***Italian Ministry of Culture (Ministero della Cultura, MiC)*** is one of the principal funding institutions supporting Italy's cultural industries, including cinema and digital media. *MiC* administers the *Film Distribution Fund* which is a support scheme introduced into the Italian legislation (Law no. 220 of 2016) for the granting of contributions to support the distribution of Italian films with primary theatrical exploitation beyond Italian borders. This fund provides three types of financial support: *automatic grants*, *selective grants*, and *tax credits*[34].

On one hand, automatic grants support Italian production companies by evaluating their past works' artistic, economic, and cultural impact. Results are determined using a points-based system. The awarded funds can be reinvested in developing, producing, and distributing new documentaries. On the other hand, selective grants cover both TV series and single productions and their distribution on cinema, TV and web. Selective grants are attributed for *Screenplay Development* (exclusively for authors), *project development and pre-production series*, *production.* Finally, a tax incentive system was introduced in Italy in 2009 and operates for production, distribution and exhibition as well as for investment in production by companies and individuals external to the sector. The *tax credit* allows the possibility of offsetting tax liabilities with credit matured following investment in film. A *tax shelter* is also available for film production and provides the opportunity to benefit from a tax shield for the portion of profits invested in the production of films. Production tax credits apply to films of all genres,

[31] Italian Senate. (n.d.). *Constitution of the Italian Republic* [English translation]. https://www.senato.it/documenti/repository/istituzione/costituzione_inglese.pdf
[32] Horizontal subsidiarity is the sharing of powers between several levels of authority, a principle which forms the institutional basis for federal states.
[33] Italy for Movies. (n.d.). *Automatic contributions (Law No. 220/2016)*. Retrieved April 21, 2025, from https://www.italyformovies.com/bandi/detail/76/automatic-contributions-law-no-2202016
34 FIPADOC. (n.d.). *Focus Italie*. Retrieved April 21, 2025, from https://fipadoc.com/en/focus-italie

including shorts, but not to television works. All films must pass a test to ensure eligibility. To produce Italian films, the tax credit percentage is 15% based on total production cost: producers' fees and distribution costs are excluded. The annual tax credit cap is 3.5 million euros per company and per year for Italian productions and 80% of the credit must be spent in Italy. Foreign films are eligible via an Italian executive producer or production service provider. Here the tax credit percentage is 25%, calculated on the basis of Italian expenses, which shall not exceed 60% of the total cost of the film. The tax credit cap is 5 million euros per project. Expenses incurred in other EU countries up to a maximum of 30% of the total cost of the film are also eligible. For official international co-productions, the film must qualify as an Italian film and the Italian co-producer may request the tax credit only for the percentage of rights that belongs to him or her. The tax credit percentage in this case is 15%, calculated on the basis of the percentage of total costs corresponding to the percentage of rights which the Italian producer holds.

Other Italian funds are the *'Minority co-production Fund'*, which concerns documentaries for theatrical release with an Italian minority co-producer and the *'International Co-production Funds'* which concerns the co-production with one or more foreign countries. Funding is available for feature films (minimum 60 minutes, theatrical release), TV series (co-development only; episode length between 20-90 minutes), fiction, animation, and documentary. This grant can be combined with selective grants. The aforementioned structured system fosters the growth of the Italian audiovisual industry, supporting projects of cultural significance while incentivizing international collaboration and market expansion. Another key-funding institution in Italy is the ***Istituto Luce-Cinecittà***[35] involved in the production and distribution of documentaries and films that aim to be screened in cinemas. Since 2024, it organizes courses in 'Digital Humanities' for audiovisual archivists, researchers, and training activities for the workforce, managers, students, and aspiring professionals in the film and audiovisual sector.

At the regional level, Lazio, Lombardy, Campania, and Piedmont offer funding programs that support the production and development of digital media. These regional initiatives are particularly important for promoting local talent and ensuring that the benefits of the digital media revolution are distributed across the country. Finally, the existence of the ***Italian Film Commissions Association***[36], comprising 20 Film Commissions located all over Italy, is a reference point for national and

[35] Cinecittà. (2024, April). *100 years of Luce*. Retrieved April 21, 2025, from https://cinecitta.com/en/2024/04/100-years-of-luce/
[36] Italian Film Commissions. (n.d.). *Homepage*. Retrieved April 21, 2025, from https://www.italianfilmcommissions.it/

international productions, investors, authors, professional operators and institutions active in the cinema and audiovisual sector. The Italian Film Commissions are organizations of associations that provide free of charge services such as logistic assistance, access to financial resources, the granting of permits, a mapping of qualified personnel and service providers and the search for locations. It aims at stimulating investments in the cinema and audiovisual sector in the individual regions, offering a unified image of the Italian world of cinema narrated in its regional specificities, promoting the different territories in correlation with their distinctive cultural, artistic, touristic, landscape and industrial features. Encouraging territorial development on a global scale, the Italian Film Commissions association works to reinforce relations with institutions and organizations at the national and international levels. It ensures its members receive constantly updated information on activities within the sector and develops system initiatives for the promotion and development of the Italian audiovisual industry. Particularly important are the actions related to the organization of joint activities and presence at the most important film festivals and fairs in Italy and abroad. The Italian Film Commissions encourage the realization of international co-productions and operational and development partnerships. The mission of the association includes the promotion and protection of the quality of services for audiovisual productions and the operational enhancement of structures associated with the organization of initiatives for training and update. One of Italy's newest commissions is ***Veneto Film Commission*** *which* was founded in 2020. It is the only regional commission to provide calls for XR and virtual proposals. It offers location scouting grants and production funding beyond that to assist local film and TV shoots. The production fund distributes 4.4 million euros per year in two calls. Features and TV series can receive up to 300,000 euros, if they spend at least 30% locally. Documentaries, shorts, and XR content can receive up to 50,000 euros a project if they spend 60% locally. A points system considers the screenplay quality, production company and proposal solidity, the director's and team's credits, and promotional benefits for the region. In the Venice region, ***La Biennale di Venezia*** is the central cultural institution that hosts the Venice Film Festival. It collaborates with *Veneto Film Commission* for the promotion of the local film sector, the support of filmmakers, and the promotion of the region as a prime destination for high-level filmmaking. Apart from that, *La Biennale di Venezia* is also well-known for its prestigious prizes like the *Golden Lion* (for the best national participation)*, the Golden Lion* (for the best individual participant in the main show)*,* and the *Silver Lion (for the most promising young participant in the main show).* Finally, there is also the ***Venice Immersive*** *section* in the Venice International Film Festival of La Biennale di Venezia which is entirely devoted to immersive media, and awards prizes to productions of creative expression: immersive videos and XR works of any length, including installations, haptics and virtual worlds.

7.11.2. Critical Analysis

Film public funding is widely regarded as one of the most significant mechanisms for the management of a nation's film industry. However, its efficacy remains a contentious issue within academic and policy debates. In the case of Italy, Teti et al. (2018) argue that the system of state subsidies in place from 1995 to 2003 failed to revitalize the national film industry. The central issue, they contend, was the inability of state-funded films to recoup their production costs at the box office. Notably, films designated as being of 'national cultural interest' often underperformed commercially, despite receiving public financial support.

This era has been characterized as a case of government failure, attributed to a confluence of factors including bureaucratic inefficiencies and the political influence of Prime Minister Silvio Berlusconi, whose dual role in media policymaking and private media ownership raised concerns about conflicts of interest. According to Teti et al. (2018), the political environment fostered a subsidy mechanism that prioritized production entities over the development of a robust and competitive cinematic ecosystem.

Overall, the Italian subsidy framework during this period is broadly viewed as ineffective in achieving its dual cultural and economic objectives. While it succeeded in supporting films with niche cultural significance, it largely failed to generate popular appeal or sustainable industry growth.

Building on this critical perspective, Meloni et al. (2018) investigated the impact of public subsidies on the success of Italian films produced between 2002 and 2011. Their study employed a comparative approach, analysing a range of indicators - including box office revenues and accolades from film festivals - to assess the effectiveness of Italy's public film financing system. The results reinforced the concerns raised by Teti et al. (2018), suggesting that public funding did little to enhance either the commercial performance or the perceived quality of Italian cinema.

Meloni et al. (2018) concluded that subsidized films tended to underperform in comparison to their non-subsidized counterparts, both in terms of quantitative success (box office receipts) and qualitative recognition (festival awards). These findings further challenge the assumption that state support necessarily leads to cultural or commercial enrichment in the cinematic sector.

In sum, the Italian state film funding system has long been plagued by structural shortcomings, particularly with regard to generating positive economic outcomes and fostering sustainable industry growth. In an effort to address these persistent weaknesses, the Italian government introduced Law

220/2016 (see Section 1.1.1.5), seeking to establish a more effective and coherent framework inspired by the French model. As part of this legislative reform, the 'Fund for the Development of Investments in Cinema and Audiovisual' (*'Fondo per lo sviluppo degli investimenti nel cinema e nell'audiovisivo'*) was launched in 2022. The fund was designed to stimulate private investment and enhance the overall competitiveness of Italy's film and audiovisual sector.

Nonetheless, a fundamental challenge endures: the system remains heavily reliant on public subsidies, which are both limited in scale and subject to political and fiscal volatility[37]. Despite policy efforts to incentivize private sector participation, the actual involvement of private investors remains marginal. Leogrande (2025) underscores the critical need for greater diversification of funding sources, advocating for a more balanced model in which public subsidies are complemented by robust industrial policies, international collaboration, and the strategic use of tax credits. In this view, fiscal incentives and broader industrial strategies are not peripheral tools, but essential pillars for ensuring the long-term viability of Italy's audiovisual industry.

7.12. The Luxembourg Film Industry

Luxembourg, despite its modest geographical scale, stands as a sovereign and independent state whose film industry has emerged as a remarkable example of creative dynamism and immersive innovation. Since the 1980s, the country has experienced a significant cinematic transformation, marked by a sustained growth in both production and international collaboration. According to a 2017 report by the European Audiovisual Observatory[38], Luxembourg produced 53% more films as a majority co-producer than as a solely national producer - an indicator of its strategic positioning within transnational production networks.

Guy Daleiden, director of the Film Fund Luxembourg, has highlighted the substantial evolution of the sector, which now supports the production of between 25 and 30 films annually, spanning feature films, documentaries, and animated works. Notably, the Luxembourgish film funding model is entirely state-financed, underscoring the vital role of public support in cultivating this vibrant and outward-looking industry.

[37] NSS Magazine. (2024, April 9). *The reform of public funds for Italian cinema is causing criticism*. https://www.nssmag.com/en/lifestyle/39028/reform-public-funds-italian-cinema-new-rules-criticism
[38] Talavera, J. (2017). *Film production in Europe: Production volume, co-production and worldwide circulation*. European Audiovisual Observatory. https://rm.coe.int/filmproductionineurope-2017-j-talavera-pdf/1680788952

7.12.1. Presentation of Funding Bodies and Schemes

Luxembourg's film sector is supported by two principal public institutions. The first is the *Centre National de l'Audiovisuel* (CNA)[39], established in 1989, which is entrusted with the preservation, conservation, presentation, and promotion of the nation's audiovisual heritage. The CNA plays a multifaceted role that spans production, distribution, archiving, and educational outreach. It also maintains a media library (*médiathèque*) and a specialized research library that serve as key resources for both professionals and the public.

Although the CNA does not directly fund film productions - except in the form of scholarships for student graduation films - it does participate in the production of documentary works that are thematically aligned with Luxembourg's national heritage. In this capacity, the CNA acts less as a financier and more as a cultural custodian, shaping national memory through audiovisual storytelling.

The principal funding body dedicated to the audiovisual sector in Luxembourg is the *Fonds National de Soutien à la Production Audiovisuelle*, more commonly referred to as the *Luxembourg Film Fund*[40]. This specialized public institution operates under the authority of the Ministry of Communications and Media (*Service des Médias et des Communications*) and is tasked with implementing the government's audiovisual and cinematographic policy.

The Luxembourg Film Fund plays a central role in supporting the industry's development by allocating financial aid across various stages of the creative process, including scriptwriting, project development, production, and distribution. Its support spans a wide array of formats - from feature films and short films to animation, documentaries, and television series. With an annual budget of approximately €30 million, the Fund promotes both domestic and international co-productions, all of which are eligible under a unified, selective funding scheme. This structure reflects Luxembourg's strategic ambition to position itself as a competitive and attractive hub within the European and global audiovisual landscape.

The Luxembourg Film Fund operates under the joint supervision of the ministers responsible for culture and for the audiovisual sector and serves as the primary instrument for the implementation of national support policy in the field of cinema and media. Beyond its financial support role, the Fund is also charged with the promotion of the Luxembourgish audiovisual sector, the negotiation

[39] Centre national de l'audiovisuel. (n.d.). *Centre national de l'audiovisuel*. https://cna.public.lu/fr.html
[40] https://filmfund.lu/

and development of international co-production agreements, and the certification of the nationality of audiovisual works.

The Fund offers two main support schemes for audiovisual productions: the *Audiovisual Investment Certificate Program* (*Certificat d'investissement audiovisuel*, CIAV) and the *National Audiovisual Production Support* (*Aide Financière Sélective*, AFS). Introduced in 1988, the CIAV provides financial support for film and television productions undertaken by nationally registered and approved companies based in Luxembourg. Projects are assessed via a cultural test, and successful applicants may receive up to €2.5 million per project.

The Luxembourg Film Fund collaborates actively with industry stakeholders such as the Luxembourg Film Academy, the Union Luxembourgeoise de la Production Audiovisuelle (ULPA), and the Luxembourgish Association of Filmmakers and Scriptwriters (LARS). It also represents Luxembourg in European and international frameworks, including the *Creative Europe* programme, thereby ensuring the country's continued visibility and strategic positioning within the broader audiovisual ecosystem.

In recent years, the Fund has notably intensified its support for animated films and extended reality (XR) projects, seeking to establish Luxembourg as a leader in immersive storytelling. This ambition was affirmed at the Venice International Film Festival, where two Luxembourg co-productions were featured among the five immersive works in competition[41]: *Oto's Planet* by Gwenaël François - primarily a Luxembourgish production involving Quebec and France - was awarded the *Venice Immersive Special Jury Prize*, while *Ito Meikyu* by Boris Labbé, a co-production with France, also received critical acclaim.

7.13. Critical Analysis for Europe

This section introduces the key dimensions identified across the national reports of five EU member states (Belgium, France, Germany, Italy, and Luxembourg). These criteria form the analytical foundation for assessing the structure, function, and strategic orientation of their respective film funding systems.

[41] Fonds national de soutien à la production audiovisuelle. (2024, 18 juillet). *Le Luxembourg fait sensation avec 5 œuvres immersives en compétition à la 81e Mostra de Venise*. Gouvernement du Grand-Duché de Luxembourg. https://cgid.gouvernement.lu/fr/actualites.gouvernement2024%2Bfr%2Bactualites%2Btoutes_actualites%2Bcommuniques%2B2024%2B07-juillet%2B18-mostra-venise.html

7.13.1. Funding Criteria

The five countries under examination employ varying institutional frameworks and funding mechanisms to stimulate their national film industries. Belgium, France, Germany, and Luxembourg have established dedicated public bodies tasked specifically with promoting and supporting audiovisual production. These agencies operate with a degree of autonomy and strategic focus, often in close collaboration with the industry. In contrast, Italy's primary funding entity remains the Ministry of Culture, whose broader mandate encompasses the promotion of arts and heritage across the national territory, including cinema. This distinction reflects differing administrative philosophies - between specialized agencies focused on sectoral development and more centralized, culturally embedded approaches to film support.

When referring to direct public funding, we denote the financial support allocated by public film funds to facilitate the development and production of cinematic works. This type of funding is typically granted at an early stage of the production process and may originate from national, regional, or community-level public agencies within the film's country of origin, as well as from minority co-financing countries participating in the project.

Our analysis reveals that the funding landscape in the five EU member states under study is broadly structured around two principal categories. The first consists of national or federal funds, which often require prior commitments - such as pre-sales or letters of intent - from distributors, broadcasters, or other market players as a condition for eligibility. The second category includes sub-national or regional funds, which tend to base their support on the projected number of shooting days and local expenditure within a given territory.

According to the 2024 report by the European Audiovisual Observatory (Graph 1), sub-national film funding bodies predominantly provide selective support, with 87% of their activity focused on the creation of new works. These funds are typically guided by dual objectives: to stimulate local audiovisual production and to advance regional cultural and identity-related goals.

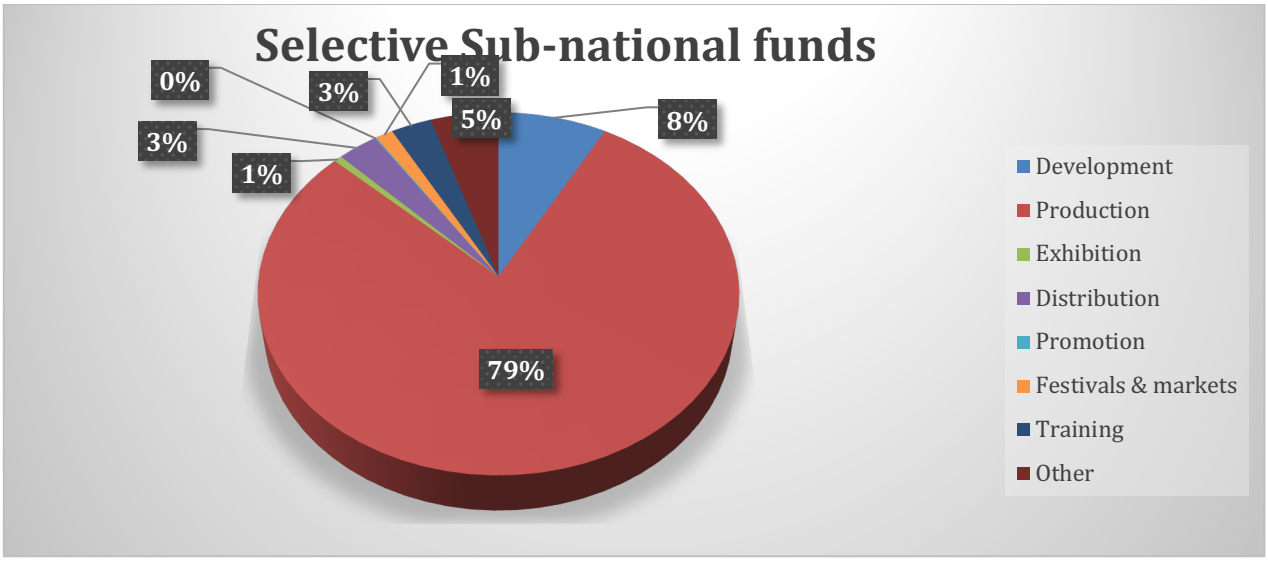


Figure 1: European Audiovisual Observatory Report 2024

In addition, direct public funding is granted through either *automatic* or *selective* mechanisms in the countries under study (Belgium, France, Germany, Italy, and Luxembourg). *Automatic funding* is primarily linked to the past performance of a work and is generally intended to sustain and incentivize ongoing investment in national and regional film and television production (Cucco, 2018: 266-268). Such funding is typically awarded based on a points system or other predetermined eligibility criteria: once a production or producer meets the requirements - often tied to an inward investment scheme - the funds are allocated with limited evaluative discretion.

Automatic schemes place little to no emphasis on the artistic or narrative quality of the projects and they are mainly designed to maximize local economic benefits, particularly through production expenditure within a specific territory. As illustrated in Graph 2, most automatic funding is directed towards production activities (63%), with smaller portions allocated to exhibition (23%), distribution (8%), development (1%), and other areas (6%). This distribution reflects the economic logic underpinning automatic schemes, which prioritise industry infrastructure and employment over content curation.

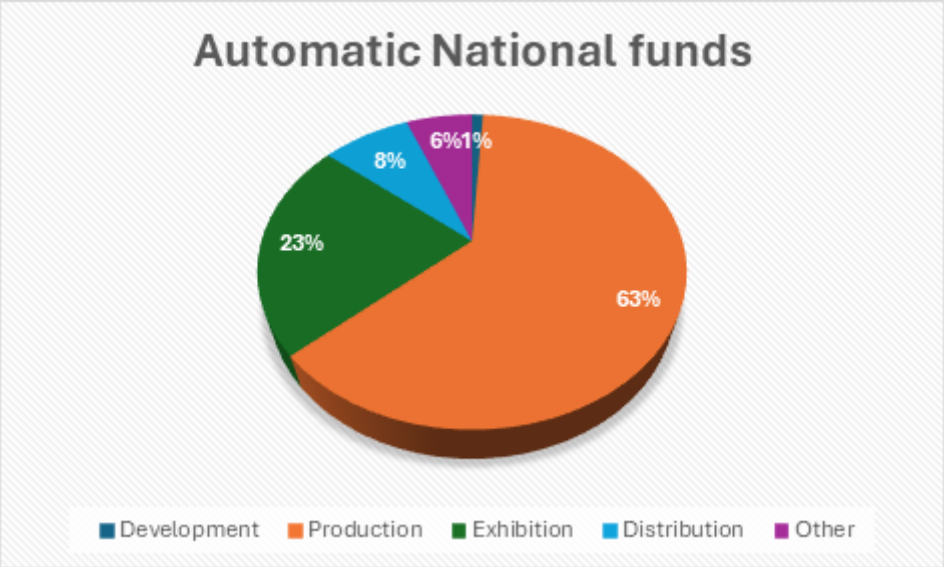


Figure 2: European Audiovisual Observatory Report 2024

Selective funding mechanisms, encompassing loans, awards, unconditional grants, grants-in-aid, and match funding, are characterised by direct state or regional financing and are therefore subject to public and industry scrutiny. Selection is typically based on qualitative criteria and is administered by committees or advisory boards, with support targeting creative projects such as screenwriting, film co-production (including animation and documentary), television productions, and XR / VR projects.

Owing to the requirement for formal project assessments, selective funding is generally perceived as a strategic tool for promoting high-quality creative outputs aligned with national cultural priorities.

Data from the countries examined indicates that selective funding predominates in public support schemes for film producers. As shown in Graph 3, selective funding spans a broader set of activities compared to automatic funding, including production (55%), development (6%), exhibition (5%), festivals and markets (5%), promotion (5%), training (6%), distribution (4%), and other activities (13%).

Thus, comparative analysis confirms that selective funding offers more diversified and widespread support across the film sector, while automatic funds remain narrowly focused, particularly on production. Selective mechanisms therefore constitute the principal mode of sustaining film-related activities in the European states analysed.

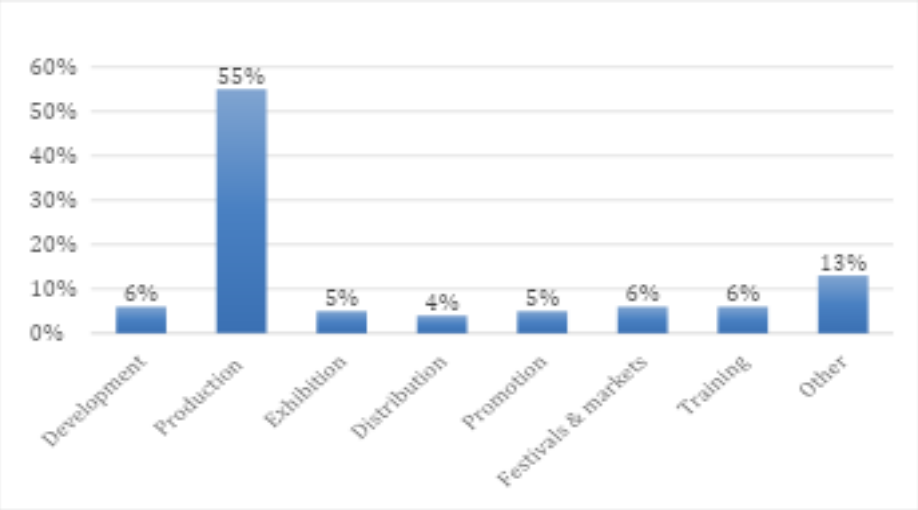


Figure 3: European Audiovisual Observatory Report 2024

Indirect public funding takes the form of fiscal incentives, which were first introduced in countries such as France and Germany during the 1980s and 1990s. These measures encompass a variety of financial tools - including tax shelters, tax rebates, and tax credits - designed to stimulate investment in audiovisual production. Typically, such incentives are calculated as a percentage of eligible production expenditures and are reimbursed *ex post*, once the spending has been completed and verified.

Fiscal incentives are primarily aimed at encouraging international co-productions and inward investment, thereby contributing both to the cultural enrichment and to the economic vitality of local communities. Rather than replacing direct public funding, these schemes generally function as complementary instruments. As noted by Talavera & al. (2016: 79) and Lind (2023), the introduction of new fiscal incentive mechanisms in a given country rarely leads to a corresponding reduction in the volume of direct state support, highlighting the increasing complexity and layered nature of national film funding ecosystems.

According to the *Cambridge Dictionary*[42], a tax shelter is defined as 'a way of investing or spending money that allows a person or company to avoid tax or to pay less tax than they would normally'. In practical terms, tax shelters refer to legally sanctioned strategies that enable individuals or corporations to reduce their taxable income. These schemes are often structured to attract high-net-worth individuals or firms with substantial tax liabilities, allowing them to deduct investments made in eligible audiovisual productions from their taxable income. While any long-term profits accrued

[42] https://dictionary.cambridge.org/dictionary/english/tax-shelter

from such investments remain subject to taxation, investors can still benefit significantly from these fiscal arrangements (Lind, 2023).

Lind (2023) further distinguishes between tax rebates and other forms of fiscal incentives. She argues that 'rebates are primarily driven by production spend rather than levels of investment', emphasizing that a tax rebate reimburses producers for a percentage of qualifying expenditure based on a set of regulated criteria. Unlike general tax incentives - which reduce a company's tax burden - rebates are paid directly from the state budget and are disbursed only after production expenditures have been completed and audited.

While tax credits and tax rebates serve comparable purposes - namely reimbursing a portion of eligible production costs - their mechanisms differ. A tax credit offsets the taxpayer's liability and becomes applicable only upon filing the annual corporate tax return. In contrast, a tax rebate constitutes a direct payment from a designated government fund, issued regardless of the taxpayer's existing liabilities. As such, tax credits benefit only those with outstanding tax obligations, whereas tax rebates can be accessed by producers irrespective of their tax position, thus offering a more universally accessible incentive.

Across the five countries analysed, all have implemented some form of tax incentive scheme to support audiovisual production (Table 1). However, the specific mechanisms and accessibility of these schemes vary significantly. With the exception of Belgium, Germany, and Luxembourg, film producers in the remaining countries - namely France and Italy - are eligible to apply for tax credits, which are granted based on qualifying production expenses and serve to reduce the producer's corporate tax liability.

In Luxembourg, by contrast, no tax credit system is in place. Instead, public financial support is channelled primarily through the National Audiovisual Production Support (*Aide Financière Sélective*, AFS), which operates under the Luxembourg Film Fund. The AFS provides discretionary loans to producers for the development, production, co-production, distribution, and scriptwriting of various types of works, including animation, fiction, documentaries, and extended reality (XR) projects. These loans are repayable from the future revenues of the funded works, thus combining public support with a performance-based repayment model that encourages commercial viability while mitigating financial risk.

Country	Funding Body	Direct public funding	Indirect public funding: Fiscal Incentives	
			Scheme name	**Scheme type**
Belgium	CCA	✕	Tax shelter	Tax shelter
Germany	FFA	✕	DFFF	Rebate
France (run by CNC)	CNC	✕	SOFICA	Tax shelter
			Credit d'Impot Cinema	Tax credit
			Credit d'Impot Audiovisuel	Tax credit
Italy	Ministry of Culture	✕	External tax credit	Tax shelter
			Producers tax credit	Tax credit
			International tax credit	Tax credit

Table 1: EU states' funding bodies and mechanisms

While the core structure of film funding schemes across the analysed European states reveals a high degree of similarity - particularly in their use of direct subsidies and fiscal incentives - important divergences emerge in terms of strategic emphasis and policy priorities. Certain countries place greater focus on territoriality, using funding mechanisms to anchor production activities within

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

national or regional borders, whether through inward investment conditions or local spending requirements. Others foreground the cultural dimensions of funded projects, incorporating criteria related to language, national identity, or gender equity.

Still others underscore the role of film funding as a driver of innovation and sustainability, aligning audiovisual policy with broader economic and technological agendas. These variations reflect not only national priorities but also evolving conceptions of the film industry's function - whether as a cultural good, an economic asset, or a vector of soft power in the global creative economy.

7.13.2. Cultural Criteria

State funding schemes often emphasize the cultural dimension of the projects they support. In Belgium (EAO 2019: 121-125), for example, the cultural test evaluates how closely a given production aligns with national or European identity by assessing several criteria. These include 1) the extent to which Belgium or another EEA member is represented in the setting of the film, 2) the nationality of the director or screenwriter, 3) the origin of the characters, and 4) the actors in lead and supporting roles. Additional elements considered are 5) whether the script is written in an official language of Belgium6), whether the project is based on a literary work of Belgian or EEA origin, and 7) whether the main theme relates to art or artists. The test also accounts for 8) the presence of historical figures or events, 9) the exploration of social issues relevant to Belgium or the EEA, and 10) the project's contribution to the preservation or revaluation of Belgian or European audiovisual heritage. These criteria reflect Belgium's commitment to supporting cultural specificity within a broader European framework, positioning film funding as both an economic tool and a vehicle of cultural policy.

In the case of the Luxembourg Film Fund, the amount of financial support awarded is calculated on the basis of the cultural, social, and economic impact of the audiovisual or cinematographic work. Eligibility for funding is strictly limited to individuals who are fully taxable residents of Luxembourg and whose primary professional activity is audiovisual production (see *Mapping*). In addition to production and co-production grants, the Luxembourg Film Fund also provides support for scriptwriting and project development. These forms of assistance may only be allocated to registered production companies based in Luxembourg, thereby reinforcing the Fund's strategic aim of fostering a nationally embedded, professionally structured audiovisual sector.

Both France and Italy assess film projects through structured cultural tests, which play a central role in determining eligibility for public funding. In France (EAO 2019: 274-281), the cultural test

evaluates four main dimensions: 1) the cultural content of the production, particularly the original language used, which must be either French or a recognized regional language; 2) the nationality of key personnel, including the director, screenwriters, composers, and members of the cast and crew; 3) the geographical location of the production; and 4) the production company, which automatically receives 10 points if it meets certain eligibility criteria.

In Italy (EAO 2019: 377-378), the evaluation framework is more quantitatively detailed. To qualify for basic public funding, a film must obtain at least 50 out of 100 points on a cultural test and satisfy a minimum of two cultural content criteria. These criteria include, among others, references to Italian or European literary works, history, folklore, society, art, culture, or the use of Italian locations for shooting. Projects that are designated as being of 'cultural interest' are eligible for enhanced levels of support. To receive this designation, a project must achieve at least 70 points on an additional evaluation, which considers 1) the quality of the project, including the script, creative team, and production feasibility, and 2) the track record of the director and screenwriter, such as past critical acclaim, awards, or festival recognition.

In the case of Germany (EAO 2019: 178-182), the cultural test is structured around three core categories: 1) the cultural content of the production, 2) the nationality of key personnel, and 3) the geographical location of the production. Each category comprises several sub-criteria, with points awarded on a scale depending on the degree of compliance. This scoring system allows for a flexible evaluation, where a project may earn between one and the maximum number of points available per category.

Within the cultural content dimension, eligible criteria include the use of the German language, the presence of German or EEA-specific landmarks and locations, the inclusion of main characters who are German or from an EEA member state, and thematic engagement with art, culture, history, religion, philosophy, or social issues. The *Bundesregierung für Kultur und Medien* (BKM) specifically rewards films that are deemed to have a tangible impact on German culture, which may include factors such as the language of the film, the nationality of the producer, or the producer's professional base being located in Germany.

Additionally, the *Filmförderungsanstalt* (FFA) requires that applicants commit to delivering a German-language version of the film as a condition for receiving support, thereby reinforcing the emphasis on national linguistic accessibility and cultural relevance.

Gender representation in film production is increasingly being integrated into the cultural criteria of EU member states' funding schemes. Projects led by female producers or directors are receiving growing institutional support, reflecting broader European objectives aimed at achieving gender equity within the audiovisual sector. According to the European Audiovisual Observatory[43] (Graph 4), the share of women among active professionals in the industry has steadily increased between 2013 and 2022, albeit with significant variation across countries.

Italy's Ministry of Culture[44] has reported a 52% increase in the number of productions directed by women compared to 2022, underscoring national efforts to reduce gender disparities in creative leadership. Similarly, the French *Centre National du Cinéma et de l'Image Animée* (CNC)[45] has introduced policy instruments specifically designed to incentivize gender-balanced productions, further embedding gender equity into the logic of public support.

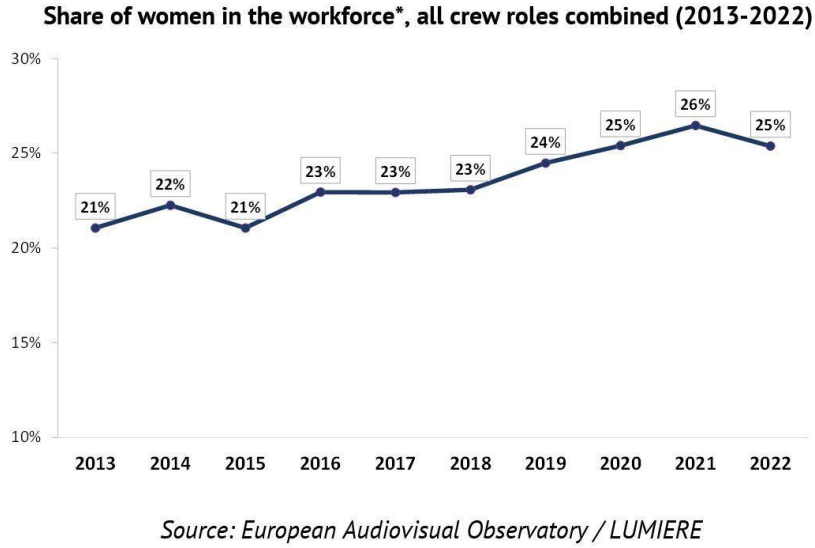


Figure 4: Share of women in the workforce

In sum, the structure of European audiovisual funding mechanisms reflects a complex and evolving interplay of cultural, linguistic, gender-related, and economic factors. Far from being neutral instruments, these funding programmes are deliberately crafted to advance the sociopolitical and

[43] European Audiovisual Observatory. (2023, October 26). *Only 26% of directors of European feature films are women*. https://www.obs.coe.int/en/web/observatoire/2023-press-releases/-/asset_publisher/0t9kVBabnI8V/content/only-26-of-directors-of-european-feature-films-are-women

[44] https://www.italyformovies.it/res/documents/public/Presentazione%20I%20numeri%20del%20cinema%202023%20inglese.pdf

[45] https://www.cnc.fr/professionnels/etudes-et-rapports/etudes-prospectives/les-oeuvres-audiovisuelles-aidees-en-2022-realisees-et-ecrites-par-des-femmes_2029589

cultural priorities of each EU member state. Whether through the reinforcement of national identity, the promotion of diversity, or the pursuit of economic competitiveness, public support for cinema serves not only as a financial tool, but also as a strategic expression of each country's vision for its cultural future.

7.13.3. Sustainability and Innovation Criteria

In recent years, the film industry has increasingly sought to reduce its environmental footprint by adopting a range of sustainable practices. These include the use of renewable energy sources, the integration of AR / VR / XR technologies into production workflows, and the implementation of waste reduction and resource efficiency programmes. This shift toward greener practices reflects not only a growing ethical awareness, but also compliance with evolving regulatory frameworks and the rising expectations of audiences for environmentally responsible content creation.

However, data on immersive film production and distribution in Europe remain fragmented. As of 2023, European-level funding bodies have not provided consolidated figures regarding the number of immersive projects supported. Instead, such data are only available at the national level, revealing a marked asymmetry between EU member states. Disparities are evident both in terms of total financial support allocated (in euros) and the number of funded projects, with significant variation in scale and intensity across national funding systems (Table 2).

Country	**Funding body**	**Number of immersive projects**	**Allocation**
Belgium	Screen.brussels	3 VR projects	No data
France	CNC	103 immersive creation projects	3.6 million euros
Germany	MBB	21 XR / AI projects (6XR & 15AI)	2.5 million euros

Italy	Ministry of Culture	No data	No data
	Biennale di Venezia	14 XR projects	No data
	Ministry of General Contemporary Creativity (digital & green investment)	1.860 projects	108 million euros
Luxembourg	Luxembourg Film Fund	8XR projects	No data

Table 2: Financial Support and Immersive Funded projects

For the Brussels-Capital Region, data are provided by the community funding body *screen.brussels*, whose 2016-2023[46] the report indicates that out of a total of 29 film projects granted funding in 2023, only 3 were virtual reality (VR) productions (Table 3). Statistically, this represents approximately 10% of the total number of supported projects that year.

This relatively modest proportion underscores the limited presence of immersive formats in the regional funding landscape, particularly when compared to more traditional genres such as feature films (14 funded projects) and documentaries (8 projects). The data suggest that while there is some openness to innovation, VR remains a niche category within Brussels' publicly funded audiovisual ecosystem.

Belgium (Screen Brussels) - Funding 2023		
Genre	**Numbers in 2023**	**Numbers 2016-2023**
Feature Film	14	110

[46] https://screen.brussels/sites/default/files/media/documents/2024-02/screen-brussels-bilan-2023-en-infographies-tableaux.pdf

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

Documentary	8	54
Animation (Feature & Series)	4	47
Live action series	3	Not specified
VR projects	3	6
Total	29	217

Table 3: Screen Brussels Report (2023)

A similar pattern emerges when examining the broader period from 2016 to 2023, during which VR projects constituted only a small fraction of the total number of funded productions. Out of 110 feature film projects, there were 54 documentaries, 47 animated works (including both feature-length and series), and just 6 VR projects that received public support. The same report by *screen.brussels* also provides a breakdown of investment by project type for the year 2023, revealing that the majority of funds were allocated to feature films (48%), followed by live-action and animated series (28%) and documentaries (14%). In this distribution, VR projects were grouped within the 'other' category, which collectively received only 1% of the total investment.

In summary, while immersive productions are present within the funding landscape of the Brussels-Capital Region, they remain significantly underrepresented both in number and in financial support when compared to more traditional formats. Nevertheless, their continued inclusion - however marginal - suggests a space for growth, particularly as audience demand, technological infrastructure, and policy frameworks evolve to better accommodate the expanding field of XR storytelling.

In the case of France, the *Centre National du Cinéma et de l'Image Animée* (CNC) published its annual report in 2023 (Table 4), offering a detailed analysis of public financial support for digital creation and video games. This type of funding plays a vital role in stimulating creativity and innovation across a wide range of digital art forms, including video games, immersive audiovisual experiences, and experimental contemporary works. The CNC's objective is to provide

comprehensive support throughout the entire lifecycle of digital projects - from pre-production and prototype development to the creation of intellectual property. The scheme also includes targeted support for writers and creators in the early conceptual stages, thereby fostering a fertile environment for new forms of storytelling and artistic exploration.

CNC - Support for immersive creation			
Aid	**Beneficiaries**	**Objectives**	**Report 2023**
Immersive creation support fund	• authors • producers	• promote the development of interactive and immersive audiovisual projects • stimulate the renewal and diversification of creative methods	€3.6 million for 103 projects: 29 beneficiaries of writing support (€288,000), 30 beneficiaries of pre-production support (€1.1 million), 30 beneficiaries of production support (€1.7 million) and 16 beneficiaries of event support (€477,000)

Table 4: CNC Report 2023

More specifically, the *Fonds d'Aide à la Création Immersive* (Immersive Creation Support Fund) supports interactive and immersive audiovisual works, including those employing virtual reality (VR) and augmented reality (AR) technologies. Designed to stimulate the development of immersive content and promote creative innovation, this fund allocated €3.6 million in 2023 across 103 projects. Funding was distributed across various phases of development, including writing, pre-production, production, and professional events.

While this financial support is essential in nurturing digital creativity, the amount dedicated to immersive creation (€3.6 million) remains relatively modest when compared to the budget of a single large-scale film production. Nevertheless, the fund's strategic allocation across different stages of

the production pipeline reflects a long-term vision aimed at ensuring both sustainability and structural growth in France's audiovisual sector.

In conclusion, the CNC's initiative represents a significant step toward supporting digital creativity and facilitating the broader digital transition of the French audiovisual landscape. It signals not only institutional recognition of immersive media as an emerging art form, but also a commitment to fostering the creative ecosystems that will shape the future of storytelling.

Germany can be regarded as a pioneer in the support of immersive content in 2023, having recognized early on the transformative potential of these technologies within the audiovisual sector. Through targeted funding for virtual reality (VR), augmented reality (AR), mixed reality (MR), and other interactive formats, German institutions have strategically positioned the country as a leader in innovative storytelling and next-generation content production. This proactive approach reflects not only a commitment to fostering technological experimentation, but also an understanding of immersive media as a key vector for cultural expression and industrial renewal in the digital era.

According to its 2023 annual activity report, the *Medienboard Berlin-Brandenburg* (MBB) funded a total of 21 XR / IAC (Innovative Audiovisual Content) projects, allocating €2.5 million to immersive and interactive works. This included €1.1 million for six XR games and €1.4 million for fifteen innovative audiovisual content projects. The funded works were actively represented at major international film festivals, including Cannes and Venice, underlining both the artistic calibre and the global visibility of Germany's immersive sector.

Beyond national support, the MBB has played a pivotal role in fostering international co-productions. Notably, it partnered with the Canada Media Fund to support three interactive co-produced media projects with a combined funding of approximately €400,000. This collaborative initiative exemplifies Germany's outward-looking strategy and commitment to cross-border innovation.

More broadly, MBB has emphasized the rapid growth and global orientation of the XR sector, investing not only in production but also in networking opportunities and transnational collaborations. These efforts contribute to positioning Berlin as a significant media innovation hub on the international stage. Finally, the MBB is also an active participant in the *Creative Europe MEDIA* programme, which further supports innovative projects and strengthens European cooperation in the audiovisual sector.

Such investments significantly contribute to strengthening Germany's creative industries while also demonstrating a clear commitment to diversifying the mediums through which stories are told. Projects such as *The Emperor* (winner of the Venice Immersive competition) and *From the Main Square* (recipient of the Grand Prize at the NewImages Festival and Best VR Animation at Kaboom) exemplify Germany's capacity to produce globally competitive immersive content. These accolades not only validate the strategic investment in immersive media but also serve to enhance Germany's visibility and credibility on the international cultural stage.

In the German context, traditional film production - particularly in the domain of large-scale feature films - often presents financial challenges due to high production costs. Immersive media, by contrast, appears to offer a more cost-effective alternative for audiovisual storytelling, particularly when combined with technological innovations such as artificial intelligence. The growing number of AI-related funding applications indicates a deliberate national effort to integrate AI into the content creation pipeline, thereby optimizing both creative potential and production efficiency.

Altogether, Germany is actively paving the way for a dynamic, technologically forward-looking, and creatively open audiovisual ecosystem - one that aligns cultural ambition with innovation-driven transformation.

In the case of Italy, all financial and production data are provided by the *Direzione Generale Cinema e Audiovisivo*[47]. According to its 2023 report on film and audiovisual production (Table 5), the Italian industry experienced a notable resurgence, with figures exceeding both 2022 and pre-pandemic levels. A total of 402 films were produced in 2023, marking a 13% increase compared to 2022 and a 23.7% increase compared to 2019. Of these, 262 were fully Italian productions, while 92 were co-productions, reflecting a sustained engagement with international collaboration.

In terms of gender representation, the report highlights a substantial increase in the number of female directors involved in both fiction and documentary filmmaking. Women accounted for 17% of all directors in 2023, representing a 52% rise compared to the previous year - an encouraging development in the broader effort to address gender imbalances in the sector. The total production expenditure for films in 2023 surpassed €700 million, constituting a 21% increase compared to 2022. These figures collectively indicate not only a strong recovery of the Italian film industry but also a progressive shift toward greater inclusivity and sustained investment.

[47] https://www.italyformovies.it/res/documents/public/Presentazione%20I%20numeri%20del%20cinema%202023%20inglese.pdf

Italy's Film & Audiovisual Production (2023)	
Cinema Production Growth	• 402 films were produced in Italy in 2023 (+13% on 2022), an increase on pre-pandemic numbers (+23,7% on 2019). • 262 films were 100% Italian productions and 92 co-productions. • increase in female directors (films and documentaries) both as a percentage of the total (17%) and in unit terms (+52% on 2022). • total cost of the films produced tallies to over €700M (+21% on 2022). • cost breakdowns demonstrate that approximately 57% of budgets come from 'other', attributable mostly to broadcaster and platform investment. • The largest quota of domestic public investment derives from tax credit: in 2023 tax credit for production alone came to €206.13 M (+17.6% on 2022). • 2023 registered an increase in tax credit requests in number of films (398) and credit amount (€225.26 M). • 60 to 80% of the films completing classification between 2019 and 2023 were distributed theatrically.
International Tax Credits	
Cinema	• 186 films requested international tax credit for a total of > € 513 M (from 2016 to 2023). • International tax credit was requested for 31 films in 2023 (40 in 2022) for a total of € 167M. • a total of € 1.38 B was requested in international tax credit.di euro (from 2016 to 2023).

Table 5: Italian Ministry of Culture Annual Report 2023

With regard to the total funding and the number of AR / VR / XR projects produced in Italy in 2023, the Ministry of Culture does not provide comprehensive or publicly accessible data. This absence of

centralised information highlights a persistent gap in institutional transparency concerning immersive media within the Italian funding landscape.

However, more detailed insights[48] are available through the *Venice Gap-Financing Market* (Table 6), an initiative organised under the *Biennale di Venezia* as part of the *Venice Production Bridge*. In 2023, this platform reported support for 14 immersive works, several of which were structured as international co-productions, notably involving partners from Germany and Quebec.

It is also noteworthy that the *Venice Production Bridge* benefits from additional funding provided by the *Creative Europe MEDIA* programme, specifically dedicated to the development and promotion of immersive audiovisual content. This reflects a growing reliance on European-level instruments to support emerging formats in the absence of detailed national-level strategies or reporting mechanisms.

Venice Gap-Financing Market (2023)	
Number of projects	**Genre**
34	26 Fiction Films
	8 Documentary projects
14	Virtual Immersive Story projects
11	Biennale College Cinema - Virtual Reality projects

[48] Out of a total of 283 project submissions, 48 were selected for participation in the 2023 *Venice Gap-Financing Market*, including 34 feature-length films and 14 immersive projects. This selection highlights the increasing visibility of immersive formats within the broader landscape of international co-production and market development. Several of the selected immersive projects were developed in collaboration with German partners, while others received support from SODEC (Société de développement des entreprises culturelles), the cultural funding body of the Government of Quebec. This illustrates the strategic role of transnational partnerships in advancing immersive media and securing diversified sources of funding across national and continental lines.

3	Biennale College Cinema projects

Table 6: Venice Gap-Financing Market Report 2023

Lastly, it is important to note that the Italian state has made substantial investments in digital and green innovation as part of a broader strategy for cultural and technological transformation. According to the 2023 report published by the *Ministry of General Contemporary Creativity*[49], a total of 1,860 projects were selected for funding under national programmes supporting innovation and digital transition, with a total allocation of €108 million.

These investments signal a strong institutional commitment to aligning cultural production with contemporary priorities such as environmental sustainability and digital modernization. While not all of these projects are strictly audiovisual in nature, they contribute to shaping an ecosystem conducive to cross-sectoral innovation - including immersive media, creative industries, and hybrid forms of artistic expression.

In the case of Luxembourg, the 2023 annual report of the *Film Fund Luxembourg* revealed that €38.2 million were allocated to support 75 projects across a variety of formats, including feature films, series, documentaries, and XR productions (Table 7). Despite its small size, Luxembourg continues to position itself strategically as an agile and innovative hub for both traditional and immersive filmmaking, leveraging public support to attract international collaborations and technological experimentation.

Numbers of funded projects per genre	
Feature-length fiction films	32
Feature-length animated films	14
Fiction series	8

[49] TOCC - Azione A2 - Direzione Generale Creatività Contemporanea

Animated series	3
Documentaries	6
XR projects	8
Short films	4
Total	**75**

Table 7: Film Fund Luxembourg Annual Report 2023

Among the 75 audiovisual projects supported by Luxembourg in 2023, 46 were feature films, including 32 fiction films and 14 animated productions, thereby reaffirming the country's continued commitment to traditional cinema. However, 8 of the funded projects were dedicated to immersive content creation, reflecting Luxembourg's strategic engagement with XR technologies. This shift aligns with broader European trends that seek to integrate technology into storytelling, offering new modes of audience engagement beyond conventional formats.

Luxembourg appears to be diversifying its audiovisual portfolio in a deliberate and calculated manner. By investing in XR, the country reduces its exposure to the high financial risks typically associated with large-scale traditional productions, while enhancing its potential cultural and commercial impact on both European and international stages. XR projects thus offer a lower-cost entry point into innovative markets, while still contributing to national cultural output.

Moreover, the fact that 38 out of the 75 supported projects were directed by Luxembourgian filmmakers, and 37 by international directors, illustrates the state's balanced approach between supporting local talent and fostering international collaboration. This openness to cross-border partnerships is especially valuable in the immersive sector, where projects often rely on global expertise in both technology and narrative innovation.

To summarize, Luxembourg's investment in immersive technologies illustrates a clear ambition to position itself as a competitive player in the evolving global content market. Through financial support for XR initiatives, the country is fostering a dynamic and sustainable audiovisual sector

capable of adapting to the challenges of the global film economy. Its strategy reflects a broader European tendency to integrate technological innovation into cultural production, with a focus on audience engagement and new forms of storytelling.

However, the data presented throughout this study reveal a fragmented and polarized funding landscape for XR projects across Europe. While countries such as Belgium (Screen Brussels), France (CNC), Germany (via MBB), and Luxembourg (Film Fund Luxembourg) have established dedicated mechanisms to support immersive content, others - such as Italy - continue to concentrate predominantly on traditional film and television formats through institutions like the *Direzione Generale Cinema e Audiovisivo*.

A recurring tension emerges between national funding priorities and the structural need for international collaboration. Although countries like France, Germany, and Luxembourg promote co-productions and transnational partnerships, funding criteria often require that expenditures be made within national borders. This results in a paradox: while internationalization is encouraged rhetorically and strategically, territorial constraints embedded in funding mechanisms may in fact reinforce fragmentation. The CNC's focus on national production, for instance, can at times limit the scope of cross-border cooperation, even though the institution also funds international co-productions.

Despite the presence of collaborative frameworks - such as the *Creative Europe MEDIA* programme, or bilateral partnerships like that between MBB and the Canada Media Fund - competition for resources remains a significant obstacle. National ambitions to strengthen domestic studios and production companies often lead to prioritizing local expenditure, thereby inhibiting the development of a truly integrated European XR ecosystem.

Nevertheless, co-production remains indispensable. The screen.brussels data highlight frequent collaborations with France, while Italy's main co-production partners include France, Switzerland, and Belgium. Germany's MBB has also demonstrated a strong commitment to international agreements and cooperative funding models.

In conclusion, while the European XR production landscape in 2023 is marked by innovation and regional dynamism, it continues to suffer from fragmentation, opaque data practices, and a lack of harmonized strategies. Each country maintains its own policies, priorities, and eligibility criteria, making collaboration more complex than it should be. The successes of regional hubs are real, but they are not yet embedded within a cohesive European vision for immersive media.

There are, however, signs of convergence. XR innovation is increasingly aligned with EU-level cultural and digital agendas, and the growing number of cross-border partnerships signals a latent potential for integration. Still, realizing a truly unified and competitive European XR ecosystem will require more coordinated policies, greater transparency, and robust support for international co-productions - building not only bridges between nations, but a common foundation for the future of storytelling in Europe.

A notable distinction emerges when comparing XR production trends between Northern and Southern European member states. Northern countries - including Germany, France, Belgium, and Luxembourg - have established robust, often well-funded ecosystems for immersive content development. These nations benefit from a combination of long-standing cultural funding policies, strong digital infrastructures, international networking capacity, and dedicated XR funding lines (e.g. *screen.brussels*, *Medienboard Berlin-Brandenburg*, CNC, and Film Fund Luxembourg). These structures allow for experimentation and early adoption of immersive technologies, reinforced by access to EU-level instruments such as *Creative Europe MEDIA* and collaborations with global partners.

By contrast, Southern European countries - with the Italian case as a core example - have tended to prioritize more traditional film and television formats in their national funding agendas. While there are emerging efforts to embrace digital and green transitions (based on the data by the *Ministry of General Contemporary Creativity*), immersive projects still represent a marginal share of the total audiovisual output. Limited institutional specialization, fragmented data collection, and a slower integration of XR-specific funding mechanisms contribute to this disparity.

This North-South divide reflects broader asymmetries in technological infrastructure, institutional agility, and access to innovation funding. It also mirrors discrepancies in how cultural innovation is positioned within national development strategies. While Northern states increasingly frame XR as a pillar of digital sovereignty and soft power, Southern states are still consolidating their foundational support systems before fully embracing immersive formats.

Addressing this imbalance requires more than isolated investments - it demands EU-level policy alignment, capacity building, and enhanced support for cross-border knowledge sharing, especially to include emerging XR creators and producers from the South in the larger European immersive ecosystem.

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

8. INTERNATIONAL POLICIES AND FUNDING SCHEMES IN THE AUDIOVISUAL / FILM SECTOR

This section focuses on the film industries of Canada and South Korea, with particular attention to the structure of their respective national/federal and regional funding institutions. The analysis centres on public funding mechanisms and tax incentive systems, examining how these instruments shape the development of national film sectors and support the integration of immersive technologies. By doing so, the chapter explores the broader role of state aid in fostering innovation and competitiveness within these two dynamic non-European film markets.

In its final part, the section offers a comparative analysis of international and European funding frameworks, highlighting the implications of these diverse models for global film production and distribution. Through this lens, the study seeks to illuminate how funding strategies influence not only national creative ecosystems, but also the global positioning of countries within the increasingly transnational audiovisual landscape.

8.1. The Canadian Film Industry

The term *'Hollywood North'* is commonly used to describe Canada's film and television industry, particularly concentrated in Vancouver and Toronto. This expression reflects a long-standing perception of Canada as a northern extension of the U.S.-based Hollywood system, owing to its close industrial ties, skilled labour force, and geographic proximity. Canadian actors and directors enjoy global recognition, and the country's audiovisual sector is showcased through numerous international film festivals that celebrate both domestic and international productions.

In recent years, the Canadian industry has experienced significant growth. The demand for production, post-production, and studio infrastructure has intensified, especially in the country's two major markets: Vancouver, which has become a key global production hub, and Toronto, a centre for both production and post-production. Meanwhile, Québec - particularly Montréal - has emerged as a strong contender, supported by a distinct cultural identity and robust provincial funding mechanisms. Calgary, Alberta, is also witnessing growing interest in studio development, signalling a diversification of production centres across the country.

April 2021 marked a turning point in the recognition of Canada's expanding role in North American film and television production. That month, Netflix[50] - the California-based digital streaming giant - announced the opening of its first Canadian corporate office in Toronto, a move widely interpreted as a strategic acknowledgement of Canada's growing importance within the global content production landscape.

Subsequent industry reports confirmed this upward trajectory. According to a 2022 publication by the Canadian Media Producers Association (CMPA)[51], the Canadian film and television industry experienced a 'robust rebound' in production activity between April 2021 and March 2022. During this period, total production volume surged by more than $2.5 billion, reaching a record-breaking $11.7 billion - an increase of nearly 22% compared to the previous high of $9.6 billion recorded in 2019-2020, prior to the COVID-19 pandemic.

The most significant growth was observed in foreign location and service (FLS) productions, which increased by 27.3% to $6.71 billion, as well as in Canadian television production, which rose by 38.9% to $3.51 billion. In the following year, the CMPA's 2023 report indicated continued growth[52], with total industry volume rising by 4.4% to $12.19 billion in 2022-2023. Once again, FLS activity played a central role, with foreign investments reaching $7.86 billion - a 3.5% increase from the previous year.

However, despite this sustained growth, the Canadian sector faced new challenges in 2022-2023. Labour strikes in the United States significantly disrupted production activity, both in Canada and globally, leading to notable slowdowns across the industry. This underscores the extent to which Canadian production remains intricately linked to U.S. industry cycles, particularly in the FLS segment.

8.1.1. Presentation of Funding Bodies and Schemes

Several federal and regional film funding institutions play a pivotal role in the success of Canada's audiovisual sector. The country's decentralized support structure fosters the emergence of new filming hubs beyond the major centres of Toronto, Vancouver, and Montréal. This geographical diversification not only stimulates regional economic development but also promotes the use of

[50] https://betakit.com/netflix-chooses-toronto-for-canadian-headquarters/
[51] https://cmpa.ca/wp-content/uploads/2023/09/Profile-2022-EN.pdf
[52] https://www.mpa-canada.org/research_docs/profile-2023-an-economic-report-on-the-screen-based-media-production-industry-in-canada/

immersive technologies in smaller cities, offering filmmakers increased flexibility and creative options.

At the federal level, Telefilm Canada stands as the cornerstone of national film funding policy. Established in 1967 under the name *Canadian Film Development Corporation (CFDC)* with an initial government allocation of $10 million, the agency aimed to support the domestic feature film industry. The first office opened in Montréal in 1968, and later expansions led to the creation of offices in Vancouver and Halifax in 1984. It was at this point that the organization was renamed *Telefilm Canada* to reflect its broader mandate (Telefilm, 2023[53]).

Today, Telefilm administers ten distinct funding programs, primarily in the form of grants, to support filmmakers across all phases of production - from script development to marketing and distribution. The agency also funds film festivals and promotional activities at the regional, national, and international levels, helping to amplify Canadian cinema's global visibility. Special support is given to international co-productions, particularly with France and other Eurimages member states, further reinforcing Canada's integration into global content networks.

Each funding stream has its own set of eligibility criteria, often differentiated by format (short films, documentaries, or feature-length works) or thematic focus. In addition, Telefilm Canada holds the authority to recommend projects for official recognition as audiovisual treaty co-productions to the Department of Canadian Heritage.

Finally, Telefilm is also responsible for administering the programs of the Canada Media Fund (CMF), a major financial instrument for television and digital content, which allocated a total of $360.3 million in 2022-2023. This integration of feature film, immersive media, and digital television funding under a unified structure makes Telefilm Canada a central player in shaping both the present and future of Canadian content production.

The *National Film Board of Canada (NFB)* - originally known as the *National Film Commission* - was established in 1939. Its foundational mission was formally defined in the *National Film Act* (1985), which states that the NFB is to 'produce and distribute and to promote the production and distribution of films designed to interpret Canada to Canadians and to other nations'. This mandate reflects the

[53] https://telefilm.ca/wp-content/uploads/2023/10/Telefilm_AR23_English.pdf

central role the institution plays in shaping Canada's audiovisual identity, both domestically and internationally.

As a public producer and distributor, the NFB is widely recognized as a cornerstone of Canada's creative industries and a steward of its audiovisual heritage. It produces or co-produces more than 50 new works annually, spanning genres and formats - from documentaries and animation to interactive and immersive projects. Since its inception, the NFB has produced over 14,000 works, with approximately 7,000 available to the public free of charge. Its productions have received over 7,000 awards, including 12 Oscars[54], positioning the institution as one of the most celebrated public film bodies in the world.

The NFB supports production through several programmatic streams, including the French Program, the English Program, the Institutional Program, and a range of filmmaker support initiatives. For the French Program, specific eligibility criteria must be met. These include the requirement that the project could not be realized without the support of the NFB, as well as a demonstrated emphasis on artistic merit, originality of creative approach, narrative quality, and potential for international reach. This reflects the NFB's dual commitment to excellence in authorship and to the global dissemination of Canadian stories.

The *Canada Media Fund (CMF)* is a non-profit organization established through a partnership between Canadian Heritage and the Canadian cable industry. Its mandate is to promote the development of innovative, high-quality Canadian content and digital media, including software applications, through a range of targeted funding programs.

Among its many initiatives, the CMF administers a portion of the *Changing Narratives Fund*, which is specifically designed to support creators from diverse and underrepresented communities. These include Indigenous peoples, Black and racialized individuals, ethno-religious minorities, persons with disabilities, and 2SLGBTQ+ creators. The program provides financial support for a variety of activities, such as training, mentorship, and professional development, as well as initiatives that connect creators, organizations, and companies to industry opportunities.

Through these targeted investments, the CMF seeks to amplify voices that have historically been marginalized in the Canadian audiovisual landscape, contributing to a more inclusive and representative media ecosystem.

[54] https://www.nfb.ca/about/

In addition, the *Canada Media Fund* (CMF) has partnered with the *Indigenous Screen Office* (ISO) to launch the *Interactive and Immersive Program*[55], a funding initiative created to support Indigenous storytellers in the development and production of projects using recent technologies and immersive media. Introduced in 2023, this fund is specifically aimed at applicants undertaking works in augmented reality (AR), virtual reality (VR), mixed reality (MR), immersive applications, and other interactive formats that incorporate audiovisual content.

The program reflects a dual commitment to technological innovation and Indigenous cultural expression, seeking to empower Indigenous creators through access to cutting-edge media forms. To be considered for funding, applicants must meet specific eligibility criteria, including confirmation of Indigenous identity and project alignment with the objectives of both the CMF and the ISO. The initiative not only expands access to immersive technologies but also contributes to the diversification and decolonization of the Canadian media landscape.

In 2023, the *Canada Media Fund*[56] *(CMF)* allocated a total of $23 million to support 37 interactive and immersive film projects, reflecting its sustained commitment to innovation in audiovisual content. Of these, 19 games and two software-based projects received a combined total of $4,495,191 under the *Prototyping Program*. Meanwhile, the *Experimentation & Innovation Program* awarded $9,539,454 to nine projects, including six games, two immersive experiences[57], and one software application. The *Commercial Projects Program* provided $8,853,265 to fund seven game projects with high market potential.

Beyond these federal-level initiatives aimed at positioning Canada as a global hub for film and immersive media production, a network of regional film commissions also plays a vital role in promoting Canada's territorial diversity. These commissions are instrumental in attracting domestic and international productions by showcasing the country's wide-ranging landscapes, urban settings, and technical infrastructure - contributing not only to economic development at the local level but also to Canada's international image as a multifaceted production destination.

[55] https://cmf-fmc.ca/document/cmf-iso-interactive-and-immersive-program/
[56] https://cmf-fmc.ca/news/cmf-to-invest-nearly-23m-in-37-interactive-digital-media-projects/
[57] It refers to 2 participants that won the inaugural Immersive/Interactive Producer Fellowship: They are Claudia Skunk (Vancouver) and Neegan Siou Trudel (Montreal) who were called to develop (in a 6-month period) expertise in the fields of VR, XR, AI and games, and to tap into the exciting job opportunities available in this growing area of production.

Creative BC[58] (British Columbia's Creative Industry Catalyst) adopts an integrated approach to the development of the province's creative sector by centralizing all production-related services within a single organization. It offers a wide range of production support, including funding opportunities, location scouting, technical expertise, and informational resources aimed at both domestic and international producers operating in British Columbia.

A key component of its mandate is the administration of tax incentive programs, such as the *Digital Animation or Visual Effects Tax Credit (DAVE)*[59], which is designed to stimulate all aspects of motion picture production within the province. In parallel, Creative BC supports a variety of Development Programs that provide funding for both traditional and digital media production activities, thereby encouraging innovation across multiple content formats.

In addition to its production and funding initiatives, Creative BC has demonstrated a strong commitment to environmental responsibility through its *Reel Green* initiative. This program offers tools, training, and best practices to help reduce the ecological footprint of audiovisual productions, promoting sustainability as a core value within British Columbia's entertainment industry.

Through these comprehensive programs, Creative BC plays a pivotal role in maintaining Vancouver's status as a major player in global film and television production, while also positioning the province as a forward-thinking leader in sustainable and technologically advanced filmmaking.

The *Société de développement des entreprises culturelles* (SODEC), founded in 1955, is a provincial agency that plays a central role not only in supporting Quebec's film and television industries, but also in fostering the broader cultural ecosystem. Its mandate extends across multiple sectors, including literature, publishing, crafts, music, visual arts, and even heritage real estate, thereby positioning SODEC as a uniquely comprehensive cultural development institution within Canada.

In the fiscal year 2023-2024[60], SODEC provided $142.6 million in funding to 1,031 cultural enterprises, covering a wide range of disciplines such as audiovisual production, music, performing arts, literature, digital creation, crafts, and the art market. Notably, the organization also launched a

[58] https://creativebc.com/
[59] https://creativebc.com/wp-content/uploads/2024/09/DAVE-Tax-Credit-Info-Bulletin-FAQ.pdf
[60] https://sodec.gouv.qc.ca/wp-content/uploads/resume-rapport-annuel-sodec-2023-2024.pdf

new program targeting producers of digital and immersive experiences, further reflecting its commitment to innovation in cultural production.

Within the audiovisual sector specifically, 345 projects were supported across the province, including 49 in development, 96 in production, and 97 in promotion and distribution. Additionally, SODEC funded 74 projects in emerging creation, 14 in the pre-development of Quebec television series or literary adaptations, 12 in television production and production enhancement, and 3 projects through corporate production assistance programs. Beyond domestic production, 253 projects focused on export and cultural outreach were also supported, underlining the province's dual emphasis on both cultural vitality and international visibility.

SODEC's approach exemplifies a hybrid model of regional cultural policy and industry support, balancing artistic development, economic sustainability, and global reach - all while adapting to new technological trends such as immersive storytelling and digital innovation.

While SODEC offers a broad range of financial assistance programs across multiple cultural sectors, its recent strategic shift toward emergent creation is particularly noteworthy. In 2023, the organization introduced new funding initiatives specifically aimed at supporting the development and production of works using digital media and immersive technologies, including virtual and augmented reality (VR / AR) and other interactive formats. This initiative reflects SODEC's intention to foster innovative storytelling techniques, offering artists and cultural enterprises new creative avenues beyond traditional production models.

In addition to its sector-specific mandates, SODEC operates in close collaboration with provincial, federal, municipal, and regional partners to promote the economic development of cultural businesses and to amplify the impact of its actions across Quebec. Its financial instruments include grants, repayable contributions, and loans, tailored to the distinct needs of industries such as audiovisual production, publishing, crafts, the art market, music, and digital creation.

Crucially, SODEC remains attuned to emerging trends that shape the evolution of cultural enterprises and professional associations. It functions as a catalyst for innovation, production, and export, positioning itself as a key driver of both cultural and economic development in Quebec. Furthermore, SODEC operates a merchant bank and administers seven tax credit programs that support the creation and production of cultural works, thereby offering a multi-tiered and flexible funding ecosystem that addresses both artistic and commercial objectives.

The *Toronto Film Television and Digital Media Office* (Toronto Commission) is internationally recognized for fostering innovation and creativity in screen-based industries. In 2023, these industries contributed $1.8 billion to Ontario's economy, generating 25,862 high-value full-time equivalent jobs, both direct and spin-off, across the province. Toronto has become a central hub for audiovisual production, offering world-class talent both in front of and behind the camera, internationally respected production and digital media companies, and a highly developed network of studios and suppliers.

The city's infrastructure and its architectural diversity also enable it to double as a wide range of global filming locations, making Toronto North America's third-largest screen-based production centre and one of the world's most prominent hubs for entertainment production.

Toronto is also home to IMAX Corporation, a global leader in high-resolution film formats and projector technologies. Renowned for its large-format screens, exceptional image fidelity, and immersive sound, IMAX partners with major studios to produce both 2D and 3D films designed for premium cinema experiences.

Moreover, the city hosts the internationally acclaimed Toronto International Film Festival (TIFF) [61], one of the most prestigious annual events in the global film calendar. Attracting filmmakers, industry professionals, and large audiences from around the world, TIFF functions as a major platform for cultural and technological exchange, as well as an influential space for industry networking, distribution deals, and critical recognition.

With reference to Canada's tax incentives, there are two major programs: the Canadian Film or Video Production Tax Credit (CPTC) and the Film or Video Production Services Tax Credit (PSTC). The CPTC[62] is a refundable tax credit designed to support the development of Canada's domestic independent production sector. It provides a tax credit of 25% on qualified labour expenditures, which cannot exceed 60% of the total budget (net of assistance). This results in a maximum tax credit equal to 15% of the total production costs. The eligible assistance includes public and private grants, government equity, and provincial tax credits (Edwards, 2018).

[61] https://www.tiff.net/
[62] https://www.canada.ca/en/canadian-heritage/services/funding/cavco-tax-credits/canadian-film-video-production/application-guidelines.html

To qualify for the CPTC, film projects must meet several criteria:

- The production company must be a taxable Canadian corporation, and the producers must be Canadian citizens or permanent residents.
- The production must satisfy a points-based test focused on key creative positions (such as director, screenwriter, lead performers, etc.).
- The project must be a linear and non-interactive film or video production. According to CPTC[63] application guidelines, *'a 360° / virtual reality (VR) production can be eligible, as long as the storyline progresses in a linear way without requiring any active viewer intervention'*.
- Formats such as news programming, games, apps, or other similar interactive products are not eligible for CPTC certification.

The *Film or Video Production Services Tax Credit* (PSTC)[64] is the second major federal tax incentive supporting Canada's audiovisual industry. Unlike the CPTC, which focuses on Canadian content and independent production, the PSTC is designed to promote Canada as a destination of choice for both foreign and Canadian-owned film and television productions. It also plays a crucial role in sustaining a production infrastructure of international calibre across the country.

This tax credit is available to production companies or production service companies operating in Canada and is calculated at a rate of 16% of the qualified Canadian labour expenditure for a given production. The qualified Canadian labour expenditure corresponds to all eligible labour costs incurred in Canada, minus any financing amounts classified as assistance, including public grants and other forms of financial support.

8.2. The South Korean Film Industry

Over the past decade, the South Korean film industry has significantly expanded its global reach, effectively exported its productions and strengthened its influence across Asia, Europe, and North America. Today, Korean cinema is widely associated with the broader cultural phenomenon known as *Hallyu*, or the 'Korean Wave', which encompasses music, television, fashion, and digital media, and has become a powerful tool of soft power and cultural diplomacy.

[63] cptc-cavco-application-guidelines.pdf
[64] https://www.canada.ca/en/canadian-heritage/services/funding/cavco-tax-credits/film-video-production-services.html

Currently, there are general tax provisions applicable to the audiovisual sector, as the Korean film financing system is not governed by a specific, standalone tax framework. Nevertheless, the Korean film industry offers a particularly compelling case study of successful cultural policy. As noted by Parc (2014), South Korea endured significant upheaval in the 20th century - first under Japanese colonial rule (1910-1945), followed by the devastation of the Korean War. Although the post-war years brought brief periods of prosperity, the industry faced renewed challenges between the 1970s and mid-1990s, including censorship, market instability, and foreign competition.

However, beginning in the late 1990s, the Korean film industry entered a period of dynamic renewal. Supported by targeted cultural policies and an evolving domestic market, it has since achieved remarkable success both at home and abroad, becoming a leading example of how state-supported cultural industries can thrive in a globalized media environment.

8.2.1. Presentation of Funding Bodies

The principal national body responsible for financing films and advancing the audiovisual and film industry in South Korea is the *Korean Film Council* (KOFIC). In addition to promoting Korean cinema abroad, KOFIC administers a range of programmes supporting production, development, distribution, and marketing. Similar to Canada, South Korea encourages film production through the provision of tax credits, particularly for domestic films and international co-productions. Moreover, KOFIC offers direct financial assistance to filmmakers in the form of grants, loans, and development funding. Major production companies and conglomerates, such as CJ ENM and Lotte Entertainment, have made substantial investments in film production, illustrating the strength of South Korea's private funding sector.

There are currently thirteen film commissions operating across almost every region of the country. South Korea ranks among the world's leading film-producing nations and constitutes the largest cinematic force within the Asian entertainment industry[65]. The South Korean state provides a wide range of incentives to support international audiovisual productions, including assistance with location scouting and filming. In 2013, the *Korea Film Commissions and Industry Network* (KFCIN) was established as a nationwide system of mutual cooperation, further enhancing the country's already exceptional network of film commissions.

[65] International Trade Administration. (2023, October 3). *South Korea - Entertainment and media*. U.S. Department of Commerce. https://www.trade.gov/country-commercial-guides/south-korea-entertainment-and-media

In Asia[66], South Korea's film policy offers a compelling case study for the development of cultural policies (Murschetz & al., 2019). Successive Korean governments have largely sought to promote and protect Korean culture - an approach comparable to that adopted by certain EU member states, such as France. The success of South Korea's film industry has been predominantly attributed to the state's protectionist measures. Initially, the country's import quota system encouraged domestic filmmakers to produce low-quality films rather than effectively restricting Korean audiences' access to foreign productions. Furthermore, the screen quota system did not guarantee substantial domestic attendance at Korean films. In addition, subsidy policies were largely insignificant prior to the late 1990s and thus cannot be credited with influencing the industry's success, which had already begun to emerge in the early 1990s. Parc (2018) argued that the critical factor in enhancing the competitiveness of South Korea's film industry was the establishment of a market-friendly business environment. He further suggested that, to bolster the competitiveness of other national film industries, policymakers should reconsider and redefine existing protectionist regulations.

Regarding fiscal incentives, the *Korean Film Council* (KOFIC)[67] offers targeted financial support to encourage both international co-productions and foreign productions conducted in South Korea. For eligible international co-productions - such as feature films and documentaries that meet the legal criteria - KOFIC provides support covering up to 25% of the expenses incurred on Korean territory. This incentive also applies to films, series, and documentaries developed and produced by foreign production companies, provided that at least 80% of the total production budget is financed by foreign capital.

For domestic filmmakers and Korean production companies, KOFIC also offers a cash rebate of up to 25% on eligible production expenses incurred within South Korea. The final grant amount is determined not only by the project's eligibility but also by the remaining program budget at the time of application, which introduces a dynamic element to the allocation process.

These fiscal incentives reflect South Korea's broader strategy to position itself as a competitive and attractive hub for international audiovisual production, while simultaneously strengthening its domestic industry through financial support mechanisms that reward investment and global collaboration.

[66] Murschetz, P. C., Teichmann, R., & Karmasin, M. (Eds.). (2019). *State aid for film and audiovisual services: A synoptic review of key principles and governance models in Europe and abroad*. In P. C. Murschetz, R. Teichmann, & M. Karmasin (Eds.), *Handbook of state aid for film: Finance, industries and regulation* (pp. [pages]).
[67] www.kobiz.or.kr

South Korea benefits from a robust and well-coordinated network of regional film commissions, which has been in place since 2010. Today, ten regional commissions operate across the country, offering a film-friendly environment in all major cities and provinces[68]. These bodies play a crucial intermediary role by facilitating the administrative and logistical aspects of film production. Their responsibilities include assisting with the acquisition of film permits, coordinating with local authorities, managing traffic control, supporting human resources recruitment, and offering a range of additional production services.

In some cases, these commissions also operate equipment rental services, studios, and post-production facilities, thereby enhancing local infrastructure and reducing production costs for both domestic and international filmmakers. A notable example is the Seoul Film Commission (SFC), which provides comprehensive filming support for national and international productions taking place in Seoul. As part of its broader mandate to strengthen the city's audiovisual industry and enhance its global visibility, the SFC offers targeted financial and logistical support to attract a wide range of projects.

According to its official website[69], the SFC operates three main incentive programs, which include the following:

- Production Cost Support:

As part of its strategy to position Seoul as a leading international filming destination, the Seoul Metropolitan Government offers a reimbursement scheme for selected productions. Under this program, producers of internationally co-produced films and foreign films shot in Seoul may receive up to 30% reimbursement of eligible production costs. The initiative is designed to enhance the city's global reputation while stimulating the development of the local film industry.

Each project is subject to a reimbursement cap of approximately USD 265,000, although this ceiling may be adjusted downward in the case of projects deemed to have exceptionally high marketing value. The scheme is administered by the Seoul Film Commission (SFC), which oversees the selection process and disbursement of funds. Importantly, these reimbursements are non-

[68] https://www.koreanfilm.or.kr/eng/locKorea/filmOrg.jsp
[69] https://english.seoulfc.or.kr/ict/ov/

repayable, and applications are open to producers of all nationalities, reinforcing Seoul's openness to international collaboration.

- Location Scouting Support:

To further encourage the use of Seoul as a filming location, the Seoul Metropolitan Government - through the Seoul Film Commission (SFC) - offers a dedicated program to support location scouting for foreign visual content productions. This initiative targets a selected group of international professionals and aims to familiarize them with the city's cinematic potential.

Eligible applicants include foreign directors, assistant directors, producers, directors of photography, production designers, and location managers. The support package typically includes two round-trip airline tickets, accommodation, access to a domestic location coordinator, and the provision of a rental car. By covering these key logistical costs, the program seeks to lower the entry barrier for international productions and promote Seoul as a viable and attractive filming destination at the earliest stages of project development.

- Seoul Screenplay Development Support:

In addition to its support for production and location scouting, Seoul City also invests in the preliminary stages of audiovisual creation through the Seoul Screenplay Development Support Program. Managed by the Seoul Film Commission (SFC), this initiative is designed to promote the planning and development of foreign visual media projects that incorporate Seoul as a key narrative or production setting.

The program provides round-trip airfare and access to a dedicated screenplay writing room in Seoul for selected foreign filmmakers, producers, and screenwriters. By offering an environment conducive to creative work, the initiative encourages international creators to embed the city into the conceptual core of their projects. This early-stage support reinforces Seoul's positioning not only as a filming location but also as a source of inspiration and narrative innovation.

8.2.2. Critical Analysis

The South Korean film industry has emerged in recent decades as one of the most dynamic and internationally recognized cultural sectors in the world. Driven by rapid technological advancement, sustained growth, and a strong domestic audience base, it is often cited as a model of successful cultural development within a globalized media economy (Jim, 2016).

Unlike many Western countries, where cultural industries are typically shaped by important levels of state intervention, South Korea has adopted a more hybrid approach, effectively combining public policy instruments with robust private sector engagement. This distinctive configuration has drawn considerable scholarly attention, particularly in comparative policy studies. Analysts frequently contrast South Korea's model with that of countries like France, where state involvement in the audiovisual sector has historically been more pronounced and centralized (see also section 4.9.1.).

South Korea's case thus offers valuable insight into alternative pathways for cultural policy, blending market dynamics with strategic government support to foster both domestic success and global competitiveness.

In a 2019 comparative analysis, Messerlin examined the institutional and economic policies of South Korea and France, with a particular focus on the role of government subsidies in shaping national film industries. Challenging the widespread assumption that large-scale direct subsidies are essential for building a robust audiovisual sector, Messerlin contrasted the approaches of the *Korean Film Council (KOFIC)* and the *Centre National du Cinéma et de l'Image Animée (CNC)* in France.

He argued that South Korea's indirect funding model has produced more cost-effective and sustainable results over the long term, as opposed to France's interventionist framework, which relies heavily on automatic and direct subsidies. In particular, Messerlin criticized France's use of a high seat tax to fund these mechanisms, suggesting that this model has limited audience engagement, stifled innovation, and consolidated power among established industry players, thereby reducing overall cultural diversity.

By contrast, South Korea's more moderate and targeted funding policies - combining limited state aid with market-driven incentives - are presented as fostering a more dynamic, pluralistic, and competitive cinematic ecosystem. Messerlin's findings have sparked renewed debate around the efficiency and cultural impact of different state-led funding strategies, particularly in the context of globalized media markets and the rapid evolution of digital and immersive storytelling forms.

Building on their earlier findings, Parc and Messerlin (2022) revisited the issue of screen monopoly regulation in the South Korean film industry. Their study challenges the widely held belief that South Korea's exhibition sector is highly monopolized. Contrary to this perception, they demonstrate that the Korean industry is, in fact, less concentrated and more diverse than that of France.

By analysing data on film turnover rates and domestic box office hit distributions, the authors argue that what may be interpreted as monopolistic behaviour in the Korean context is more accurately understood as the result of efficient screen turnover and flexible, market-responsive use of exhibition space. According to their findings, these dynamics allow for a high volume of content to circulate rapidly, rather than reflecting the dominance of a few major players.

Parc and Messerlin further caution against adopting a French-style regulatory framework in South Korea, arguing that such a shift would risk undermining the competitive forces and institutional flexibility that have contributed to the industry's vitality. Their study thus reinforces the notion that cultural policy models are not easily transferable across national contexts, and that regulatory interventions must be carefully adapted to local industry structures and audience behaviours.

The aforementioned studies offer a critical evaluation of regulatory and funding interventions in the cultural industries, particularly in the context of South Korea's film sector. They express scepticism toward France's strong reliance on anti-monopoly regulations and direct subsidization, pointing to the unintended consequences such measures may have on creative output and artistic innovation. In contrast, South Korea is presented as a compelling case in which indirect forms of financial support - when combined with competitive market mechanisms - can yield superior outcomes in both economic and cultural terms.

In conclusion, the comparative analysis of the South Korean and French film industries invites a broader reassessment of prevailing policy assumptions in the governance of cultural sectors. By emphasizing the relative effectiveness of South Korea's less interventionist, market-oriented strategy, these works challenge the notion that cultural industries necessarily require prominent levels of state protection and subsidy to thrive. Instead, they advocate for balanced, evidence-based policy frameworks that align with specific institutional, economic, and cultural contexts, and that prioritize strategic resource allocation, industry competitiveness, and creative innovation.

8.3. Concluding remarks

Despite its longstanding tradition in film production, Europe is increasingly confronted with challenges in the global competition for audiovisual innovation, particularly in the domain of XR (Extended Reality) technologies. The heterogeneity of EU funding policies and the fragmented integration of XR-related innovations across Member States stand in sharp contrast to the cohesive and strategically coordinated approaches adopted by countries such as Canada and South Korea.

This divergence places significant constraints on Europe's competitiveness within the emerging global audiovisual ecosystem.

At the European level, national funding systems continue to invest heavily in the preservation of cultural identity and the promotion of traditional narrative forms. Programmes such as the French CNC and the German FFA offer substantial support for conventional film production, yet often relegate XR innovation to a peripheral concern, with only limited allocations dedicated to specialised media. Even within the broader Creative Europe Programme, the budget specifically earmarked for XR content — €139 million under the MEDIA strand — remains modest compared to the overall investment in traditional audiovisual formats. Moreover, although the European Virtual and Augmented Reality Industrial Coalition represents a positive step towards greater coordination, it has only recently commenced its activities and has yet to generate tangible structural outcomes.

In contrast, Canada has developed a significantly more integrated strategy. Canadian policies explicitly support XR production as part of broader national objectives for competitiveness agendas, with substantial public investment not only in content creation but also in infrastructure, research, and international market expansion. Through federal and provincial initiatives such as Telefilm Canada and the Canada Media Fund, funding is allocated to projects that explore interactive narratives and technological innovation. Critically, Canadian policymakers do not perceive XR as a niche creative sector, but rather as an essential component of a wider digital strategy closely aligned with economic growth, cultural diplomacy, and technological sovereignty.

South Korea provides an even more striking illustration. Through state-supported initiatives such as the Korean Film Council (KOFIC) and the Korea Film Commission and Industry Network (KFCIN), the country has actively integrated XR and immersive media into its mainstream audiovisual policies. National strategies explicitly support the production of VR, AR, and XR content through direct grants, equipment subsidies, and the development of XR infrastructures, including immersive theatres and specialised creative hubs. Furthermore, South Korea’s cultural policy adopts a holistic approach, integrating cinema, gaming, and interactive media, and recognising that the future of storytelling will be inherently hybrid and multi-platform. Unlike the fragmented national funding systems observed in Europe, South Korea’s approach is nationally coordinated and globally oriented, thereby securing a leading position in the evolution of the global audiovisual ecosystem.

The differences in these strategic approaches have tangible consequences. While Europe continues to lead in artistic innovation and the production of high-quality traditional cinema, it faces an increasing risk of lagging behind in domains that will drive new audience engagement and future

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revenue streams. As younger audiences worldwide increasingly gravitate towards interactive and gamified experiences, the regions that successfully master these technologies are likely to play a decisive role in shaping the future of cultural production and consumption. The European Union's strong emphasis on cultural preservation, coupled with a relatively slow pace of technological convergence, places it at a comparative disadvantage when measured against the Canadian model of innovation and the comprehensive, export-oriented strategy pursued by South Korea.

A fundamental reassessment of Europe's audiovisual policy strategies is necessary to counter the risks identified in the preceding analysis. Firstly, XR and VR content should no longer be regarded as experimental or peripheral but instead be integrated as core components within national and EU-level funding schemes. Secondly, the development of a harmonised European framework for XR innovation is required to address inter-State disparities, stimulate cross-border initiatives, and establish a continental market capable of competing with those of North America and East Asia. Thirdly, while safeguarding its cultural identity, Europe must actively reinterpret its narratives, values, and aesthetic traditions within immersive formats, ensuring their relevance and vitality in the evolving media environment.

The hybridisation of classical film and XR technologies represents both a technological challenge and a significant cultural opportunity. As evidenced by the policy successes of South Korea and Canada, strategic investment in XR infrastructures and hybrid content development not only consolidates national cultural industries but also enhances international competitiveness. For Europe, the adoption of a 'VR mindset' is therefore not an option but a necessity in securing a sustainable and forward-looking audiovisual sector.

The present comparative analysis highlights that, while the European audiovisual policy framework remains strong in the defence of cultural heritage, it requires significant adaptation to meet the demands of a globalised media ecosystem characterised by hybridity and interactivity. Drawing lessons from the Canadian and South Korean experiences, Europe must place technological innovation, cross-border networking, and the establishment of an integrated XR / VR ecosystem at the heart of its strategic priorities. It is through the pursuit of such a strategy that the European Union will be able to sustain its film heritage and maintain a leading role in the evolution of global storytelling practices. The following recommendations propose a roadmap to support this necessary transformation.

8.4. Recommendations for New Policy

The European Union has long prioritized the promotion of emerging technologies and the advancement of innovation within its cultural and creative industries. However, this study has demonstrated clear disparities in both the ***accessibility*** and ***implementation*** of VR / AR / XR technologies across the European continent. In order to foster a more coherent hybridisation of 'cinema-XR' and to align ***state and private support policies***, the following recommendations are proposed:

Firstly, it is imperative to ***increase the overall volume of XR funding***, with the explicit aim of enabling the ***coexistence of traditional and immersive technologies*** within audiovisual production. Enhanced funding would foster experimentation, encourage technological integration, and support creators working across multiple formats. At present, significant disparities exist among EU member states: while countries such as ***Germany and France*** offer relatively well-structured programs (characterised by high production quality but limited in financial scope), others such as ***Belgium and Italy*** lag in terms of systemic support for immersive works. A ***coordinated pan-European effort*** is therefore necessary to ensure that creators in all member states can access the financial and technical resources required to innovate in this field.

Secondly, there is an urgent need to ***standardize and harmonize public and private funding frameworks*** for immersive and XR projects across Europe. A more unified regulatory and financial structure would not only simplify the application process and increase ***transparency*** for creators but also reduce the ***funding inequalities*** that currently separate well-resourced countries from those with minimal XR investment. Harmonization would also facilitate ***cross-border collaborations***, creating an environment where European creators can cooperate more easily and benefit from shared infrastructures and joint financing mechanisms.

Lastly, the study highlights the fact that ***younger creators are often more receptive to immersive technologies***, and thus ***emerging technologies should be integrated into higher education curricula***. Universities and film schools must play a key role in shaping a skilled and adaptable workforce, capable of navigating and innovating within a rapidly evolving audiovisual landscape. By investing in ***technological literacy, interdisciplinary training, and production-oriented education***, Europe can position itself as a ***global leader in the XR film industry***, ensuring that future generations of filmmakers are not only technologically proficient, but also creatively empowered.

9. Empirical Studies as an Argument for the Growth of 'Cinema / XR' Hybridisation

9.1. Comparison of Social Spatial Cognition Induced by Cinema and by 'Cinema / XR'

Another important dimension of this research focuses on the ***social and cognitive mechanisms*** triggered by both the production and viewing of audiovisual content, considered independently from traditional cinema and the emerging 'cinema / XR' hybrid forms. This line of inquiry serves as a conceptual and empirical foundation for making scientifically grounded arguments concerning the future development of cinema and the cultural policy strategies the European Union could pursue to enhance the global attractiveness of its cinematographic output - particularly in light of ***evolving patterns of spatial cognition*** within contemporary societies.

The theoretical and empirical basis of our comparison is rooted in the question of ***how space is constructed and perceived*** in media more broadly, in conventional film representation, and in works arising from the hybridisation of cinema and immersive technologies (XR). By analysing the shifts in spatial perception induced by these diverse formats, this research aims to identify concrete recommendations for cultural policy, geared towards emerging narrative forms, altered modes of spectator engagement, and new paradigms of spatial storytelling.

9.2. Main Hypotheses of Empirical Research

9.2.1. Hypothesis I

Based on the study of the ***experimental features*** and **contrastive routines of social cognition** observed in the domain of spatial orientation - on the one hand through the practices and reception of classical cinema, and on the other through the creative use and reception of XR technologies - it is possible to demonstrate that ***XR experiences induce distinct cognitive patterns*** in users.

Compared to traditional cinematic formats, immersive XR technologies engage users in ***more active and embodied modes of perception***, thereby prompting ***novel spatial and social cognitive processes***. These include altered relationships between viewer and space, enhanced sensorimotor coordination, and a shift from observational to participatory modes of narrative involvement. The

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contrast highlights a fundamental transformation in the way individuals construct meaning and orient themselves within mediated environments.

9.2.2. The hypothesis corollary

These emerging ***perceptual and cognitive structures*** reflect broader developments in media environments and the ways in which contemporary media ecosystems shape users' cognitive schemas - whether as viewers, consumers, media designers, or content creators. The dominant ***medial landscape*** is increasingly immersive, interactive, and multisensory, fostering new forms of engagement and interpretation.

If cinema remains confined to the ***spatial and perceptual model*** developed between 1897 and the 1970s - characterised by directional and frontal image capture, passive viewing in a darkened theatre, reduced perceptual openness to the real scene, and limited social interaction among spectators - it risks falling out of step with the evolving dynamics of ***social cognition***, particularly as experienced by younger audiences immersed in contemporary digital culture.

To enhance the ***attractiveness and cognitive relevance of European cinema***, one essential strategy would be to ***acknowledge the transformative potential of XR technologies****, and to* ***clarify and strengthen policy incentives*** aimed at supporting creators and distributors working in this field. Such a shift would not only modernise the cinematic experience but also align it more closely with the perceptual and social habits of emerging generations.

9.2.3. Hypothesis II

By demonstrating that young and creatively inclined individuals are best positioned to lead the integration of XR technologies into both the creative and spectatorial dimensions of cinematic practice, it becomes evident that targeted interventions must go beyond mere funding or technical infrastructure. In parallel with incentive policies aimed at supporting hybrid cinema / XR creation and equipment, there is a pressing need for coordinated action at the European level to foster the emergence of specialised training programmes explicitly focused on cinema / XR.

Such programmes should be embedded within higher education institutions and film schools across Europe, offering interdisciplinary curricula that blend cinematic storytelling, immersive design, spatial cognition, and technical XR skills. By investing in education as a vector for transformation, European institutions can cultivate a new generation of creators, curators, and audiences attuned

to the evolving languages of moving image, and capable of shaping the future of audiovisual culture at the intersection of art, technology, and society.

9.3. Theoretical Framework: Space in Film Studies

9.3.1. Conditions for the Possibility of the Comparison

In any comparative study, it is essential to compare elements that are methodologically comparable. Cinema, with its 130-year history, has had ample time to develop and stabilise its own narrative conventions - a grammar shaped both by its most influential auteurs and by the social practices of its audiences. In contrast, XR videography remains an emerging and experimental medium, lacking fully codified and universally accepted storytelling structures.

One illustrative example is the contrast between the cinematic camera's directional framing, which guides the viewer's gaze through intentional composition, and the 360° camera's omnidirectional field of vision, which decentralises the viewer's point of focus and invites a more exploratory mode of engagement. This fundamental difference exemplifies the broader ontological and experiential divergence between the two media.

Therefore, to apply a valid contrastive methodology, it is first necessary to establish a set of general conceptual parameters, and to identify core narrative or communicative functions that are common across media forms. This foundational step allows for meaningful comparisons, not of forms or aesthetics alone, but of the function's media perform in relation to storytelling, perception, space, and user engagement.

9.3.2. Role of Space in the Media

The principal functions shared by all media may be summarised as follows: to represent the real world - that is, to provide information about the state of the world; to establish communication between members of a community; to provoke individual and collective emotional responses; and, finally, to argue for conclusions based on presented information.

With regard to the cinematic medium, film theorist Lev Manovich notes in his seminal article 'Spatial Computerisation and Film Language' (2001) that the most significant developments brought about by the computerisation of film concern the treatment of represented space. When focusing on the

first fundamental function of media - representing the real world - it becomes clear that each medium structures information according to its particular relationship to space.

This insight finds further support in cognitive research. As Menzel and Sayers (2022) demonstrate, spatial cognition in primates, including humans, is deeply influenced by physical navigation. Movement through the environment impacts not only low-level neural pathways and perceptual processes, but also high-level cognitive functions, including emotional memory and abstract reasoning. In this light, media technologies - products of human cultural evolution - can be seen as various attempts to mediate and organise spatial experience.

Throughout history, the media have encoded space in different ways. With the digitalisation of photography and cinema, however, spatial representation has undergone a profound shift. Computer-generated environments have expanded the margins of representational possibility, giving rise to new grammars of space, motion, and point of view. The primacy of spatial representation in contemporary media is consistently emphasised in the critical literature (Marvin et Sun-ha, 2017; Christie, 2024), suggesting that the evolution of immersive media may be best understood as a continuation - and radicalisation - of this trajectory.

9.3.3. Spatial Approach in Cinematographic Studies

The spatial approach in film studies was notably pioneered by David Bordwell, whose influential work *The Classical Hollywood Cinema: Film Style and Mode of Production to 1960* (Bordwell, Staiger et Thompson, 1985) examines how spatial organisation functions within classical narrative cinema. Bordwell highlights how filmmakers utilise techniques such as on-axis cuts, shot/reverse shot sequences, and relative continuity editing to construct a spatially coherent and intelligible diegetic world. These techniques are designed not only to support storytelling but also to guide the viewer's attention and to clarify the spatial relationships between characters and objects on screen.

Building upon this foundation, and drawing upon more advanced empirical methods, Artur Shimamura launched a new interdisciplinary research agenda in the early 2010s under the label of *psychocinematics* (Shimamura, ed., 2013). This approach integrates psychology, neuroscience, and film theory, positing that our experience of cinematic media is grounded in both the physical properties of spatial representation and the cognitive mechanisms through which we perceive and interpret space - specifically, our innate systems of spatial orientation. Higher-order cognitive processes, such as narrative comprehension and emotional engagement, are theorised as being layered upon these foundational spatial frameworks.

A key innovation in Shimamura's work is the application of eye-tracking technology, which allows researchers to measure objectively where viewers focus their gaze on the screen and how their visual attention shifts over time. This empirical technique facilitates the study of cognitive responses such as attentional focus, emotional resonance, and narrative processing. Crucially, eye-tracking offers a way to supplement traditional film analysis with quantifiable data, thereby reducing the subjective bias often inherent in interpretative approaches to narrative structure and editing style. It has proven especially valuable in evaluating the effectiveness of different montage techniques, and in understanding how filmmakers guide and manipulate viewer experience at a perceptual level.

9.3.4. Space as the Common Denominator of Cinema and 'Cinema / XR'

According to Lev Manovich, the evolution of classical cinema towards its hybridised forms is fundamentally driven by changes in the mental representation of space. It is undeniable that both cinematic and XR content - as well as their hybridisation - generate diverse spatial representations in both creators and spectators. Although these representations differ in form and intensity, they each contribute, in distinct ways, to the development of cognitive skills related to the subject's spatial orientation.

A comparative analysis of these cognitive skills reveals that, while qualitatively different, they can lead to quantitatively comparable results when applied to real-world spatial tasks in physical environments. This suggests that spatial orientation and its underlying imaginary function as a shared cognitive foundation for both traditional cinematic and XR creative technologies. Consequently, this spatial dimension represents a common ground upon which the hybridisation of creative and spectatorial practices can be meaningfully developed.

From this theoretical premise emerges the central objective of our experimental study, which involves samples of young audiences. The study aims to compare the impact of classical cinema and hybrid audiovisual content on creative and spectatorial cognition, specifically in relation to spatial orientation.

This research seeks to update and extend the 'psychocinematics' framework initiated by Shimamura (2013), by integrating experimental approaches to spatial cognition with emerging cinematic and XR technologies. By doing so, it aims to offer robust scientific arguments in support of a closer integration of European cinema and XR technologies - thus fostering greater alignment between traditional film practices and the evolving dynamics of the contemporary media landscape.

9.4. Methodological Framework: Eye-tracking Applied to Extended Film Studies

9.4.1. Why is Eye-tracking Useful in Film Studies?

Known since the early 20th century and digitised in the late 1990s, the eye-tracking method has been employed in film studies since around 2010, following significant advances in its technological development and refinement (Wade & Tatler, 2005). It now enables detailed analysis of the cognitive mechanisms involved both in the creative process of filmmaking and in the reception of audiovisual content by viewers.

For creative teams, eye-tracking serves as a tool for verifying the effectiveness of editing strategies, assessing the aesthetic impact of mise-en-scène and visual composition, and evaluating how visual attention is distributed across the cinematic frame. For audiences, eye-tracking provides an objective means of studying perceptual and mental processing in response to filmic images and sound.

Several psychophysiological parameters of the gaze can be used in analysing both the production and reception of cinematic messages, including:

- Gaze direction
- Saccadic trajectories
- Fixation duration and attentional persistence

Moreover, the attentional synchronisation between image and sound can also be investigated, offering valuable insight into multisensory narrative processing. Eye-tracking is fully compatible with other biometric measurements, such as galvanic skin response or heart rate variability, thereby enabling multimodal analysis of viewer experience.

On the stimulus side, eye-tracking data is typically correlated with salient and meaningful elements of the visual field - so-called points of interest - which can be mapped to narrative, aesthetic, or emotional functions. As vision is inherently spatial, eye-tracking is particularly well suited to evaluating cinematic theories of spatial construction. This was the principal direction of early empirical research by pioneers such as Arthur Shimamura and Tim J. Smith, whose work between 2010 and 2015 laid the foundations of the field.

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The epistemological value of eye-tracking lies in its ability to quantify the gaze, offering precise measurements of eye movement and attention allocation. These metrics can be directly associated with higher-order cognitive processes involved in meaning-making, emotional response, and spectatorial engagement, thereby reducing the interpretative subjectivity that has traditionally characterised film theory. Eye-tracking thus allows for a fruitful oscillation between aesthetic interpretation and empirical validation, legitimising the application of scientific methodologies to the analysis of cinematic experience.

Since 2010, eye-tracking - together with brain imaging techniques - has become one of the two primary scientific approaches underpinning the emergence of psychocinematics, now widely recognised by the research community as a key element of ***the computational turn*** in film studies (Stelmach, 2024).

9.4.2. Place of Eye-tracking in the Study of 'Cinema / XR' Hybridisation

In the conclusion of his seminal chapter in *Psychocinematics*, edited by Shimamura, Tim J. Smith writes:

'To an external observer film viewers may appear highly passive. The intention of this chapter was to demonstrate how incredibly active viewers are in terms of how they both shift their gaze around the screen and cognitively process the presented information. The construction of the narrative is a collaborative process that requires suitable presentation of the relevant audiovisual information by the filmmaker and active acquisition and encoding of that information by the viewer.'

This statement highlights the active role of the viewer, not only in directing their gaze but also in cognitively engaging with audiovisual content. When applied to 'cinema / XR' hybrid experiences, this activity expands considerably, as the cognitive mechanisms involved in perception and orientation are mobilised in new and complex ways.

In comparing the visual ergonomics of XR to classical cinema, one observes that the viewer's gaze, previously constrained by the rectangular frame of the screen, becomes a spherical gaze defined by the spherical cap of vision. In head-mounted displays (HMDs) with 3 degrees of freedom (3DOF), this gaze is controlled by rotational movement around the neck's pivot axis (yaw, pitch, roll). In more advanced systems such as the Oculus Quest 3, which offer 6 degrees of freedom (6DOF), gaze interaction is enhanced by the ability to move freely through space, incorporating translational motion (up/down, left/right, forward/backward).

This transition from a static, framed visual experience to a dynamic, embodied spatial navigation reflects not only a shift in medium but a transformation in the cognitive architecture of spectatorship. The hybridisation of cinema and XR thus opens new horizons for understanding how viewers construct meaning, orient themselves in narrative space, and engage emotionally and sensorily with audiovisual content.

- The spherical cap

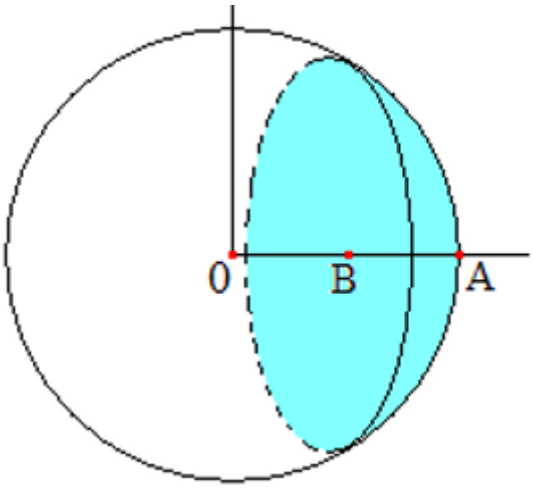


Figure 5: Fields of vision as a function of the extent of the spherical cap

VR Sketch Sheets (VRSS) refer to the conceptual synthesis between the theoretical domain of vision - that is, the total visual coverage from an unconstrained centre, extending across all theoretically observable portions of three-dimensional Euclidean space - and the cognitive and perceptual structuring of the visual field. This structuring incorporates both physiological constraints and mental habits of vision.

Specifically, VRSS describes the section of the visual sphere situated on the ground plane and its categorisation based on the ratios between the width and depth of comfortable visual perception. These proportions correspond to ergonomic thresholds within which the viewer can maintain visual attention, orientation, and immersion without discomfort or disorientation.

This model allows for a more precise understanding of how XR environments should be designed to align spatial geometry with cognitive ergonomics, particularly in narrative-driven immersive experiences. It offers a valuable framework for creators working at the intersection of aesthetic composition, spatial cognition, and user-centred design in immersive media.

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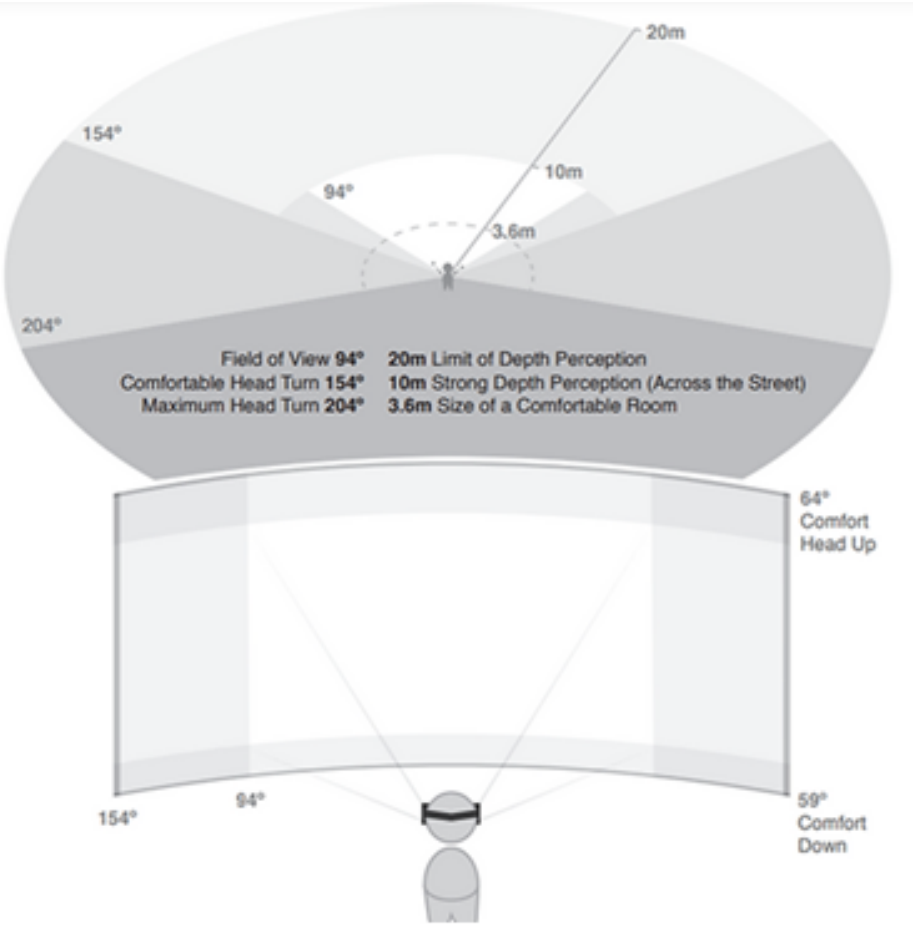


Figure 6: VR Sketch Sheets

As a result, the eye movements of the XR viewer are significantly expanded and become markedly more mobile than in traditional cinematic contexts. The immersive environment invites the user to engage with the visual scene not from a fixed, frontal perspective, but through continuous repositioning of the gaze, driven by interest, curiosity, and spatial cues.

For instance, in an interior XR representation of a historical monument - such as the conference room of the Château de la Napoule - the space may be presented through a virtual tracking shot, allowing the viewer to explore the room from multiple vantage points. Despite this freedom of movement, the scene may still retain a clear central visual anchor, guiding perceptual attention without prescribing a fixed trajectory. This combination of spatial freedom and focal coherence exemplifies how XR reshapes the visual experience into a dynamically constructed perceptual narrative, where the viewer plays an active role in assembling the scene's meaning through movement and gaze:

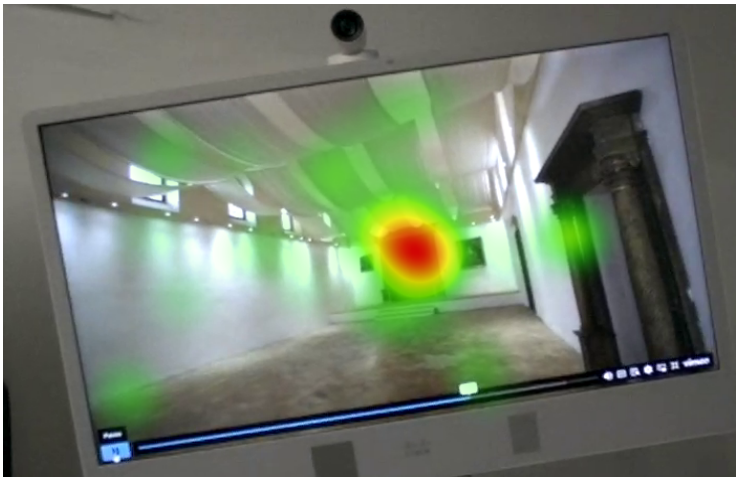


Figure 7: Central visual anchoring in 2D screen viewing

In the VR version of the same room, within a shot of comparable duration, the viewer's attention is engaged in three distinct directions, requiring, in this example, a 270° pivot of the head or body to observe the full extent of the scene. Unlike in traditional cinema, where spatial exploration is dictated by camera movement and framing, here the viewer's gaze and physical orientation actively determine the unfolding of the visual narrative.

This necessity for spatial repositioning not only enhances the sense of embodied presence but also transforms the viewer into an agent of spatial narration. The scene is no longer revealed sequentially by editorial choices but is instead constructed perceptually and cognitively by the viewer's own exploration of the environment. Such examples underscore the fundamentally different temporal-spatial grammar of XR media, and the need for new frameworks of analysis to understand how meaning is built through gaze mobility and spatial immersion.



Figure 8: Attentional points distributed in spherical vision

Our objective is therefore to extend the application of the eye-tracking method beyond traditional film studies, and to adapt it specifically to the comparative analysis of viewer reception between classical cinema content and 'cinema / XR' hybrid productions. This approach follows the foundational work of Clay, König, and König (2019), which coincided with the emergence of the first industrial eye-tracking solutions for immersive media - initially developed by Pupil Labs, Tobii, and FOVE, and now led by the Varjo system, which we have adopted for our own research.

9.5. Components of an Experimental Setup



Figure 9: Photos of the device and the experiment

A complete experimental setup using eye tracking in virtual reality (VR) involves a combination of hardware and software components. Below is an overview of the essential elements typically included in such a configuration:

9.5.1. VR Hardware Set

This includes a virtual reality headset (HMD - Head-Mounted Display), motion sensors, and, where necessary, handheld controllers to enable interaction with the virtual environment (Figure 10).



Figure 10: Varjo XR-4 VR Eye Tracking System (left) & HTC VIVE Focus 3 VR Eye Tracking System (right)

A complete, high-quality configuration of these components is provided by the Varjo XR-4, a professional-grade headset developed by SpeederNet in collaboration with Varjo.

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

An alternative solution is the HTC VIVE Focus 3 (Figure 11), which supports application development via Unity, making it highly adaptable for experimental design.

Microsoft also offers consumer-grade VR headsets that are suitable for research purposes. These devices feature high refresh rates, enhanced computing power, and integrated eye-tracking capabilities, making them particularly well-suited to studies involving immersive interaction and gaze behaviour.

Microsoft also provides consumer-grade virtual reality headsets that support user-driven application development. These devices are well-suited for research contexts thanks to their high refresh rates, enhanced processing capabilities, and integrated eye-tracking technology.

9.5.2. Software

Common tools for designing virtual reality experiences include Unity and Vizard, the latter often used in conjunction with the SightLab library for eye-tracking analysis. Unity is a free and widely adopted game engine, supporting development in C# and JavaScript, whereas Vizard is more specifically tailored for virtual reality research applications, with programming carried out in Python.

Vizard, developed by the company WorldViz (founded by Peter Schlueer), is designed to provide researchers with user-friendly access to eye-tracking data while maintaining the low-level control and high data quality required for scientific rigour. As Andy Beall, founder and Chief Scientist of WorldViz, notes: *'It is incredible how easy it is to set up immersive eye-tracking experiences. With Vizard, you can quickly add eye tracking to your virtual scene and perform analyses, including recording and exporting your data.'*.

Vizard supports integration with a variety of specialised research devices, including those developed by the CoCoLab, such as biophysiological sensors (e.g., EEG, ECG). Its Python-based interface not only simplifies development but also enables access to a vast ecosystem of existing libraries and tools. Together, Unity and Vizard allow researchers to design both simple and complex 3D environments, programme object behaviour, and extract detailed information on participant behaviour using eye-tracking and electrophysiological measurements.

These capabilities open new frontiers in experimental design across diverse fields, including psychology, neuroscience, performance assessment, training, and consumer behaviour research.





Figure 11: Photos of the experiment

9.5.3. PC Hardware

Despite the remarkable advancements in computer hardware over the past three decades, current VR applications still place substantial demands on computational power, even on the latest systems. This is particularly evident when rendering complex scenes with multiple dynamic objects, intricate textures, or fluctuating lighting conditions. To ensure an optimal experience, it is essential that the VR environment operates at a high refresh rate; otherwise, response delays or jerky motion can easily induce motion sickness in participants.

The computer system typically functions as the interface between the eye-tracking technology and the VR headset, collecting and processing all behavioural data related to the subject's interaction within the virtual environment. For this purpose, the experiment will be conducted on a DELL Precision 3680 Tower workstation, equipped with a 14th Gen Intel Core i9 14900K processor, ensuring the required computational power for high-quality rendering and real-time data processing.



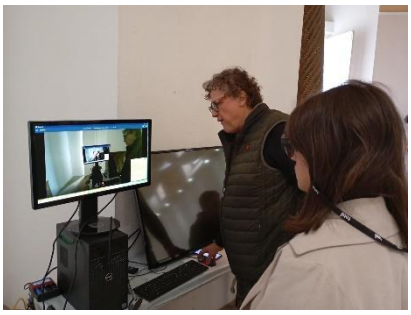


Figure 12: Photos of the experiment

9.5.4. Eye-tracker: XR Headset and Environmental Glasses

These devices are specifically designed to integrate with different types of VR headsets, providing advanced eye-tracking capabilities for immersive experiences. Companies currently offering eye-tracking technology for VR headsets include Varjo with the XR-4 and HTC Vive with the Eye Focus 3.

Among the leading devices is the Tobii Pro Glasses 3 (Figure 13), an advanced wearable eye-tracking solution designed for research purposes. This device enables the capture of detailed eye-tracking data in real time, offering scientific accuracy that propels research beyond controlled environments and into more natural, real-world settings. The Tobii Pro Glasses 3 are particularly valuable as they allow participants to behave naturally, without the interference typically associated with laboratory-based eye-tracking setups. Eye-tracking data is collected seamlessly while the participants engage in real-world activities, providing rich insights into cognitive and perceptual processes during immersive experiences.



Figure 13: Tobii Pro Glasses 3

9.5.5. Cable Management

Most VR setups involve multiple cables connecting the headset (and eye tracker) to the computer. As subjects typically move around in the virtual environment, they are at risk of becoming tangled in these cables, which can interfere with their immersion and performance. This issue can be mitigated

by seating participants in a 360° rotating chair, ensuring freedom of movement without the risk of entanglement.

Some manufacturers, such as HTC, offer wireless solutions for VR headsets, such as the Focus 3 (Figure 11), which can serve as a useful alternative to traditional wired setups. However, despite these advances, the majority of eye-tracking systems for VR still rely on cabled connections, necessitating careful cable management to ensure that the participant's experience remains smooth and unobstructed.

9.5.6. Disposable Hygiene Protectors

VR headsets are primarily designed for individual use. However, in a laboratory setting, where multiple participants may use the same headset, concerns arise regarding hygiene and comfort. Specifically, the headset cushion comes into direct contact with the subject's face, and the body heat generated during use can promote perspiration, which may affect both the comfort of the participant and the cleanliness of the device.

To ensure a comfortable and hygienic experience, it is strongly recommended to use disposable cushion protectors where the headset comes into contact with the skin. Alternatively, dry wipes or sanitising wipes should be used to clean the headset thoroughly after each use. This practice not only maintains hygiene but also ensures that each participant has a clean and comfortable interface with the VR system.

9.5.7. Development of an IT Solution for Research

The UniCA team oversaw two computer science internships aimed at developing tools to address the research challenges of the Reboot project.

1. Noé Mercier's Internship (September 23, 2024 - December 20, 2024)

The objective of Noé Mercier's internship was to develop real-time eye tracking data acquisition software for cognitive research, focusing on the viewing of film content projected in a VR headset. The first experimental version of the software was based on the Vizard software toolkit (a prospective study will determine whether the cost of using this toolkit is viable).

Key features that were developed include:

- Recording and playback of eye tracking behaviour for 'after-action review', including 3D path analysis.
- In-depth data analysis capabilities.
- Precise experimental time control and device synchronisation.
- 360° videos and 3D files from a variety of sources as customisable stimuli.
- Recording of gaze direction, pupil size, fixation times, and other low-level parameters.
- Generation of heat maps to visualise eye tracking data.

During the course of the internship, Mr. Mercier revisited and corrected the software code twice to address errors that emerged during development.

2. Rémi Orsini's Internship (April 7, 2025 - July 31, 2025)

The second phase of development focused on creating a more generic application in Unity using C#, with the aim of building two distinct functionalities.

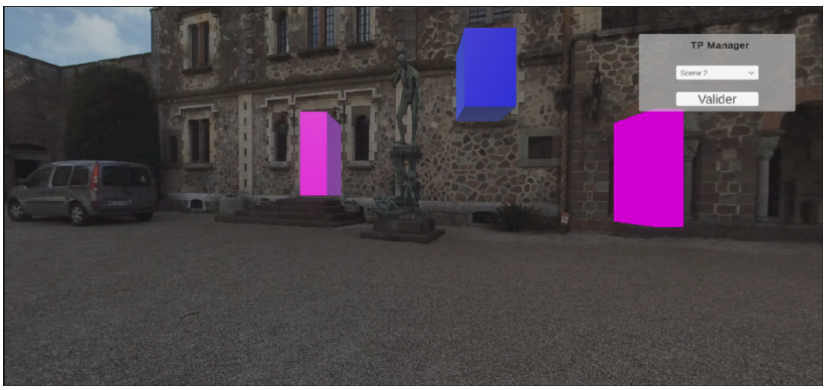
Creator Mode: For researchers to integrate 360° scenes and define waypoints, all without coding.

This feature enables researchers to integrate 360° film scenes of their choice easily, define waypoints between these scenes via defined objects or teleportation, all without requiring any programming. The software then generates an instance that can be used by participants to navigate seamlessly from scene to scene.

User Mode: This mode allows participants to use scenes created in Creator Mode, taking virtual reality tours while navigating through the scenes using the integrated eye tracking functionality of the Varjo headset. Participants follow the paths defined by the researchers, guided by the predefined waypoints.

After just one week of development, the first prototype of the software was successfully programmed. The current version allows the creator to move within panoramic scenes using keyboard controls, manually switch between scenes, and create waypoints (represented as cubes) that link different scenes, specifying the destinations for each waypoint from a list of available scenes.

Looking ahead, future development will focus on the integration of new scenes using a template and the desired panoramic video. Another priority is the ability to export completed instances to the Varjo VR headset, enabling participants to experience the final VR tours.



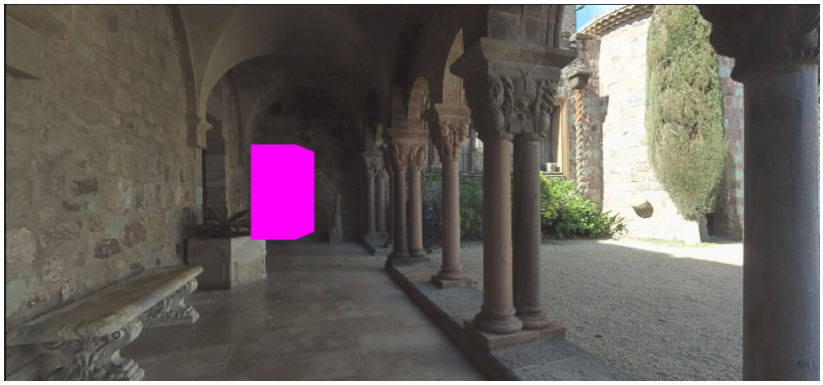


Figure 14: Teleportation from one scene to another

9.5.8. Training and Cooperation with SpeederNet and Tobii

The Reboot/UniCA team attended two days of in-person training and several online sessions focused on hardware usage and data processing:

- Tobii - December 9, 2024, at the Château de la Napoule
- SpeederNet - January 16, 2025, at the Maison des Sciences de l'Homme et de la Société Sud-Est, CoCoLab Technology Platform

Training sessions on the VR headset and Glasses 3 goggles were organised with SpeederNet and Tobii. Sylvain Dorriere, Account Manager for France & Switzerland - Products & Solutions for

Medical & Scientific Research, hosted a day of discussions on research methodologies using the Glasses 3 goggles and how to utilise the Tobii Pro Lab software.

Support for Varjo tools was provided by Stanislas Jordikian, Business Development Manager at SpeederNet, through collaborative sessions.

9.6. Experimental Protocol

In line with our theoretical and methodological framework, we propose to conduct the experiment on a historical architectural and artistic monument with a complex topology: the Château de la Napoule, which functions as a castle, museum, and event / exhibition space. This will serve both as the thematic content for our study and as the location for our experiment on viewing and itinerancy within the real landscape.

Building upon this setting, the team will create two audiovisual documents centred around the same subject matter.

First one, an 'heritage' presentation film using the entire classic cinematographic 'grammar' (the range of image planes, classical narrative editing schemes, voice-over, music, sound effects):

- La Napoule Art Foundation - Classic - https://vimeo.com/1034496770.

Second one, a journey in 360°/VR with circular vision, and free and voluntary movement interactivity:

- La Napoule Art Foundation - VR - https://www.youtube.com/watch?v=jFchzlQQPNs.

For technical reasons, for viewing in a commercial Oculus 3 headset and another in the Varjo experimental headset, the latter is presented in two versions:

- one with postural visual interaction via neck rotation,
- another with interaction via neck rotation and a manual controller.

We make watch separately these two media, classic and VR, by two distinct groups of young people, having no prior knowledge of the monument.

1. We proceed to the recording of the attentional points management during two types of contents watching, respectively by:

- XR content by headset - using eye-tracking VR headset (Varjo technology) for XR content.
- Film content on screen display - using environmental eye-tracking glasses (Tobii Glasses technology).

2. We invite each participant to draw a topographic map of the space memorized during viewing.
3. We invite each group, 'cinema' and 'XR', to walk through the real monument with an injunction of specifics tasks in spatial orientation (e.g. '*visit - 1. the conference room, 2. living room, 3. dining room, 4. balcony and 5. workshop*', etc.), in recording their attentional points management by means of environmental eye-tracking glasses (Tobii Glasses technology) and measuring performance (the time to complete the injunction).
4. We record the journey execution times for each participant.

9.7. Data Corpus Collection

The data is stored in appendices, as well as in this document, containing the following sections:

- reference number,
- reduced labels of snapshots,
- reduced labels of visualization of heat maps obtained by attention filter,
- task execution times,
- drawings.

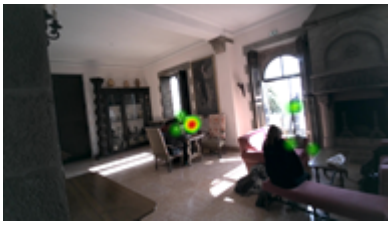
Comments follow, if required.

9.7.1. Data of 03/07/2025 Experience at Château de la Napoule

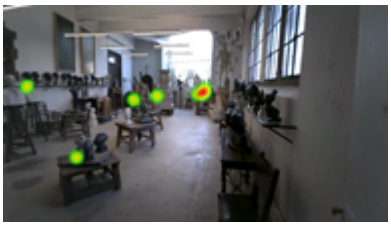
Environmental itinerancy with Tobii Glasses - 'cinema / XR' viewing group.

Each participant is represented with 5 snapshots and 5 visualizations from different locations of the castle visited.

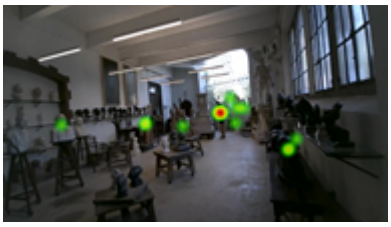
(*Sampling limited to 3 participants, the dataset in the appendices.)

N°	Snapshots	Visualizations	Times	Drawings
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2			03:29,32	
				
				
				

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

				
3			02:47,29	
				
				
				

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

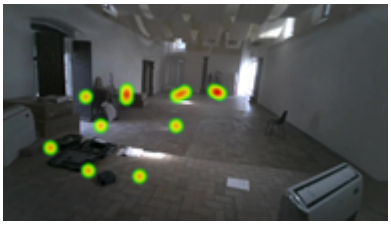
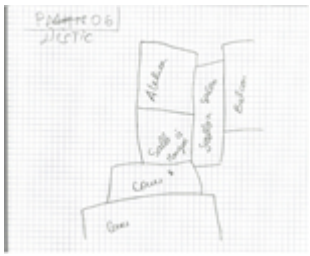
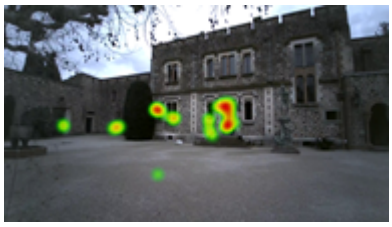
				

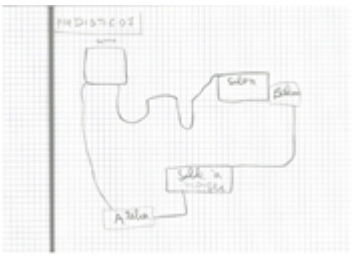
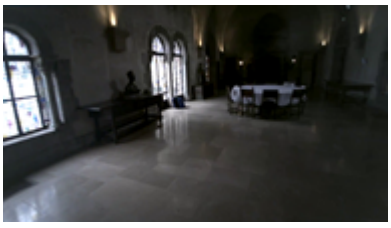
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9.7.2. Data of 03/14/2025 Experience at Château de la Napoule

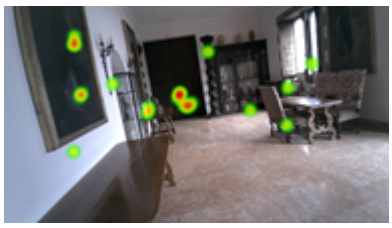
Environmental itinerancy with Tobii Glasses - 'classic movie viewing group'. Each participant is represented by 5 snapshots and 5 visualizations from different locations within the castle visited.

(*Sampling limited to 3 participants; the full dataset is provided in the appendices.)

N°	Snapshots	Visualizations	Times	Drawings
1			02:59,49	
				

				
				
				
2			08:46,43	
				

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3			04:23,12	
				

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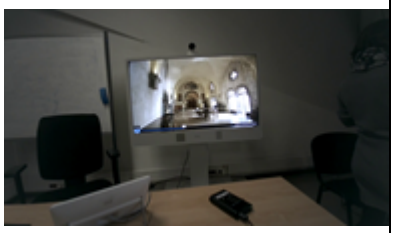
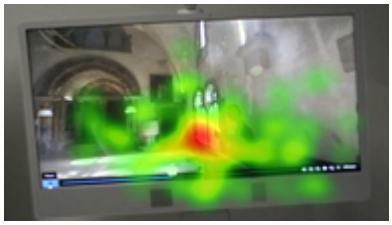
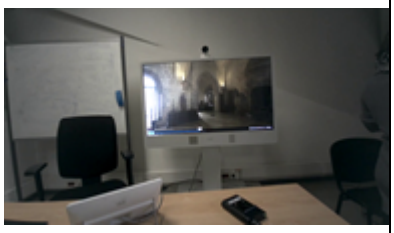
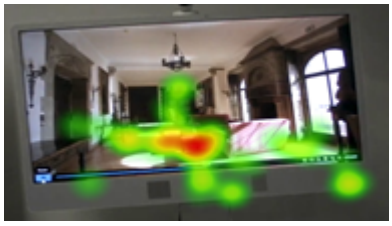
				
				
				

Table 9: Data of 03/14/2025 experience

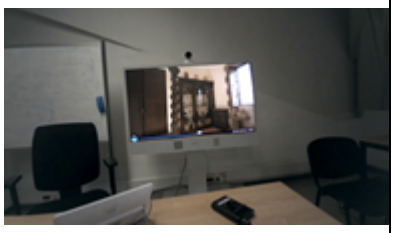
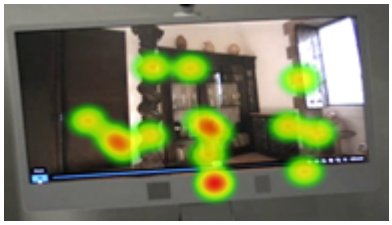
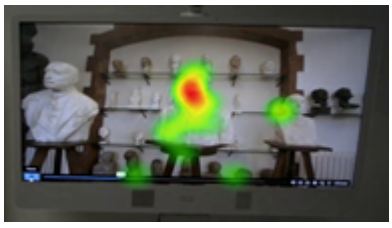
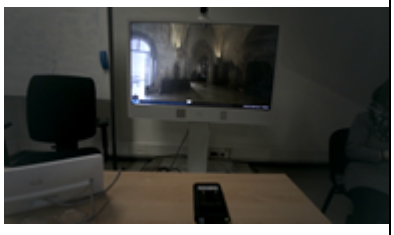
9.7.3. Data of 04/01/2025 Experience at MSHS Sud-Est

With the use of Tobii Glasses, the 'Cinema watching group' participants are represented by 5 snapshots and 5 visualizations from different locations of the castle presented.

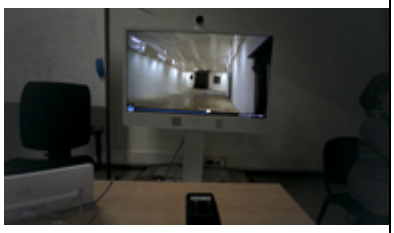
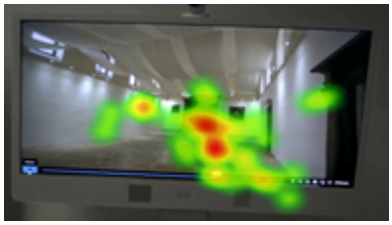
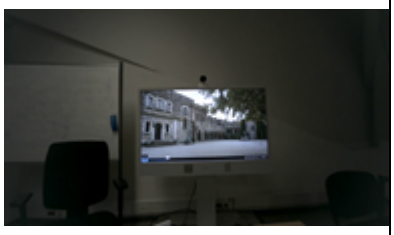
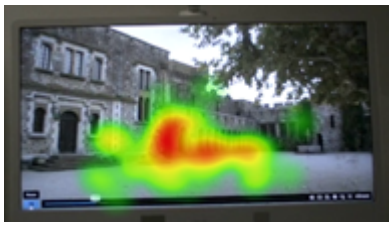
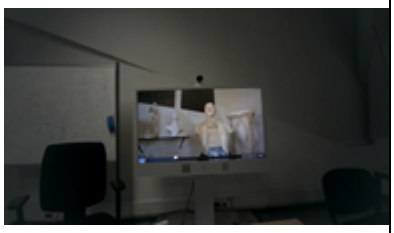
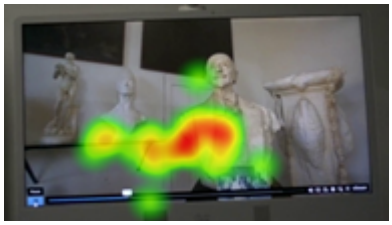
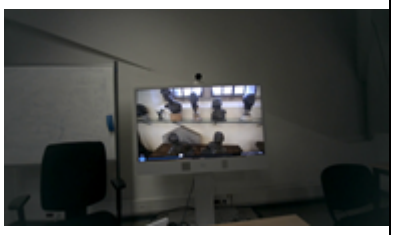
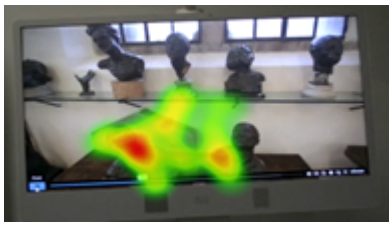
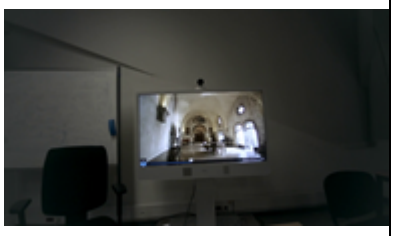
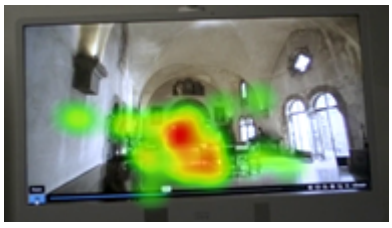
(*Sampling limited to 3 participants; the full dataset is provided in the appendices.)

N°	Snapshots	Visualizations	Drawings
1			
			
			
			

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2			
			
			
			

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

			
3			
			
			
			

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

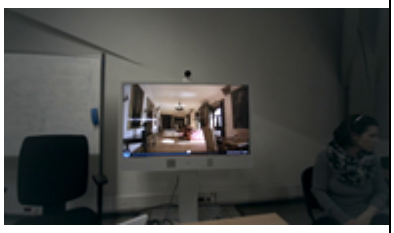
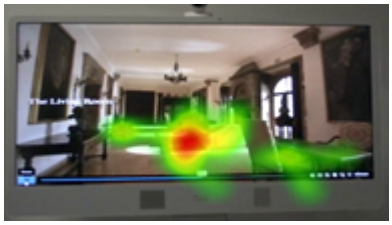
			

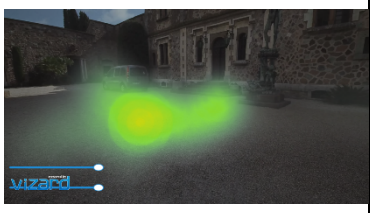
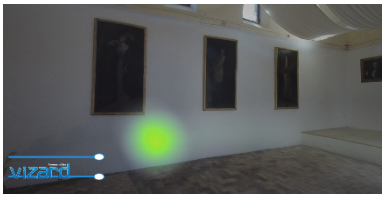
Table 10: Data of 04/01/2025 screen experience

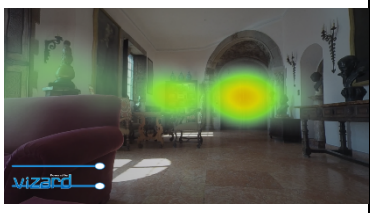
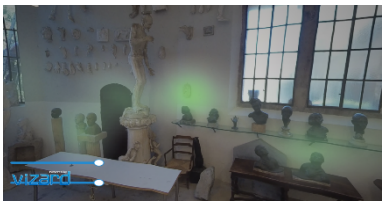
9.7.4. Data of 04/01/2025 Experience at MSHS Sud-Est

With the use of the Varjo headset, the 'VR watching group' participants are represented with three complementary views. These views correspond to the three most frequent gaze directions within the visual sphere of VR, as the retro-gaze is infrequent. Each participant's gaze is depicted in relation to three different rooms of the castle they are visiting.

(*Sampling limited to 3 participants; the full dataset is provided in the appendices.)

The drawings follow

N°	View 1	View 2	View 3
1.1			
1.2			

1.3			
2.1			
2.2			
2.3			
3.1			
3.2			

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3.3			
N°	Drawings		
1			
2			
3			

Table 11: Data of 04/01/2025 VR experience

9.8. Partial Conclusions - Interpretation of Results Method

We compare the spatial orientation skills of two groups by considering the following elements:

- The execution times of spatial orientation tasks.
- Restitutions in the form of drawings depicting the topography of the location viewed through two media.
- Visualization in the form of heat maps, generated by the Tobii Pro Lab software using the Gaze Filter - I-VT (Attention), which provides more relevant data in mobility situations compared to the Gaze Filter - I-VT (Fixation).
- Extraction of snapshots from the dynamic video stimulus, interpreted in terms of landscape semiotics.

The interpretation is carried out in two stages:

- First, individual cases are examined to gain a deeper understanding of our corpus.
- Second, statistical processing is applied to compare the two groups: 'cinema' and 'cinema / XR Hybridisation'.

We interpret the ***temporal data***, ***drawings***, and ***eye-tracking results*** in terms of the ***semiotics of landscape and its motor affordances*** (Renaud, 2003).

The primary objective of this comparative study of certain cognitive parameters common to classic cinema and the hybridisation of 'cinema / XR' is to provide supporting arguments for the new European policy on the creation and training of 'cinema / XR' This aims to bridge the growing gap between the social cognition induced by all media, which is increasingly shaped by XR technologies, and the perceptual ergonomics of cinema, which remains overly tied to its historical modes.

Indeed, the results of the 'REBOOT' project, which focuses on the hybridisation of 'cinema / XR' result in the visualisation of attentional points, presented as 'heat maps' that align with both the direction of gaze and the auditory postures of spectators and listeners.

However, the cognitive support for the management of areas of interest should not be interpreted solely in terms of gaze directionality and auditory focus, but also as a function of the semiotic load, and ultimately the circumstantial semantics embedded in various parts of the landscape. Therefore, our results must be complemented by considerations concerning the semiotics of environments. This reflection may, in turn, suggest the existence of a cognitive, temporal, or persistent

implementation of behavioural patterns related to both hearing and viewing, consisting, on one hand, of enaction (eye movements and aural postures) and, on the other hand, of figures of meaning that can be interpreted in terms of affordances, inherent to both the real environment and its audiovisual representation.

9.9. Partial Conclusion - Speed of Task Execution

Person	Time VR	Time CC	Seconds VR	Seconds CC	Notes CC
1	04:02,55	03:40,61	242,55	220,61	PMHn
2	03:29,32	03:50,81	209,32	230,81	PMHn
3	02:47,29	02:53,94	167,29	173,94	PMHn
4	02:43,23	07:40,21	163,23	460,21	PMHn
5	03:05,99	06:43,69	185,99	403,69	PMHn
6	02:40,98	02:59,49	160,98	179,49	PdiSTiC
7	03:02,88	08:46,43	182,88	526,43	PdiSTiC
8	02:51,21	04:23,12	171,21	263,12	PdiSTiC
9	04:47,50	07:36,14	287,5	456,14	PdiSTiC
10	03:27,47	02:49,93	207,47	169,93	PdiSTiC
11	02:58,88	05:49,87	178,88	349,87	PMHn
12	04:12,45	04:48,04	252,45	288,04	PMHn
13	02:45,44	02:58,53	165,44	178,53	PMHn
14	04:32,83	07:02,84	272,83	422,84	PMHn
15	03:33,91	03:48,20	213,91	228,20	PMHn
16		03:32,02		212,02	PMHn
17		04:50,25		290,25	PMHn
18		02:42,53		159,14	PMHn
			Group VR	**Group CC**	
Average:			204,128667	289,63	
Standard deviation:			41,8378255	117,628505	
Average (minutes)			**03:24,13**	**04:49,81**	
Standard deviation (minutes):			**00:41,8**	**01:57,6**	

Table 12: Speed of Task Execution

9.10. Partial Conclusion - Collective Statistics

Below is the snapshot utilised for the Tobii analysis for the two groups: the VR (Virtual Reality) group and the CC (Classic Cinema) group. This snapshot serves as the spatial reference for the analysis:



Figure 15: Snapshot of the workshop scene

9.10.1. Results - Group VR - Duration Plot (Oculus 3 headsets, room: atelier)

The eye-tracking data presented in the following graph was collected to assess the duration of intervals corresponding to each participant's presence in the 'atelier' of the Napoule Castle. The duration of interval refers to the amount of time between consecutive eye fixations along a given line, measured in milliseconds. Each point on the graph represents one such interval, while the horizontal blue line (approximately 6342 milliseconds) indicates the average interval duration across all participants. The grey shaded areas depict the range of standard deviation, illustrating the extent of variability within the data.

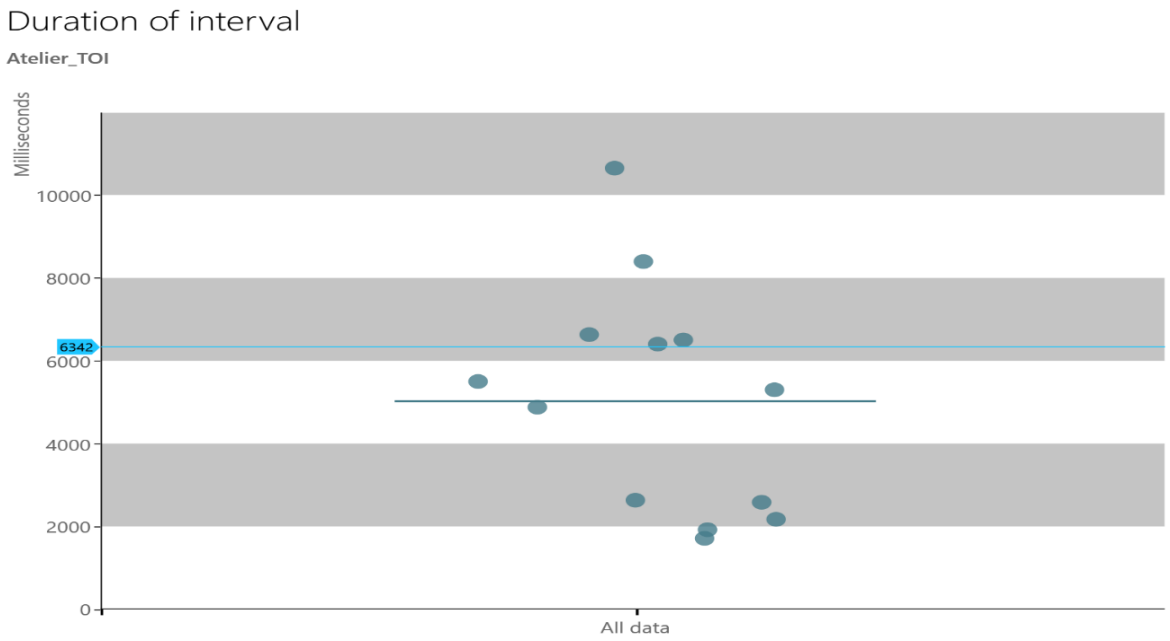


Figure 16: Duration of interval - Group VR

The relatively long average interval suggests that participants were not hurried in shifting their gaze from one point to another; rather, they appeared to take their time as they moved through the atelier. This indicates a degree of engagement with the visual stimuli, possibly reflecting moments of analysis or reflection upon the information perceived. The wide distribution of interval durations - ranging from less than 2000 milliseconds to over 10,000 milliseconds - further implies the absence of a singular, uniform pattern of visual exploration. At times, participants briefly scanned from one object to another (shorter intervals); at other times, they lingered longer, which may reflect either a deeper engagement with the material or, conversely, difficulty in processing the information (Just et Carpenter, 1976). In cognitive terms (Shimamura, 2013, pp. 16-21), these variations in fixation duration may be interpreted as evidence that participants' attention and engagement within the space were modulated by their emotional responses, narrative interpretations, and prior knowledge.

9.10.2. Fixation Heat Map

The heatmap fixation provides a graphical visualisation of where participants directed their gaze within the atelier and the duration of their fixations on specific areas. The following image presents the fixation patterns recorded across all participants within the VR group.

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Figure 17: Fixation Heat Map of the workshop scene - Group VR

Based on the direction and density of fixations, it can be observed that upon entering the room, participants' immediate attention was drawn to the portraits on the left. Subsequently, their gaze shifted towards the centre of the room, focusing on the busts and various sculptures. The gaze then progressed towards the back of the room, where a large statue is positioned beneath the glass roof. Finally, some attention was directed towards the right-hand side of the space, although this was notably less intense, characterised by shorter fixation durations.

In particular, the first plaster head on the left emerges as an area of high attentional focus, consistent with the well-documented tendency for faces to naturally attract human gaze. Its prominent position within the direct field of vision upon entering the room likely reinforces this effect. Conversely, the large windows on the right do not capture significant visual attention - a typical finding, as individuals tend to prioritise informational or aesthetic elements over sources of light (Shimamura, 2013). Finally, although the statue positioned against the back wall does receive some fixations (indicated by green dots), the level of attention it attracts is noticeably lower than might be expected given its imposing presence.

9.10.3. Attention Heat Map

The attention heatmap, similar in appearance to the fixation heatmap, is generated from a combination of data to estimate what elements attract attention, rather than solely reflecting the

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duration of gaze. In the following image, the areas of attention recorded across all participants are displayed. The red regions indicate zones where the majority of participants concentrated their attention.



Figure 18: Attention Heat Map of the workshop scene - Group VR

It is evident that the sculptures in the centre of the room immediately draw attention, more so than indicated by the fixation heatmap. Numerous hotspots are visible, particularly around the busts and statues in the central and deeper areas of the room. The two busts on the left also attract considerable attention, likely due to their human-like forms and the stark contrast they present against the neutral background. The attention heatmap results suggest that attention is not merely a reflection of human behaviour, but rather guided by factors that naturally capture the eye.

9.10.4. Attention Scan Path

The attention scan path refers to the sequence and order in which a person directs their gaze across different points within a scene, image, or screen. It consists of two principal elements: (1) fixations, which are the points where the eye pauses to focus on specific details (typically represented by circles), and (2) saccades, which are the rapid movements of the eye between successive fixations. In the following image, fixation points are illustrated as coloured circles, with the size of each circle

corresponding to the duration of the fixation, while the connecting lines (saccades) trace the path of eye movement from one point to another.

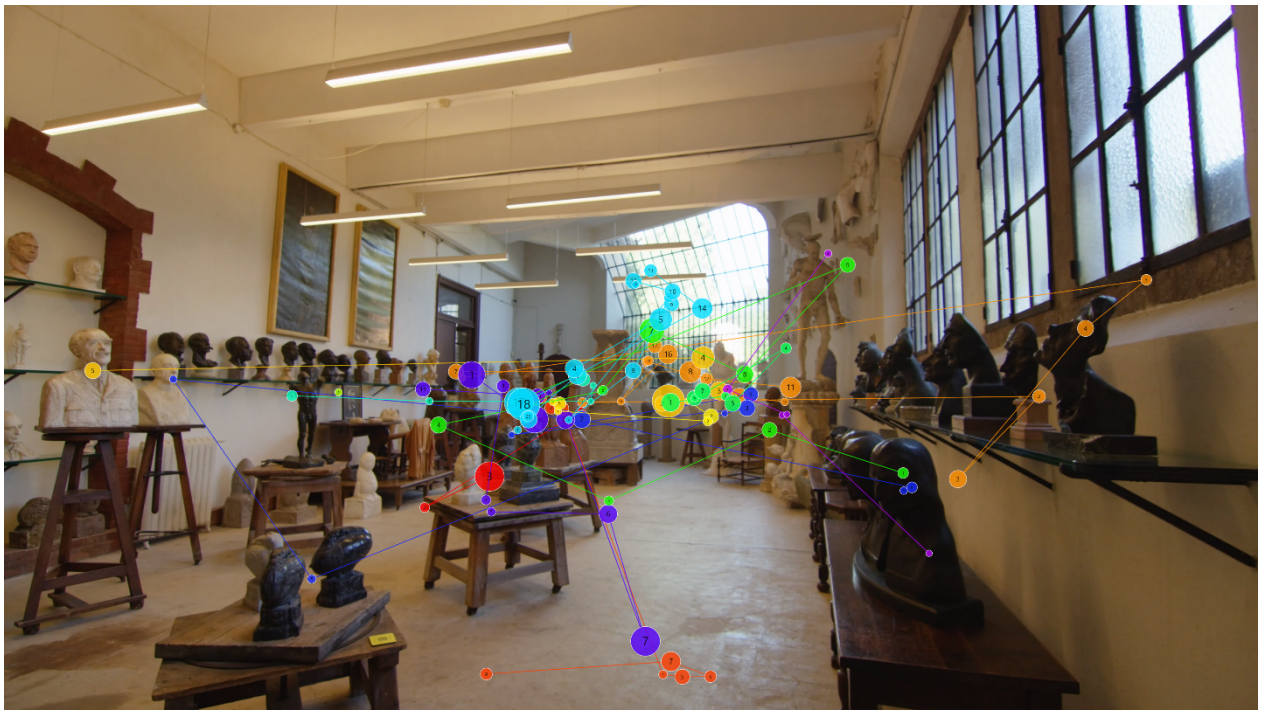


Figure 19: Attention Scan Path of the workshop scene - Group VR

A distinct pattern emerges in the visual navigation of most participants within the atelier: the statue positioned at the centre of the room serves as a visual reference point from which participants begin to map the space. From a spatial cognitive perspective, this can be attributed to the tendency of individuals to select salient or significant objects to orient themselves within an environment (Wang et al., 2020). Following this initial focal point, participants then shift their attention to other sculptures and objects scattered throughout the room. The approach to scanning the space also varies among participants: some individuals move from left to right across the room, indicating an intentional exploration, while others adopt a more dynamic, non-linear process, transitioning from the foreground to the background. This strategy allows participants to actively construct a spatial map of the room, engaging not only with objects but also with their spatial relationships (ibid.).

In conclusion, the scan path data expounds how participants prioritise certain visual elements over others, how attention moves and flows throughout the room, and how individuals ultimately construct their mental map of the atelier.

9.10.5. Opacity Map

Opacity refers to the manner in which eye-tracking data is displayed on the visual stimulus, particularly in terms of visibility and intensity. In Tobii Pro Lab, the Opacity Map darkens regions that were not viewed, while areas that were observed gradually become more visible, represented by a grey gradient. In the following photo, the bright spots indicate the locations where most participants focused their gaze upon entering the atelier, highlighting the areas that the eyes and brain prioritised in the overall snapshot.



Figure 20: Opacity Map of the workshop scene - Group VR

More specifically, the bright areas of the photo signify regions that attracted high visual attention, where participants either looked more frequently or for longer durations. In contrast, the darker areas were largely overlooked or ignored by the participants. The remaining sections of the image gradually fade in prominence, reflecting the density and duration of gaze directed towards them.

9.10.6. Results - Group CC - Duration Plot (Tobii Pro Glasses 3, room: atelier)

The following graph illustrates that certain participants experienced extended viewing episodes, with durations exceeding 10,000 milliseconds, and one instance approaching 14,000 milliseconds. In contrast, other participants exhibited relatively shorter gaze durations, ranging from approximately 2,000 to 4,000 milliseconds, suggesting either reduced interest or a more fleeting engagement. The data points also indicate that, while participants were generally aligned in terms of what they focused

on, there was considerable variation in the duration of time they spent processing the content of the atelier.

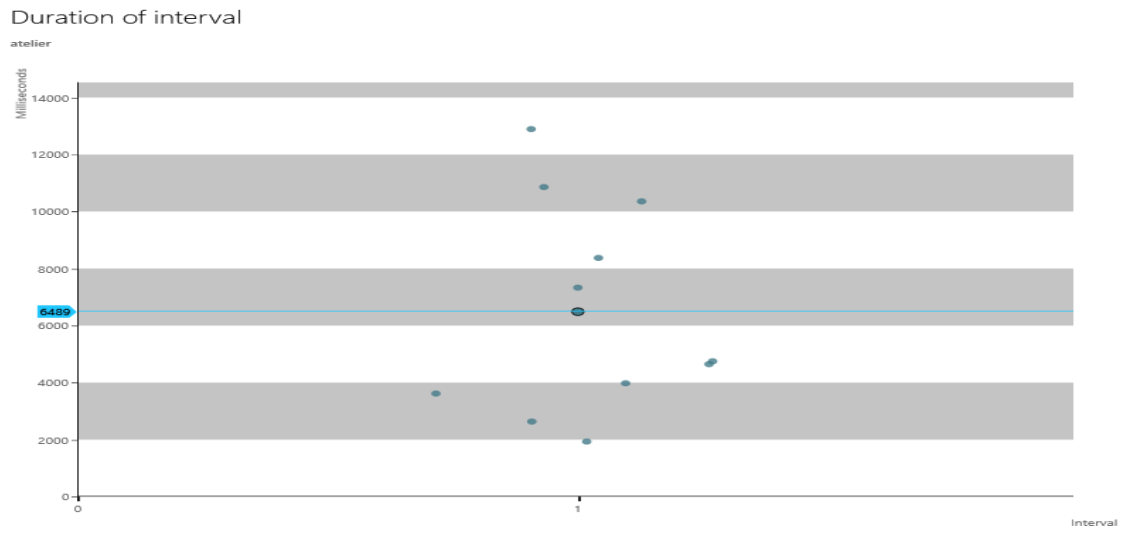


Figure 21: Duration of interval - Group CC

9.10.7. Fixation Heat Map

According to the provided image, the focal points of interest are slightly concentrated in the middle-depth and left-centre of the room. The red and yellow areas demonstrate those participants repeatedly looked at the sculptures and busts positioned at eye level and centrally within the room.



Figure 22: Fixation Heat Map of the workshop scene - Group CC

The areas marked in green indicate that participants dispersed throughout the room, particularly on the side featuring the tall sculpture and near a few busts positioned on the right side of the room, close to the windows. These regions attracted relatively minor visual attention. In terms of lighting, the floor and the upper corners of the room exhibited little to no fixation activity. Consequently, it can be concluded that participants demonstrated a 'controlled' and selective form of attention, focusing primarily on meaningful and informative elements, such as the sculptures, rather than non-informative features, such as the lighting or the floor (Shimamura, 2013).

9.10.8. Attention Heat Map

Based on the data presented in the accompanying image, it can be observed that there is a significant concentration of gaze in the central region, particularly around the sculpture tables. These areas are highlighted in red and yellow, signifying heightened attention from the majority of participants. In contrast, the large standing statue and the surrounding artworks in the background garnered moderate attention, suggesting that while the engagement was brief, it was shared by most individuals. With regard to the lighting, the corners of the room, certain artworks along the right-hand wall (beneath the windows), and the ceiling, did not attract significant attention from the participants.



Figure 23: Attention Heat Map of the workshop scene - Group CC

In summary, the data suggest that participants, upon entering the atelier, predominantly oriented their attention towards its central features. Their visual exploration was marked by selective attention

and a relatively constrained scanning strategy, rather than by an extensive or systematic examination of the spatial environment.

9.10.9. Attention Scan Path

Analysis of the scan path (see following image) indicates that the statues placed on the central tables of the atelier elicited the highest levels of visual engagement. This is evidenced by the dense aggregation of fixation points and the convergence of saccadic trajectories within the central zone. Participants' initial gaze behaviour was primarily oriented towards areas labelled 1, 2, and 3, suggesting that their attention was immediately anchored by the central sculptural installation upon entry.



Figure 24: Attention Scan Path of the workshop scene - Group CC

Only a limited number of scan paths exhibited a left-to-right directional movement. In contrast, a consistent progression of gaze from the foreground towards the background was observed, indicative of participants' visual exploration into the depth of the space. Each participant displayed a distinct scan path, reflected in the variability of fixation points and differentiated saccadic pathways, as illustrated by the coloured mapping. In conclusion, the scan path analysis reveals an inherent tendency to prioritise statues positioned in highly salient, symmetrically arranged locations, with lighting conditions likely amplifying their perceptual prominence.

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9.10.10. Opacity Map

The final visual representation displays the fixation-derived opacity map, delineating darker zones indicative of minimal or absent visual engagement and lighter zones reflective of intensive gaze fixation. The most luminous regions correspond to the artworks exhibited on the back wall, the centrally located sculptures, and the tall statue adjacent to the window, all of which consistently elicited repeated visual fixations. These findings imply that the spatial configuration — including vertical and horizontal positioning — combined with specific lighting conditions, substantially influenced participants' attentional deployment within the environment.



Figure 25: Opacity Map of the workshop scene - Group CC

The regions along the right wall — particularly the busts positioned on the shelving — together with substantial portions of the ceiling and floor, remained dark on the opacity map, suggesting minimal visual engagement. These findings further substantiate the hypothesis that both lighting dynamics and spatial depth critically influence the allocation of visual attention, supporting the broader theoretical framework whereby centrality and illumination function as key determinants of visual salience in three-dimensional environments (Wang et al., 2020).

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9.10.11. Comparison

The Tobii eye-tracking data highlight marked distinctions in audience engagement patterns between the VR and CC groups. Participants assigned to the VR condition demonstrated a more exploratory and dispersed visual exploration of the atelier. Multiple Areas of Interest (AOIs) received moderate to high attentional engagement, as evidenced by the duration interval plots and the fixation-based heat maps, suggesting a broader spatial distribution of gaze. The Oculus Quest 3 headsets appear to have facilitated freer navigational behaviours, closely resembling real-world exploratory dynamics. Moreover, the scan path analysis reveals a multiplicity of entry points and fluid saccadic movements, indicative of heightened environmental curiosity. Finally, fixation metrics show that while participants surveyed a wider spatial extent, they spent less time per object, reflecting the inherently dynamic and transient perceptual processes characteristic of virtual environments.

Participants assigned to the CC condition displayed a notably selective and targeted visual engagement pattern. The attention and fixation heat maps demonstrate that peripheral elements received minimal visual attention, whereas central and right-sided Areas of Interest (AOIs) exhibited prominent clustering. Analysis of the opacity map and scan paths reveals a constrained exploration style, akin to a visual tunnel, indicating that under physical observation conditions, participants tended to orient predominantly towards salient spatial features rather than engaging in broad environmental scanning. This behavioural pattern suggests heightened visual anchoring within the CC group, with attentional resources concentrated in fewer regions, accompanied by denser fixation distributions and extended dwell times within selected zones.

The findings of the REBOOT project indicate that the sustained global competitiveness of the EU film industry hinges not only on continued investment in traditional filmmaking practices, but equally on the proactive adoption of technological innovations and hybrid formats including Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). The analysis underscores that emerging technologies are reshaping attentional dynamics, youth engagement, social interaction patterns, and immersive cognitive experiences, making the ability to shape interactive media consumption a critical determinant of competitiveness. Investing in XR capacities thus constitutes an imperative strategic priority for the European Union, essential to preserving cultural sovereignty, enhancing international audiovisual influence, and maintaining generational relevance in an evolving global landscape.

9.11. Partial Conclusion Based on VR Eye-tracking Results

9.11.1. Introduction: The Eye in the Labyrinth

Building upon a comparative protocol, three groups of students were exposed to the heritage site of the Château de Mandelieu La Napoule via different modalities: a physical, in-person visit; a standard screen-based video (monitored with Tobii eye-tracking); and a fully immersive VR experience using the VARJO system. None of the participants had any prior exposure to the site or the experimental procedure, thereby ensuring the authenticity of the spatial memory formation process. Following the exercise, participants were asked to sketch a floor plan of the site and to locate six designated areas, the courtyard, conference room, lounge, dining hall, seafront, and workshop, while the time taken for spatial recognition was recorded.

The analysis centred on the patterns of visual attention and cognitive mapping that emerged from these experiences, with particular emphasis on the immersive VR group. Eye-tracking data, encompassing fixation patterns, gaze trajectories, and attention heatmaps, were interpreted through the lens of recent cognitive science theories concerning perception, attention, and embodied cognition.

9.11.2. Recall of the Theoretical Framework: Cartography of Attention

The present analysis draws on contemporary models of attentional control that emphasise the dynamic interplay between sustained focal attention and transient, exploratory attention in complex environments (Carrasco, 2020; Eimer, 2015; Nakayama et Mackeben, 2018). These phenomena, originally conceptualised by early cognitive theories (e.g., Posner, 1980), now benefit from refined neurocognitive frameworks particularly suited to interpreting gaze behaviours in immersive virtual reality contexts. Particular attention is given to the phenomena of peripheral visual processing, ambient perception, saccadic transitions, and the challenges associated with allocentric spatial encoding in virtual environments (Chrastil et Warren, 2012).

Further theoretical grounding is provided by Shimamura's (2013) framework on experiential engagement, which highlights how attention, memory, and aesthetic experience are dynamically intertwined during media consumption. Shimamura's insights into cognitive-affective processes offer a pertinent lens through which to view participants' navigation of immersive environments. Additionally, Bandura's (1986) social cognitive theory underscores the importance of self-efficacy

and observational learning, concepts that are particularly relevant when considering how novice VR users adaptively regulate their behaviours and expectations in unfamiliar sensory landscapes.

A key theoretical dimension concerns the distinction between allocentric and egocentric spatial encoding. Allocentric encoding involves constructing a mental map based on external landmarks and spatial relations, whereas egocentric encoding relies on one's own body-centered perspective (e.g., 'turn left at the archway'). Chrastil and Warren (2012) demonstrated that virtual navigation, when decoupled from proprioceptive and vestibular feedback, tends to impair allocentric map-building and fosters a reliance on egocentric strategies. This observation is crucial in interpreting the participants' behaviours within VR.

9.11.3. General Observations on VR Gaze Patterns

During the immersive sessions, participants displayed frequent moments where visual attention became dispersed, fragmented, or non-focalised. Rather than indicating simple distraction, these patterns reflect the natural oscillation between ambient exploration and focal search within complex spatial environments. Such dynamics are exacerbated in VR, where cognitive overload and sensory novelty may intensify exploratory behaviours.

It is particularly noteworthy that despite their general unfamiliarity with immersive head-mounted displays, participants demonstrated remarkable adaptability in navigating and encoding the virtual space. Their ability to manage attention within these novel sensory environments, even amidst initial cognitive load, speaks to a latent plasticity of perceptual strategies when engaged in immersive narratives.

The absence of dense fixation clusters in heatmaps, far from being insignificant, signals a state of cognitive navigation that prioritises broader environmental scanning over targeted attention. This phenomenon aligns with Trevarthen's (1968) concept of ambient perception and Rensink's (2000) theories of the 'attentional blink', underlining the fluid interplay between different attentional modes in immersive settings.

9.11.4. Technical Considerations: Eye-tracking Metrics and Cognitive Load

The use of Tobii and VARJO integrated eye-tracking technologies allowed for a precise capture of participants' visual behaviours. Key metrics such as fixation duration, saccade paths, and heatmap density offer critical insights. Research has shown that longer fixation durations are typically

associated with deeper cognitive processing (Holmqvist et al., 2011), whereas erratic saccadic paths may indicate search strategies or cognitive uncertainty. Heatmaps and opacity maps reveal zones of attentional concentration or neglect, with sparse regions suggesting either attentional overload or a lack of salient cues.

As demonstrated by Makransky and Petersen (2021), VR can overload working memory, particularly for novice users, owing to the overwhelming quantity of sensory stimuli demanded by the device. This overload often results in fragmented gaze behaviours, with scanning without anchoring. Nonetheless, the ability of the participants in this study to adapt and stabilise their attentional strategies over time is encouraging for the application of VR in cultural and educational contexts.

9.11.5. Understanding Spatial Encoding

In this context, 'spatial encoding' is defined as the cognitive process through which participants perceive, process and memorise the spatial layout of the environment. The process entails the translation of the visual and navigational information encountered during exploration into a coherent internal representation, termed a 'mental map'. This map serves as a guide for subsequent recall, recognition, and navigation. Effective spatial encoding typically manifests through sustained fixations on salient landmarks, coherent scanning strategies, and the ability to integrate visual information into an organised memory system. Conversely, erratic gaze behaviour, fragmented attention, and absent or sparse fixation patterns may indicate challenges in building a stable spatial memory. Thus, the quality of spatial encoding is a critical factor in determining into the depth and efficacy of participants' immersive experiences.

The participants' successful identification of key zones, despite the sensory novelty of VR and the absence of prior site knowledge, suggests an encouraging potential for immersive media to foster spatial learning even in inexperienced users. This further underscores the idea that narrative-driven VR can serve as a powerful vector for cognitive engagement and memory consolidation.

9.11.6. Participant Case Studies: P1 to P10 Analysis

Participant P1

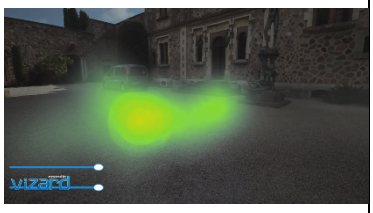
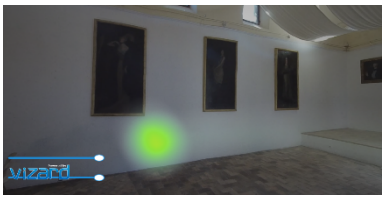
1.1			
1.2			
1.3			

Table 13: Participant 1 Case Studies

In the Courtyard, Participant P1 exhibited relatively concentrated fixations near the central axis of the courtyard structure, suggesting an initial phase of spatial anchoring. Upon entering the Archway area, however, gaze paths fragmented considerably, indicating exploratory scanning without immediate focal targets. The Lecture Theatre phase showed renewed focalisation, particularly around the main visual cues such as entrances and large furniture pieces. In the Living Room and Dining Hall, P1's attention dispersed again, with scan paths forming wide arcs, perhaps revealing cognitive fatigue or environmental overload. Finally, in the Studio/Workshop and Seafront, a return to more linear gaze patterns suggested task-oriented attention, likely driven by the explicit instruction to locate specific areas.

This behaviour suggests that while P1 managed partial encoding of key locations, the fluctuating attentional focus may have resulted in fragmented spatial memory, potentially impacting the participant's ability to recreate an accurate mental map post-visit.

Participant P2

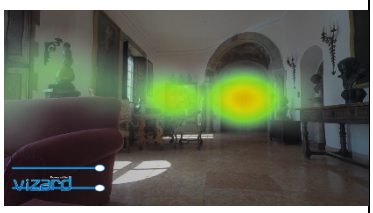
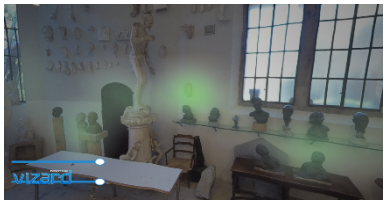
2.1			
2.2			
2.3			

Table 14: Participant 2 Case Studies

A marked difference was observed in the gaze behaviour exhibited by P2 in the Courtyard when compared to that of P1. Instead of centring attention early, P2 displayed a roaming gaze with brief, scattered fixations. In the Lecture Theatre, attention focused more narrowly on dominant architectural features such as windows and podium structures. In the Living Room and Dining Hall, P2 showed very few dense fixation clusters, suggesting a lower level of spatial encoding. The absence of fixation on certain salient details, particularly in the Dining Hall, may correspond to cognitive disengagement, as suggested by recent findings in VR-induced attentional shifts (Makransky et Petersen, 2021).

This pattern indicates that P2's spatial memory construction may have remained superficial, capturing isolated features without integrating them into a cohesive whole.

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Participant P3

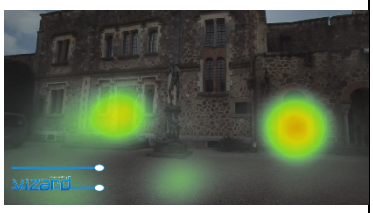
3.1			
3.2			
3.3			
			
3.4			

Table 15: Participant 3 Case Studies

P3 demonstrated relatively strong initial focus in the Courtyard, with several overlapping fixations near key structural pillars. In the Archway, however, gaze trajectories revealed frequent saccadic movements without sustained fixations, a hallmark of exploratory attention. It is worth noting that,

during the Lecture Theatre phase, P3's attention stabilised, concentrating on central objects and exits. The Living Room and Dining Hall elicited highly fragmented gaze behaviours, possibly indicating navigational uncertainty. By contrast, the Studio/Workshop and Seafront areas saw longer fixations and diminished scan path entropy, suggesting heightened spatial familiarity.

Overall, P3 seemed to progressively improve spatial encoding over time, gradually refining their mental representation of the environment despite initial challenges.

Participant P4

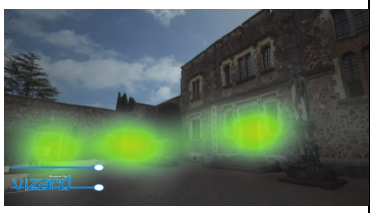
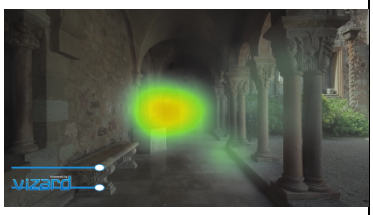
4.1			
4.2			
4.3			
4.4			

Table 16: Participant 4 Case Studies

P4 exhibited a unique pattern in the Courtyard: frequent short fixations combined with small saccadic jumps. This micro-scanning behaviour persisted across the Archway and Lecture Theatre, indicating heightened vigilance or a cautious exploration strategy. In the Living Room and Dining Hall, P4's fixations appeared more stable, though still relatively dispersed. In the Studio/Workshop and Seafront areas, attention patterns narrowed considerably, suggesting task focus as participants became more goal driven.

Such a scanning strategy may have favoured a detailed but compartmentalised encoding of spatial features, potentially leading to a segmented rather than holistic spatial memory.

Participant P5

P5's Courtyard phase was marked by long fixation durations on the peripheries rather than central features, implying a scanning strategy focused on environmental borders. In the Archway and Lecture Theatre, gaze behaviour became more focalised, with sustained attention on key spatial transitions such as doorways. The Living Room and Dining Hall triggered extensive exploratory behaviour, marked by erratic saccades and minimal fixation clustering. This pattern points to either cognitive overload or lack of salient guidance cues. In the final stages (Studio/Workshop and Seafront), P5's gaze paths indicated improved spatial understanding, with smoother, more directed trajectories.

This evolution suggests that although P5 initially struggled with spatial encoding, exposure and repetition eventually fostered a more coherent mental mapping of the environment.

Participant P6

Participant P6 presented an initial exploratory strategy in the Courtyard, with short, dispersed fixations suggesting a broad ambient processing of the space. In the Lecture Theatre, fixation density increased markedly around architectural thresholds such as doors and windows. In the Living Room and Dining Hall, P6 exhibited intermittent focal engagement, alternating between brief explorations and periods of visual stagnation. The absence of Studio/Workshop exploration in P6's data hints at either navigational disorientation or early cognitive fatigue during the immersive experience.

Consequently, P6's spatial encoding process appears incomplete, likely resulting in a fragmented internal representation with significant omissions.

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Participant P8

In the Courtyard, P8 showed a structured scanning pattern with periodic returns to previously fixated zones, indicating an attempt to build a coherent spatial map. The Archway sequence revealed more linear gaze trajectories, contrasting with highly fragmented attention during the Living Room and Seafront phases. Notably, P8 devoted considerable attention to the conference room, suggesting selective encoding of salient architectural elements over general spatial coverage.

This selective approach may have resulted in a spatial memory rich in landmarks but sparse in global spatial coherence.

Participant P10

Participant P10 demonstrated highly focused visual exploration from the outset, with a strong emphasis on central features in the Courtyard. In the Archway and Lecture Theatre, fixations clustered intensively on transition points between spaces, reflecting effective anticipatory attention. The Living Room and Dining Hall phases revealed less structured gaze behaviour, with frequent saccadic transitions and a reduced number of prolonged fixations. In contrast, the Studio/Workshop and Seafront stages showed a return to more task-driven gaze paths, indicating an adaptive adjustment of exploration strategy over the course of the session.

Overall, P10 exhibited a dynamic encoding process, balancing between initial precision and later-stage adaptation to task demands.

9.11.7. Preliminary Discussion

The variability observed among P1 to P10 highlights the non-uniform nature of spatial encoding and attentional strategies within immersive environments. It underscores that VR experiences do not impose a singular perceptual mode; instead, they invite a dance between exploration and focus, engagement and withdrawal. The fluidity of attention in VR, far from being a flaw, reflects the unfolding of a new cinematic consciousness, one in which narrative agency is partly ceded to the embodied perception of the viewer.

Considering that the majority of participants were first-time users of head-mounted displays, their ability to quickly adapt, explore, and begin forming coherent spatial representations is particularly remarkable. Rather than being overwhelmed, participants often demonstrated intuitive navigation strategies and attentional shifts appropriate to the complexity of the environment. These findings

suggest a fertile ground for the deployment of immersive technologies in cultural and cinematic contexts, where even neophytes can be transformed into active explorers of narrative spaces.

The preliminary findings support the hypothesis that immersive technologies, when appropriately designed, have the potential to cultivate richer, more participatory forms of spatial and narrative engagement. This, in turn, could herald a renaissance for European cinema, expanding its creative and cognitive horizons beyond the traditional frame. Moreover, these results open pathways for future hybrid Cinema-XR experiences. By integrating embodied cues such as virtual locomotion or haptic feedback, future VR narratives could scaffold deeper allocentric spatial memory, turning simple observation into true experiential knowing. This transition could dramatically enhance the narrative richness and emotional resonance of immersive cultural experiences.

9.11.8. Implications and Future Directions

Immersive technologies, when thoughtfully designed, expand the grammar of storytelling. They move beyond framing the spectator's eye within a limited viewport to transforming the entire perceptual world into a stage. Inheritances such as La Napoule are re-animated, no longer static relics but dynamic, emotionally inhabitable spaces.

The competitiveness of European cinema may depend on this paradigm shift: from passive spectatorship to active spatial co-creation, balancing guided narrative with autonomous exploration. Attention itself becomes an art form, one that must be meticulously crafted.

Recommended next steps include the comparative quantification of gaze metrics across the physical, screen-based, and VR groups; the estimation of cognitive load indices based on fixation dispersion (Krejtz et al., 2016); and the exploration of embodied interaction strategies to reinforce spatial memory and narrative immersion.

In sum, the findings of the REBOOT project offer a compelling vision for the future of immersive storytelling, where technology and cognition converge to reshape the experience of cultural heritage and cinematic expression.

10. PERSPECTIVES OF EXPERIMENTAL RESEARCH IN THE 'CINEMA / XR'

10.1. Emergence of the New Hybrid Cinematographic Culture since 2023-25

At a time when the first academic training programmes have been introduced in France since 2023-24, and when the first sustainable jobs are emerging in this sector, with an increasing number of audiences being exposed to this type of content - particularly in fields such as sport, medicine, advertis ing, events, professional training, live streaming, immersive videoconferencing, and signage - the society of the targeted spectacle is transitioning into the era of ecological spectacle: environmental, immersive, and interactive. This new form blends realities, sometimes artificial and other times integrated into the consciousness and memory of individuals through natural perception.

A promising avenue for future research could involve conducting studies that bridge eye-tracking methodology and semiotic analysis of the environment. Such studies would allow for an exploration of the social reception of audiovisual products from the 'cinema / XR' hybridisation, which are now entering a phase of widespread social acceptance. As these products begin to integrate into the circuit of social biofeedback, they have the potential to shape the evolving culture of the 'hearing gaze', influencing both the way audiences perceive and engage with these immersive experiences.

Neither the Canadian and American precursors of this type of research (eye-tracking in cinema and XR) undertaken in the early 2000s, nor researchers in 2019, have had the opportunity to investigate the new patterns of spectatorial and creative cognition among audiences exposed to the image and sound culture of XR, coupled with the conventions of classic cinema. This gap in research presents a unique opportunity to explore how these emerging hybrid forms of media are reshaping the cognitive and perceptual experiences of contemporary audiences.

The extension of the REBOOT research project in this direction can address the question of how, from the perspective of spectatorial and creative cognition, the new visual and auditory culture is being adjusted. This culture is being influenced not only by cinema hybridised with XR but also by other forms of immersive media, such as the search for geographical information through 360° imagery services like Google Street View. Both contribute equally to the evolving ways in which audiences engage with and process spatial, visual, and auditory information.

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10.2. Foreshadowing of the 'Master Cinema-XR' Training

This proposal outlines a new two-year Master's degree program, 'Cinema / XR - ***Bridging Realities***', a joint initiative between Université Côte d'Azur (France) and the University of Cape Town (South Africa). It aims to train 'imaginative creators and technical innovators' fluent in both traditional cinema and emerging XR technologies.

The program is motivated by the growing convergence of cinema and XR, supported by studies and initiatives like the AAP Specific call and the REBOOT project, and recognizing the innovative use of XR in African cinema, particularly in South Africa.

The curriculum includes foundational knowledge in the first year split between Europe and South Africa. The second year offers two specialization tracks. The program culminates in a Master's project and thesis.

10.2.1. Program Structure (2 Years / 120 ECTS)

The program would be structured around core modules providing foundational knowledge and specialized tracks allowing for deeper exploration.

Year 1: Foundations & immersion

Semester 1 (Europe): Core principles

Classical audiovisual storytelling (6 ECTS), Hybrid video production I (6 ECTS), Fundamentals of XR technologies (6 ECTS), Digital media theory & aesthetics (6 ECTS), Introduction to photogrammetry & 3D Scanning (6 ECTS), Media ergonomics & user experience (3 ECTS), Language & intercultural Europe / Africa communication (3 ECTS)

Semester 2 (South Africa): Expanding Horizons

Hybrid video production II (6 ECTS), Immersive 360° storytelling (6 ECTS), Aerial audiovisual production (6 ECTS), Introduction to Metaverse concepts & platforms (6 ECTS), Cognitive & aesthetic approach in digital media (6 ECTS), Sound design for immersive media (3 ECTS)

Year 2: Specialization & Innovation

Students will choose one of two specialization tracks, allowing for focused skill development:

Track 1: Immersive narrative & experience design

Semester 3 (Europe or South Africa - Student Choice): deepening

Advanced Metaverse creation & worldbuilding (6 ECTS), VR / AR / MR development & prototyping (6 ECTS), Immersive live streaming (6 ECTS), XR for immersive professional e-learning (6 ECTS), Research methods in XR & Media (6 ECTS), Optional module (3 ECTS)

Semester 4 (Europe or South Africa - Student Choice): Project & Thesis

Master's project (24 ECTS), Master's thesis (6 ECTS)

Track 2: Innovative Media & Communication

Semester 3 (Europe or South Africa - Student Choice): Deep Dive

Mobility media experiences (6 ECTS), Digital signage & experiential environments (6 ECTS), DAB+ radio & hybrid audio / video experiences (6 ECTS), AI fundamentals for communication & artistic creation (6 ECTS), Research methods in media & communication (6 ECTS), Optional module (3 ECTS)

Semester 4 (Europe or South Africa - Student Choice): Project & Thesis

Master's project (24 ECTS), Master's thesis (6 ECTS)

New Teaching Options to Consider:

Environmental eye-tracking for Immersive Design, Volumetric capture & point cloud processing, Generative AI for media creation, Cross-cultural storytelling in XR, Accessibility in immersive media, Real-time motion capture & Integration, Interactive installation design, Legal and ethical frameworks for XR and Metaverse.

10.3. Research on the New Industrial Offer for Hybrid Cinema

Hybrid cinema is currently benefiting from a renewed industrial offering, particularly through complex, miniaturised devices that incorporate the latest advances in spatial sound and immersive / interactive image technologies. These capture devices now engage with the captured environment through evolving artificial perception, organised by AI modules. They interact with both the visual

display and sound diffusion systems, dynamically mediating between the sound and visual sources and the active behaviour of the listener-spectator. This technological integration enhances the immersive experience, allowing for a more responsive and interactive relationship between the audience and the audiovisual content.

This new complex device facilitates the emergence of novel perceptual ergonomics, thereby giving rise to new cognitive patterns in audiovisual culture. By integrating advanced technologies in sound, image, and artificial perception, it reshapes how audiences interact with and process immersive content, fostering a more dynamic and engaging perceptual experience.

In this current and future context, by combining eye-tracking methodology with hearing posture detection (Luberadzka et al., 2024), we can envisage research on:

- new creative devices, such as those for images resulting from the automation of the transition between 360° video and autostereoscopic 3D, or sound resulting from the coupling of ambisonics and binaural sound. and reception,
- new visualization and sonification devices aimed at miniaturizing and simplifying the ergonomics of equipment, leading to the replacement of movie theatres with 'naturalized' installations with variable decor and geometry and the replacement of VR / AR headsets with active glasses,
- other innovations that are currently being patented and that contain AI modules enabling scalable human / machine interaction through artificial learning and accelerated adaptation of user cognition.

11. General Conclusion and Recommendations

This study has investigated the current relationships that the professional cinema sphere has with XR technologies through the lens of social cognition. The practice of each media shapes vast swaths of perceptual and mental structures in creators and the audiences concerned. The emergence of new media is conditioned by cognitive skills and competencies, and the exercise of media in turn influences the emergence of new patterns. The classic example is given by writing/reading (+-5300 BU) where the required skills have been prepared beforehand: at the perceptual level by the skills to understand visual symbols, and at the mental level by symbolic thought and spatial awareness. Once the use of writing became widespread, writing structured memory and reorganized learning to ultimately prepare the social coordination that was never possible before and which required the emergence of other media again (Watkins, 2005).

The practice of cinema for 130 years has imprinted new patterns on both high-level perceptive and mental structures that have become widespread. Taking into consideration that other emerging media, and in particular media with XR technologies, are reconfiguring cognitive skills at the social level and that this reorganization on several points competes with cinematographic structures, we have noted a worrying gap that is widening between the patterns of social cognition induced by cinema, and the corresponding patterns induced by XR technologies. This is the difference between the organization of the visual scene into central and targeted areas, for cinema, and the organization of the spherically distributed visual field with a structural multitude of perspectives, for XR. It is also a question of comparing the perceptive passivity of classical cinema with the enactive dynamic, the absence of interaction with the interactivity, the linear narrative paths with the spatial and alternating editing of XR (Manovich, 2001).

At the same time, we have observed the existence of Hybridisation between classic cinema and the XR sphere. It is a persistent phenomenon, but it has long remained at the stage of avant-garde experiments. However, since the early 2000s, it has encouraged the emergence of new industrial formats. Several non-European cinematography then makes it an expansion strategy imagined with large resources: financial aid, architecture of viewing spaces, implementation of dedicated creative training.

We wanted to know if European countries are considering the same measures? Indeed, there is a European policy, primarily at the member state level, to encourage digital creation, particularly in the field of media that blends narrative elements and the photorealistic approach of cinema with the

treatment of XR space. We launched a large-scale study to understand the details, structure, and volume of European support for the 'cinema / XR' Hybridisation. The results show that these policies are disparate, unharmonized, and often very weak. The notable absence from this spectrum of support is the training of young creators in the 'cinema / XR' Hybridisation.

Some countries are exemplary, others remain cautious, and all European countries are being overtaken in this area by certain non-European countries that we have studied.

In order to accelerate the decision-making process in this area, we have undertaken a comparative study of cognitive abilities that emerged through contact with cinema content and XR content. It is obviously difficult to work on the evolution of cognitive patterns over long periods, especially since the media landscape permeates our senses and brains as a complex network of interdependent elements. However, it is possible to verify how two groups of participants in the experiment behave in relation to the parameter recognized as rudimentary in the construction of the representation of the world, by all media without exception: spatial orientation. This simple test shows unequivocally what type and quantity of information a viewer/listener receives depending on the type of media used. The results argue in favour of better spatial orientation in the group that viewed a heritage site in the VR headset compared to the group attending a classic film screening on the same site. The performance in terms of task completion time of the former is better.

We wanted to support the explanation of this result by the eye-tracking method long used in film studies. Now, the industrial offer allows research with eye-tracking for XR products. Although requiring computer support, which we provided, the Varjo experimental station, one of the leaders in the field, offers remarkable measurement precision, in duration plot, fixation heat map, attention heat map, attention, scan path and opacity, allowing advanced interpretations, some of which we are considering for the extension of the Reboot project.

The way in which the spectator becomes aware of a site that is previously unknown to him is completely different from the cognitive ergonomics offered by classic cinema. In cinema, the cognitive subject receives a targeted vision of the space and its layout, which means that not only is the visual field offered to him structured according to the central targeting, but also the fragment that is offered to him comes from a choice previously made by the creator of the moving image. The viewer is thus linked with the creator by a pact of trust which is beneficial and can vary depending on the evolution of the creator throughout his career.

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In the XR experience, this last element is replaced by personal guidance, trusting one's own gestures, neck and eye positions and interactive controls. As a result, the session must sometimes be longer when interactivity is programmed for controllers (Varjo) or denser when the viewer exercises their own movements to orient themselves (Oculus). The better temporal performances of XR already confirm the classic results in cognitive science on the cognitive reinforcement of learning and memorization in subjects who participate in topokinetic tasks with their own body movements, which is explained by the observation that the more the perception of a representation of an environment involves proprioceptive stimuli, the more the subject increases the motor anticipation of their own movements in this environment (Berthoz, 2008).

We are not advocating for one of the spectatorial, cinematographic or XR attitudes, but we note that the combination of the advantages of both, of the confidence in the creative approach of recognized artists and the personal involvement in the search for visual and auditory information, can significantly increase the attractiveness of the cinematographic spectacle. Europe therefore has everything to gain by favouring the Hybridisation of two genres and by promoting creative training based on both vectors of technologies and two types of storytelling that they offer.

The foreshadowing of such training is our latest contribution to the discussion on Europe's incentive policy to increase the attractiveness of European cinema. During our experiments with two distinct groups, the creative group in XR technologies and the novice group (D5.3.1), it appeared that young creators appropriate more quickly than others the spectator behaviours aimed at taking advantage of all the narrative benefits offered by this type of experience. Our hypothesis is then that investment in the creative sector of the 'cinema / XR' Hybridisation can accelerate the democratization of equipment as well as their evolution towards more ergonomic design (***evolution of the VR / AR headset to VR / AR glasses***), can also be more beneficial for the technological adaptability of young creators and thereby increase the quality of the extended cinematographic spectacle and give it its role as an instigator in the evolution of the entire media landscape, as was the case with cinematography at the height of its development in the 1970s. Thus, 'cinema / XR' type education can lead to a faster arrival of the new creative and spectatorial culture, the one that, safeguarding the spectacular narrative means of classic cinema, offers the immersive, interactive spectacle that mixes realities, whose glory days are still to come.

In summary, the findings of this study indicate that the global competitiveness of the European film industry can be enhanced only through the implementation of a coordinated strategy embracing XR and immersive technologies. The REBOOT project demonstrates that emerging media practices not

only redefine cognitive modalities, audience behaviours, and expectations, but also precipitate the reconfiguration of traditional cinematic paradigms. Current European initiatives aimed at promoting the hybridisation of cinema and XR remain fragmented, limited in scope, and insufficiently oriented towards the development of young people's creative competencies. In this context, the adoption of comprehensive policies to support hybrid creative processes, to invest in XR-based education, and to facilitate technological advancement within the sector appears essential to sustaining Europe's leadership in cultural innovation and ensuring the long-term viability of its audiovisual industry. By fostering the convergence of narrative excellence, interactivity, and immersivity, the European audiovisual sector may simultaneously preserve its cultural heritage and assert a leading position within an evolving global media landscape. ***A firm and strategic commitment to this hybrid future is likely to prove central to reinforcing Europe's cultural sovereignty, technological leadership, and international influence.***

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12. REFERENCES

Action Plan: https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_20_2250/IP_20_2250_EN.pdf

Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall.

Bandura, A. (1989). Social cognitive theory. In R. Vasta (Ed.), *Annals of child development: Vol. 6. Six theories of child development* (pp. 1-60). JAI Press.

Berthoz, A. (2008). Physiologie de la perception et de l'action. *Annuaire du Collège de France 2007-2008*, p. 303-327.

Beyea, D. Foxman, M. Ratan, R. Klebig, B., Leith, A. & Chen, V. H. H. (2025). Metaverse-mediated communication: A call for theory-driven XR research [Editorial]. *Journal of Media Psychology: Theories, Methods, and Applications, 37*(2), 61-63. https://doi.org/10.1027/1864-1105/a000465

Bizern, C. & Autissier, A.-M. (1998). Public aid mechanisms for the film and audiovisual industry in Europe: Comparative analysis of national aid mechanisms.

Boekmanstichting. (2019). *P19-0348*. https://www.catalogus.boekman.nl/pub/P19-0348.pdf

Bomnüter, U. (2018). Public film funding under a federalist paradigm: A synoptic analysis of state aid for film in Germany. In P. Murschetz, R. Teichmann, & M. Karmasin (Eds.), *Handbook of state aid for film* (pp. 373-390). Media Business and Innovation. Springer. https://doi.org/10.1007/978-3-319-71716-6_17

Bomnüter, U. & Schulze, A. (2019). Governance of the German film industry: A multilevel analysis of state aid policy. *International Journal of Arts Management, 22*(1), 54-72. http://www.jstor.org/stable/45221738

Bordwell, D. Staiger, J. & Thompson, K. (1985). *The classical Hollywood cinema: Film style & mode of production to 1960*. Columbia University Press.

Carrasco, M. (2020). Attention: a conceptual framework. *Nature Reviews Neuroscience*, 21(9), 559-572.

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

Centre national du cinéma et de l'image animée. (2020, 15 octobre). *The National Centre for Cinema and Moving Images (CNC) develops new means to promote the French image industry*. https://www.cnc.fr/web/en/news/the-national-centre-for-cinema-and-moving-images-cnc-develops-new-means-to-promote-the-french-image-industry_1580634

Centre national du cinéma et de l'image animée. (2022, 31 octobre). *Appel à projet France 2030 « La grande fabrique de l'image » sur les studios et la formation*. https://www.cnc.fr/professionnels/aides-et-financements/multi-sectoriel/appel-a-projet-france-2030--la-grande-fabrique-de-limage--sur-les-studios-et-la-formation_1672282

Chandler, J.-R. (1977). *The visible hand: The managerial revolution in American business*. The Belknap Press of Harvard University Press.

Chrastil, E. R. & Warren, W. H. (2012). Active and passive spatial learning in human navigation: Acquisition of survey knowledge. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 38(5), 1520-1537.

Christie, I. (2024). *Spaces: Exploring spatial experiences of representation and reception in screen media*.

Clay, V. König, P. & König, S. (2019). Eye Tracking in Virtual Reality. *Journal of Eye Movement Research*, *12*(1), 1-18. https://doi.org/10.16910/jemr.12.1.3

Cucco, M. (2018). The vertical axis of film policies in Europe. In N. Mingant & C. Tirtaine (Eds.), Reconceptualising film policy (pp. 263-275). Routledge.

Duchowski, A. T. & al. (2020). Eye tracking methodology: Theory and practice. *Springer Series in Information Sciences*.

Ebert, R. (1994). Great movies: *Un Chien Andalou*. *Chicago Sun-Times*.

Eimer, M. (2015). The neural basis of attentional control in visual search. *Trends in Cognitive Sciences*, 19(10), 526-534.

ERICarts Institute. (2017, novembre). *Belgium: Cultural policy profile*. Compendium of Cultural Policies & Trends. https://www.culturalpolicies.net/wp-content/uploads/pdf/belgium/belgium_112017.pdf

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

European Audiovisual Observatory. (2019, May). *Mapping of film and audiovisual public funding criteria in the EU*. https://rm.coe.int/mapping-of-film-and-audiovisual-public-funding-criteria-in-the-eu/1680947b6c

European Audiovisual Observatory. (2023, 12 décembre). *Mapping of film funds - Belgium (BE)*. https://rm.coe.int/mapping-film-funds-be/1680aed573

European Commission. (2009, February 7). *Communication from the Commission concerning the State aid assessment criteria of the Commission communication on certain legal aspects relating to cinematographic and other audiovisual works (Cinema Communication) of 26 September 2001*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52009XC0207(01)

European Commission. (2013). *Communication from the Commission on State aid for films and other audiovisual works* (Text with EEA relevance). Official Journal of the European Union, C 332/1. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013XC1115(01)

European Commission. (2020). *Media and audiovisual action plan*. European Union.

European Commission. (n.d.). *Creative Europe programme - Performance*. https://commission.europa.eu/strategy-and-policy/eu-budget/performance-and-reporting/programme-performance-statements/creative-europe-programme-performance_en

European Union. (1992). *Treaty on European Union* (p. 48). Official Journal of the European Communities.

Guerrini, L. (2024, December 1). It has become harder to make films in Italy: All about the reform that will also be limiting foreign productions. *nss magazine*. https://www.nssmag.com/en/lifestyle/39028/reform-public-funds-italian-cinema-new-rules-criticism

Holmqvist, K. & al. (2011; updated 2022). *Eye Tracking: A comprehensive guide to methods and measures*. Oxford University Press.

Jin, D. Y. (2016). *New Korean wave: Transnational cultural power in the age of social media*. University of Illinois Press. http://www.jstor.org/stable/10.5406/j.ctt18j8wkv

Just, M.A. Carpenter, P.A. Eye fixations and cognitive processes. Cogn. Psychol. 1976, 8, 441-480.

Katsarova, I. (2014). *An overview of Europe's film industry* (Briefing No. PE 545.705). European Parliamentary Research Service. https://www.europarl.europa.eu/RegData/etudes/BRIE/2014/545705/EPRS_BRI(2014)545705_REV1_EN.pdf

Keith, C. (1998). Image after image: The video art of Bill Viola. *PAJ: A Journal of Performance and Art, 20*(2), 1-16

Kim, J. (2022). Internal hypertopias: A trope in the contemporary Chinese postinternet art of the moving image. *Journal of Chinese Cinemas, 16*(1), 92-107. https://doi.org/10.1080/17508061.2022.2115869

Lange, A. Westcott, T. & Debande, O. (2004). *Public funding for film and audiovisual works in Europe - A comparative approach*. European Audiovisual Observatory. https://orbi.uliege.be/bitstream/2268/322271/1/Public_funding_for_film_and_audiovisual.pdf

Lewallen, C. & Bowen, D. (2019). *Bruce Nauman: Spatial encounters*. University of California Press.

Lind, Y. (2023, August 1). The fundamentals of tax incentives. SSRN. https://ssrn.com/abstract=5007359

Luberadzka, J. Gusó Muñoz, E. Sayin, U. & Garriga, A. (2025). Audio technology for improving social interaction in extended reality. *Frontiers in Virtual Reality, 5*, Article 1442774. https://doi.org/10.3389/frvir.2024.1442774

Makransky, G. & Petersen, G. B. (2021). The Cognitive Affective Model of Immersive Learning (CAMIL): A theoretical framework for immersive learning experiences. *Educational Psychology Review*, 33(3), 937-958.

Manovich, L. (2001). *The language of new media*. MIT Press.

European Audiovisual Observatory (2019). Mapping of film and audiovisual public funding criteria in the EU https://ec.europa.eu/information_society/newsroom/image/document/2019-25/film_funds_-_final_report_CB944929-F4AD-7314-C2E6C1B8A1B0A9F6_60332.pdf

Marvin, C. & Hong, S.-H. (Eds.). (2017). *Place, space, and mediated communication: Exploring context collapse*. Routledge. https://doi.org/10.4324/9781315394183

McGrath, J. (2022). Suppositionality, virtuality, and Chinese cinema. *boundary 2, 49*(1), 263-292. https://doi.org/10.1215/01903659-9615487

Meloni, G. Paolini, D. & Pulina, M. (2018). State subsidies to film and their effects at the box office: Theorizing and measuring why some genres do better than others. In P. C. Murschetz, R. Teichmann, & M. Karmasin (Eds.), *Handbook of state aid for film: Finance, industries, regulation* (pp. 99-117). Springer.

Menzel, C. R. & Sayers, K. (2022). The natural history of primate spatial cognition: An organismic perspective. In B. L. Schwartz & M. J. Beran (Eds.), *Primate cognitive studies* (pp. 123-145). Cambridge University Press.

Messerlin, P. & Parc, J. (2014). The effect of screen quotas and subsidy regime on cultural industries: A case study of French and Korean film industries. *Journal of International Business and Economy, 15*(2), 57-73.

Messerlin, P. & Vanderschelden, I. (2018). France's protected and subsidised film industry: Is the subsidy scheme living up to its promises? In P. C. Murschetz, R. Teichmann, & M. Karmasin (Eds.), *Handbook of state aid for film: Finance, industries, regulation* (pp. 311-333). Springer.

Morton, L. H. (1992). El cine del futuro: The cinema of the future. *Presence: Teleoperators and Virtual Environments, 1*(3), 279-294. https://doi.org/10.1162/pres.1992.1.3.279

Murschetz, P. Teichmann, R. & Javed, S. (2019). State aid for film and audiovisual services: A synoptic review of key principles and governance models in Europe and abroad. *América Latina, 8*, 181-200.

Nakayama, K. & Mackeben, M. (2018). Sustained and transient components of focal visual attention. *Vision Research*, 38(22), 2749-2758.

Orankiewicz, A. (2022). The role of public support for the film industry: An analysis of movie production incentives in Europe. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, 66*(2).

Orzel, C. (2017). *Coming soon, thinking back: Cineplex Entertainment and exhibition practice in transition* (Unpublished doctoral thesis). Department of Communication Studies, Concordia University, Montreal, Quebec, Canada.

Otmazgin, N. (2021). Japanese culture through videogames. *Social Science Japan Journal, (*Vol. 24, Issue 1), 265-268. https://doi.org/10.1093/ssjj/jyaa044

Pajares, F. Prestin, A. Chen, J. A. & Nabi, R. L. (2009). Social cognitive theory and mass media effects. In *Book chapters* (Vol. 3).

Parc, J. (2014). A retrospective on the Korean film policies: Return of the Jedi (Working paper). Seoul National University EU Center and Sciences Po Paris. Available at https://www.europarl.europa.eu/cmsdata/84084/A-JParc-Brussels-vDec-EN-PE.pdf (accessed March 30, 2025).

Posner, M. I. (1980). Orienting of attention. *Quarterly Journal of Experimental Psychology*, 32(1), 3-25.

Quah, S. R. (2010). Réalité historique, récit fictionnel : La Chine dans le cadre du théâtre de Gao Xingjian. *Perspectives chinoises, 111*, 15-25. https://doi.org/10.3406/perch.2010.3844

Rauschnabel, P. A. Reto, F. R. Hinsch, C. Shahab, H. & Alt, F. (2022). What is XR? Towards a framework for augmented and virtual reality. *Computers in Human Behavior, 133*, 1-12. https://doi.org/10.1016/j.chb.2022.107299

Renaud, P. Décarie, J. Gourd, S.-P. Paquin, L.-C. & Bouchard, S. (2003). Eye-tracking in immersive environments: A general methodology to analyze affordance-based interactions from oculomotor dynamics. *CyberPsychology & Behavior, 6*(5), 519-526. https://doi.org/10.1089/109493103769710541

Rensink, R. A. (2000). The dynamic representation of scenes. *Visual Cognition*, 7(1-3), 17-42.

Rose, F. (2021). *The art of immersion: How the digital generation is remaking Hollywood, Madison Avenue, and the way we tell stories*. W.W. Norton & Company.

Screen Flanders. (n.d.). About us. Screen Flanders. https://screenflanders.be/en/about-us/

screen.brussels. (n.d.). *Home*. screen.brussels. https://screen.brussels/en

Shimamura, A. P. (2013). *Psychocinematics: Exploring cognition at the movies*. Oxford University Press.

REBOOT (www.thereboot-project.eu) has received funding from European Union's Horizon Europe Research and Innovation programme under Grant Agreement No. 101094769.

Shimamura, A. P. (2013). *Experiencing Art: In the Brain of the Beholder*. Oxford University Press.

Shimamura, A. P. (2013). Psychocinematics: Issues and directions. In A. P. Shimamura (Ed.), *Psychocinematics: Exploring cognition at the movies* (pp. 1-26). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199862139.003.0001

Sitney, P. A. (2002). *Visionary film: The American avant-garde, 1943-2000*. Oxford University Press.

Smith, T. J. (2013). Watching you watch movies: Using eye tracking to inform cognitive film theory. In Shimamura A. P. (Ed.), *Psychocinematics: Exploring cognition at the movies* (pp. 165-190). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199862139.003.0009

Sobieszczanski, M. (2019). Towards cognitive media genetics. *Epistémè, 19*. Center for Applied Cultural Studies, Korea University. (Sung-do Kim & Pascal Lardellier, Eds.)

Steele, J. (2016). Towards a 'transnational regional' cinema: The francophone Belgian case study. *Transnational Cinemas, 7*(1), 50-66. https://doi.org/10.1386/trac.7.1.50_1

Stelmach, M. (2024). Cinema counts: The computational turn and quantitative methods in film studies. *Kwartalnik Filmowy, 127*, 6-28.

Sutherland, I. E. (1968). A head-mounted three-dimensional display. In *Proceedings of the December 9-11, 1968, Fall Joint Computer Conference, Part I (AFIPS '68 [Fall, part I])* (pp. 757-764). Association for Computing Machinery. https://doi.org/10.1145/1476589.1476686

Talavera, J. (Ed.). (2016). *Public financing for film and television content: The state of soft money in Europe*. European Audiovisual Observatory.

Tatler, B. W. & al. (2011). Eye guidance in natural vision: Reinterpreting salience. *Journal of Vision*, 11(5), 5-5.

Teti, M. Collins, A. & Sedgwick, J. (2018). Government failure: The ineffectiveness of Italian state subsidies to film. In P. C. Murschetz, R. Teichmann, & M. Karmasin (Eds.), *Handbook of state aid for film: Finance, industries, regulation* (pp. 333-348). Cham, Germany: Springer.

Thoër, C. Boisvert, S. & Niemeyer, K. (2022). La télévision à l'ère des plateformes. *Questions de communication*, (41). https://doi.org/10.4000/questionsdecommunication.29183

Thompson, K. & Bordwell, D. (2019). *Film history: An introduction* (4th ed.). McGraw Hill Education.

Treaty on European Union. (1992). (Maastricht Treaty). https://europa.eu/european-union/sites/europaeu/files/docs/body/treaty_on_european_union_en.pdf

Trevarthen, C. (1968). The development of intersubjective motor control in infants. *Symposia of the Society for Experimental Biology*, 22, 407-443.

Vohra, M. (Ed.). (2025). *Introduction to extended reality (XR) technologies*. John Wiley & Sons.

Vosmeer, M., & Schouten, B. (2014). Interactive cinema: Engagement and interaction. In A. Mitchell, C. Fernández-Vara, & D. Thue (Eds.), *Interactive storytelling: 7th International Conference on Interactive Digital Storytelling, ICIDS 2014, Singapore, November 3-6, 2014, Proceedings* (Vol. 7, pp. 140-147). Springer International Publishing. https://doi.org/10.1007/978-3-319-12337-0_13

Wade, N. J., & Tatler, B. W. (2005). *The moving tablet of the eye: The origins of modern eye movement research*. New York, NY: Plenum Press.

Wang, C. Chen, Y. Zheng, S. Yuan, Y. & Wang, S. (2020). Research on generating an indoor landmark salience model for self-location and spatial orientation from eye-tracking data. *ISPRS International Journal of Geo-Information, 9*(2), 97. https://doi.org/10.3390/ijgi9020097

Watkins, T. (2005). The Neolithic revolution and the emergence of humanity: a cognitive approach to the first comprehensive worldview. (Vol. 2, pp. 84-88). Oxford: Council for British Research in the Levant and Oxbow Books.

Whitney, J. (1991). Fifty years of composing computer music and graphics: How time's new solid-state tractability has changed audio-visual perspectives. *Leonardo, 24*(5), 597-599. https://doi.org/10.2307/1575668

Wibowo, T. Deli, D. & Syahputra, B. (2024). Literature review on cinematic technique in video game storytelling. *CoMBInES - Conference on Management, Business, Innovation, Education and Social Sciences, 4*(1), 48-58.

Zurbrugg, N. & Paik, N. J. (1990). Nam June Paik. *Eyeline, 13*, 17-19. https://archive.org/details/vasulka10104

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