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List of definitions & abbreviations

Abbreviation	Description
3D	3 dimensional
AA	Automated Analysis
AI	Artificial Intelligence
App	Application
C	Constraints
CTR	Click-through rate
D	Deliverable
DOP	Director of Photography
E	Ethical Requirements
EU	European Union
FR	Functional Requirement
G	Goals
GDPR	General Data Protection Regulation
GIS	Geographical Information System
GWs	Gateways
ICT	Information and Communication Technology
IPR	Intellectual Property Rights
L	Legal Requirements
NFR	Non-functional Requirement
PD	Participatory Design
Previs	Pre-visualization
R	Revision
Recce	Visit that place to become familiar with it
ROI	Return on Investment
TA	Thematic Analysis
TR	Technical Requirement
UI	User Interface
UWB	Ultra-Wideband
VR	Virtual Reality
WP	Work Package



Executive Summary

This document renders the 1st release of the report which aims to map the key requirements for the broad range of diverse end-user (incl. filmmakers, producers, audience, interested public, actors, investors, distribution & advertisement entities, etc.) involved in the proposed platform, in the framework of WP2: Domain Analysis & Technological Framework Definition - of the SCENE project under Grant Agreement No. 101095303. The requirements extracted and/or defined are related to all stages of production (pre-production, production, post-production & distribution). The use-case scenarios are also developed following a co-creation approach with representatives of the key platform stakeholders by adopting a common structural representation.



1 Introduction

1.1 Purpose, Context and Scope of the document

This document (D2.2) reports the user and technical requirements, the use cases and considerations for the SCENE platform and its components. More precisely, this deliverable identifies the conditions by conducting a requirements analysis of the different stakeholders. The term “requirements” refers to the collection of necessary qualities that define the system and its functioning. These prerequisites must be met for the system to function properly. The first stage in this process is to identify the stakeholders who will engage with the platform so that their needs may be understood and converted into actionable requirements.

This process helps the development of application scenarios that will be introduced in the SCENE platform. The scenarios that will be designed in the platform will then be tested by the different stakeholders selected. Participatory Design (PD) process is adopted and will involve actively all the identified target groups in the requirement and design process of the whole project to satisfy their needs and ensure the results in terms of usability and accessibility. It contains essential information, extracted via a requirement analysis process, required for the implementation of the SCENE platform, and guide the project’s implementation and the establishment of a common language between partners.

Productions companies, location managers and artistic directors will be interviewed to provide insight to the development team and thus, elaborate a comprehensive view of users’ needs and real-world expectations, and in-depth comprehension of processes of the filming operations. To this end an online meeting in the form of workshop has been organised to define detailed user stories for the use cases. Each use case represents the main expected operational scenarios, optimization criteria constraints, components, and actors involved.

1.2 Relationship with other deliverables

This section presents the relationship between D2.2 deliverable with other deliverables of the SCENE project. Since D2.2 presents the requirements of the SCENE platform and its components, it relates to several of the project’s deliverables. The relationship between the deliverable D2.2 and the rest of the project’s deliverables is shown in Figure 1. Initially, it relates with D2.3 ‘End-User needs & requirements. R2’ of WP2 and T2.3, which is an updated second version of this deliverable, including updated and extended requirements. In addition, it is related with D2.5 ‘State-of-the-art analysis and specifications of SCENE solution’ and T2.5, presenting the specifications for the SCENE platform and its components, extracted from the requirements collected and presented in D2.5 & D2.6.

With WP3, D2.2 is related with D3.3 ‘Media Asset Manager’, D3.4 - ‘3D model reconstruction methodology’ of T3.4 & D3.5 ‘Blockchain-based IPR preservation platform’ of T3.5, presenting all the architecture and implementation of the corresponding components. The requirements collected during the requirements collection process, described in D2.2 and in D2.3, will be analysed and used for the specification extraction of these components.

The D2.2 is also related with D4.1 ‘Location Scouting’ related to T4.1, D4.2 ‘AI-based Audience Preferences Scouting Tool’ of T4.2, D4.3 ‘Lighting & Audio simulation tools’ and T4.3, D4.5 ‘Post-production Effects’ of T4.5 and D4.6 ‘Distribution Engine & Recommendation System’ of T4.6. These deliverables, along with their corresponding tasks present the implementation and functionalities of the corresponding components of SCENE platform, whose requirements have been collected and presented in this deliverable.

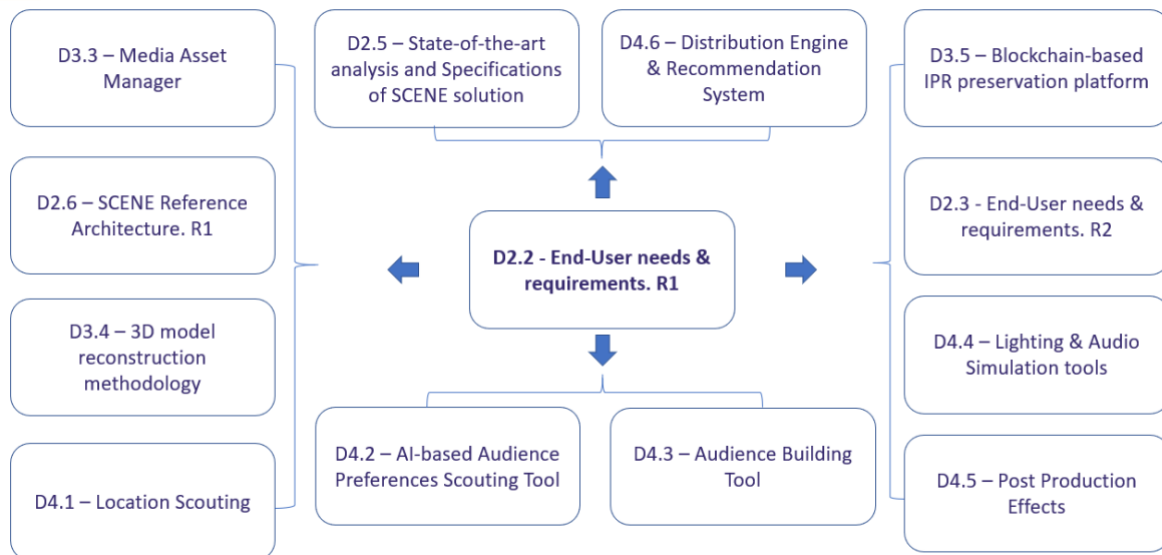


Figure 1: Relations of D2.2 with other deliverables

1.3 Structure of the deliverable

This deliverable is structured and organized as follows. Section 1 provides the scope of this deliverable in detail, its relationship with other deliverables and a brief description of the deliverable’s structure. Section 2 introduces the requirements collected for the SCENE platform, also analysing the project’s goals and users’ questionnaires collected for the requirement identification process. Section 3 presents in detail the use cases depending on the functionalities of the platform, while the next section, section 4 presents the technical and legal assessment as they have been delivered by the requirements collection process.

After the presentation of the aforementioned information, section 5 presents in detail the limitations existing in the SCENE platform implementation process. Finally, section 6 is a conclusion presenting the outcomes of the requirement collection process and the next steps of the project.

2 Requirements

Section 2 presents a detailed overview of the requirements essential for our project's success. We start by establishing the "Project Goals," which define the objectives and direction of SCENE. This is followed by "User’s Stories," where we delve into the perspectives and needs of our stakeholders, addressing potential challenges and solutions.

Further, we examine "Users’ Questionnaires," using both quantitative and qualitative analysis to gather deep insights into user preferences and expectations. The section concludes with "Identified Requirements," categorizing them into functional, non-functional, and constraints. Each of these sub-sections plays a crucial role in ensuring that our project is well-defined and aligned with user needs and project objectives.

To refine goals and gather requirements, two primary data sources were utilized: the grant agreement and submitted deliverables. While the grant agreement provides a dependable starting point, capturing the needs of various stakeholders, it lacks direct input from potential end users. To address this gap, a set of "requirements extraction questionnaires" was developed and distributed among pilot partners with access to potential end users and their specific needs. Furthermore, we prepared a workshop with end-users to communicate the vision of SCENE, to get valuable feedback and to disseminate the questionnaire. This

approach ensured a more comprehensive understanding of requirements, taking into account perspectives beyond the initial conceptualization of the project.

2.1 Project Goals

This paragraph outlines the high-level goals for the system, defining its targets and purpose. These goals were distilled from the ambitions and objectives documented in the grant agreement. To make them more practical and focused, the broader ambitions and objectives were broken down into shorter, more concrete components. These components now constitute the project goals of SCENE, as presented in Table 1.

Table 1: Project Goals

ID	Title	Description	Why (↑)	How (↓)	Constraints
G1	Interoperable Architecture	The architecture should be interoperable, allowing different components in different systems to connect seamlessly with each other, in a service-oriented protocol, allowing scalability.	NFR1, NFR8	FR13, FR14, FR19, FR20, FR25, FR28, FR38	
G2	Promote Europe’s Cultural Heritage	The system has to adopt technologies that can assist in promoting Europe’s both tangible & intangible Cultural Heritage.		FR1, FR27	
G3	Early evaluation of filming conditions	Need to allow to simulate the lighting and acoustic conditions of a cultural site.		FR1, FR47, FR48, FR49, FR56	C2, C3, C11, C14, C18
G4	High-Precision and realistic digital surrogates/models	3D models of cultural sites can both assist in promoting Europe’s cultural heritage and being the means for early evaluation of filming conditions.	G2	FR1, FR2, FR15, FR17, FR47, FR48, FR49	C4, C7, C11, C14
G5	Integration of different technologies	Open-source tools, standards and common ICT protocols will be used to ensure interoperability and efficient integration among the solutions, to achieve the modernization and increase of competitiveness of the European film-making industry.	NFR8	FR13, FR15, FR16, FR17, FR19, FR20, FR38	
G6	Obtain full access to the field site	Bring on board and build trust with demonstration ecosystems.			
G7	Maintaining privacy and confidentiality	Ensuring General Data Protection Regulation (GDPR) compliance and follow GDPR restrictions, considering privacy and (cyber) security.	NFR6, NFR14, NFR15,	FR8	
G8	Scalable and replicable solution	Apply dedicated tools and methodologies to evaluate and enhance the scalability and replicability of all tools.	NFR1	FR17	
G9	Location Scouting	The system should have a system that will both assist location scouters and enrich the 3D cultural models with regional aware information.	G2, G4	FR5, FR14, FR15, FR17, FR26, FR27, FR31, FR32, FR33	
G10	Quality metrics	The project aims to produce quality metrics and media-related KPIs for post-production effects.		FR64	

G11	New Ontology	Creation of a new as-agnostic and as-scalable-as-possible ontology building on top of the most modern proposals from several areas, merging them into a novel reference for Heritage, film-making pre- and post-production		FR13, FR26, FR28	
G12	Recommendation System	The system should be supported by a recommendation algorithm, taking into account users' past behaviour and film's properties.		FR9, FR14, FR17, FR23, FR50, FR51, FR52, FR53, FR55	C1, C6, C10, C13
G13	Blockchain in IPR management	The system can support smart contracts and develop an efficient system enriched with Ricardian Contracts to produce legal documents understandable to humans.		FR21, FR22, FR40, FR41, FR42, FR43, FR44, FR45, FR46	
G14	Distribution technologies	The system should support secure and controlled distribution of media files to propose the type of audience that the film makers should target to.		FR17, FR21, FR22, FR24, FR40, FR41, FR42, FR43	C6
G15	Acoustic modelling	Modelling acoustic data combining both approaches (geometrical modelling and blind estimation) in an information fusion schema.		FR56, FR57, FR58, FR59	C12, C15, C16, C17, C18
G16	Scene Relighting Technologies	Implement technologies to provide efficient AI solutions, utilizing neural renderers for manipulating the lighting conditions of EU cultural heritage locations.		FR47, FR48, FR49	C14
G17	Media Asset Manager	This tool will incorporate format agnostic content to create collections and bundles, and support different types of content licensing and monetization, among other functionalities.		FR14, FR16, FR17, FR18, FR21, FR22, FR24, FR40, FR41, FR42, FR43	C6
G18	Data Lakes	Create a common data lake used as a common repository of the raw information required by all tools.		FR19	
G19	Ontology alignment	Automatic ontology alignment tool will facilitate the knowledge integration into a holistic and single-point knowledge graph.		FR28	
G20	Post-production and playout tools	These tools aim to enable interactive enrichment of newly produced and heritage digital visual media.		FR65, FR66	
G21	Post-production effects	These effects aim to improve the aesthetic and artistic aspects of a movie's content.		FR67	
G22	Audience preferences scouting	This tool aims to predict trends based on audience viewing behaviour and the interaction with the presented content.		FR35, FR36, FR60, FR61, FR62, FR63	
G23	Audience building tool	This tool aims to engage audiences, understand the impact of the audience		FR34, FR35, FR36, FR37, FR39, FR53,	



	around a new production and facilitate the attraction of funding for the production.		FR54	
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2.2 User's Stories

This section offers a comprehensive exploration of the diverse roles and challenges encountered in the film and production industry. This section is divided into two main subsections: "Stakeholder Perspectives" and "Challenges and Solutions."

In "Stakeholder Perspectives" (2.2.1), the focus is on the unique experiences and processes associated with various key roles in the industry, incl.:

1. **Location Managers,**
2. **Set Designers,**
3. **Directors,**
4. **Producers,**
5. **Investors.**

Each role is dissected to reveal the intricate steps and considerations involved in their respective domains. For instance, Location Managers are shown navigating through strategic location management, while Set Designers delve into the creative and technical aspects of set design.

The "Challenges and Solutions" subsection (2.2.2) shifts the focus to specific issues faced during production, such as choosing filming locations, obtaining location permits, and securing funding. This part of the section not only identifies common obstacles but also discusses potential countermeasures and innovative solutions to streamline processes and enhance efficiency.

Overall, Section 2.2 offers an insightful look into the world of film and production, presenting a narrative that weaves together the perspectives of various stakeholders with the practical challenges they face, thereby presenting a complete picture of the industry's inner workings.

2.2.1 Stakeholder Perspectives

2.2.1.1 Location Managers

The location management process involves the strategic handling and administration of physical locations or geographical areas within a business or organization. This process typically includes several key steps:

1. **Identification of Locations:** Determine the places where the business operates or intends to operate. This could involve existing offices, branches, warehouses, or potential areas for expansion.
2. **Analysis and Evaluation:** Assess each location based on various factors such as market potential, accessibility, cost, competition, infrastructure, and regulatory requirements. This step helps in understanding the feasibility and profitability of each location.
3. **Decision Making:** Choose the most suitable locations based on the analysis conducted. This might involve prioritizing certain areas for expansion, consolidating operations, or opening new facilities.
4. **Site Selection and Setup:** Once locations are chosen, the process involves acquiring real estate, setting up infrastructure, obtaining necessary permits/licenses, and establishing the operational framework for each location.
5. **Resource Allocation:** Allocate resources such as manpower, equipment, and finances according to the specific needs and requirements of each location. This might involve tailoring staffing





levels, inventory, or marketing efforts to suit the demographics and demands of different regions.

6. **Monitoring and Management:** Continuously monitor the performance of each location against predefined metrics and benchmarks. This helps in identifying areas that need improvement and allows for adjustments in strategies if required.
7. **Optimization and Improvement:** Based on performance analysis, optimize operations by implementing changes to improve efficiency, cut costs, or enhance customer satisfaction at each location.
8. **Risk Management:** Address potential risks associated with each location, such as geopolitical instability, market fluctuations, regulatory changes, or natural disasters. Develop contingency plans to mitigate these risks and ensure business continuity.
9. **Expansion or Consolidation:** Periodically reassess the overall location strategy. Decide whether to expand into new areas, consolidate operations, or exit locations that no longer align with the business objectives.

Effective location management is crucial for businesses, especially those with multiple locations or global operations. It involves a combination of strategic planning, operational execution, and continuous evaluation to ensure optimal performance and alignment with organizational goals.

2.2.1.2 Set Designers

Set design is a crucial aspect of creating immersive experiences in various fields like theatre, film, television, events, and even some forms of marketing. The set designer process typically involves several key steps:

1. **Understanding the Script or Brief:** The process usually begins with a deep understanding of the script (in theatre or film) or the creative brief. This involves grasping the storyline, themes, era, mood, and specific requirements for each scene or setting.
2. **Conceptualization and Research:** Based on the script or brief, the set designer starts brainstorming ideas and themes for the sets. They conduct research into historical periods, architectural styles, cultural references, and other relevant elements that will inform the design.
3. **Initial Designs and Sketches:** Using their understanding and research, set designers create initial sketches or digital renderings to visualize the sets. These sketches might include floor plans, elevation drawings, and 3D models to give a comprehensive idea of the proposed set.
4. **Collaboration and Communication:** Set designers work closely with directors, producers, art directors, and other relevant stakeholders to discuss and refine the initial designs. This collaboration helps align the vision and ensures that the sets meet the artistic and practical requirements of the production.
5. **Materials and Construction Planning:** Once the designs are approved, the set designer plans the materials needed for construction. This could involve choosing appropriate materials such as wood, metal, fabrics, and props that suit the design and budget.
6. **Construction and Fabrication:** The set designer oversees or collaborates with a team of artisans, carpenters, painters, and other craftsmen to build and create the sets. They ensure that the construction adheres to safety standards, timeliness, and the artistic vision.
7. **Dress Rehearsals and Adjustments:** As the sets are built, they undergo testing during rehearsals. Set designers observe how the sets function in practice and make necessary adjustments for functionality, aesthetics, and suitability for the performance or shoot.
8. **Final Touches and Finishing:** Once the sets are finalized, set designers add final touches, including props, set dressing, and any additional elements needed to enhance the visual impact and authenticity of the set.





9. **Maintenance and Disposal:** Throughout the production or event, set designers may be responsible for maintaining the sets, ensuring they remain in good condition. After the production or event concludes, they might oversee the disposal or storage of the sets.
10. **Documentation and Evaluation:** Finally, set designers document the entire process for future reference and evaluation. They analyse what worked well and what could be improved for future projects.

Effective set design requires creativity, technical expertise, collaboration, and a deep understanding of the production's requirements. It's a dynamic process that evolves from conceptualization to execution while balancing artistic vision with practical considerations.

2.2.1.3 Directors

1. **Script Development:** Directors might be involved in script development, offering input, revisions, or collaborating closely with screenwriters to shape the story.
2. **Casting:** Directors work with casting directors to select actors who fit the vision for each character. They might conduct auditions and make final casting decisions.
3. **Visualizing the Film:** Story boarding, creating shot lists, and working with production designers to conceptualize the visual style and tone of the film.

2.2.1.4 Producers

The role of a producer in a movie is multifaceted and crucial to the film's success. Producers are responsible for overseeing various aspects of a movie from its inception to its release and beyond. Their responsibilities can include:

1. **Project Development:** Producers often initiate a project by acquiring scripts, rights to books, or original ideas. They might collaborate with writers, directors, and other creators to develop the concept into a viable film.
2. **Financial Management:** Producers handle the financial aspects, including budgeting, securing financing, and managing expenses throughout the production process. They might seek funding from studios, investors, or other sources.
3. **Hiring and Management:** Producers assemble the team, including the director, cast, and crew. They negotiate contracts, hire key personnel, and oversee their work to ensure the project's smooth functioning.
4. **Logistics and Planning:** Producers coordinate the logistical aspects of production, such as scouting locations, arranging for equipment, scheduling shoots, and managing timelines.
5. **Creative Decision Making:** Producers often have creative input, offering feedback on scripts, casting choices, editing, and overall storytelling. They work closely with the director to maintain the vision of the film.
6. **Marketing and Distribution:** Producers are involved in marketing strategies and decisions about how the film will be distributed and promoted to reach its audience effectively.
7. **Legal and Administrative Tasks:** They handle legal issues, contracts, permits, insurance, and other administrative tasks necessary for the production.

The role of a producer can vary based on the size of the production, the type of film, and the specific responsibilities delegated within the production team. Ultimately, their goal is to shepherd the film from concept to completion while ensuring it meets artistic, financial, and logistical objectives.

2.2.1.5 Investors

Investing in a film involves assessing various factors to make informed decisions. Here are some criteria to consider when evaluating a potential film investment:



1. **Script and Story:** The quality of the script is paramount. A compelling and well-written story is the foundation of a successful film. Assess the uniqueness of the story, its market appeal, character development, and overall narrative structure.
2. **Talent Attached:** Evaluate the director, lead actors, and key crew members involved. A reputable director with a track record of successful films or talented newcomers can significantly influence a film's potential success.
3. **Budget and Financial:** Analyse the production budget and financial projections. Ensure that the budget is realistic for the type of film and the expected returns. Consider factors like production costs, marketing expenses, and potential revenue streams.
4. **Market Potential and Audience Appeal:** Understand the target audience for the film. Consider genre, demographics, and market trends. A film that caters to a specific audience or taps into current trends might have a higher chance of success.
5. **Distribution Strategy:** Evaluate the distribution plan for the film. A solid distribution strategy is crucial for reaching the intended audience. Consider whether the film has secured distribution deals or has a clear plan for reaching theatres, streaming platforms, or international markets.
6. **Production Team and Experience:** Assess the experience and track record of the production team. This includes producers, cinematographers, editors, and other key crew members. Experience and expertise in their respective roles can contribute to the film's quality.
7. **Legal and Contractual Considerations:** Ensure that all legal aspects, including contracts with talent, intellectual property rights, and insurance, are properly handled. Consulting entertainment lawyers is crucial to mitigate legal risks.
8. **Potential for Ancillary Revenue:** Consider the potential for additional revenue streams beyond the box office, such as merchandising, streaming rights, DVD sales, and international distribution.
9. **Risk Mitigation and Diversification:** Spread investment across multiple films or diverse projects to minimize risk. Diversification can help offset potential losses if one project underperforms.
10. **Due Diligence and Research:** Conduct thorough research and due diligence on every aspect of the film. Analyse past performances of similar films, market trends, and the competitive landscape.

2.2.2 Challenges and Solutions

2.2.2.1 Choosing locations for filming

Locations are a crucial part of any production, often deciding the final country/destination of filming. And the process of searching is usually time consuming, fractured and somewhat unpredictable. The most common way is to use the existing fragmented archives of the production companies and location managers, lacking a global system of parameters, relevant search and a unified accessible and easy to navigate database. So far, countermeasures are to collaborate with multiple location managers, and expand internal archives. A diverse searchable database of locations would improve the pre-production phase.

2.2.2.2 Location Permits

Some locations might belong to several authorities and owners, making it difficult and time consuming to obtain each permit. Additionally, there are no straightforward legal guidelines of location limitations, liability, and insurance for each case. Countermeasures include negotiating with interested authorities promising promotion of the locations, increasing fees, while continuously improving legal ways to obtain permits.

2.2.2.3 Locations approval

The process of choosing a suitable location and further planning the shoot at the location can take a lot of time, expenses, and multiple visitations. For example, firstly, location manager searches multiple suitable locations for the producer and the director. Once location (or several options) is pre-selected, the location



manager goes again to take photos and videos of a specific angle, collect more information, etc. During this process a big amount of data (videos, photos) is moved across multiple parties, with comments back and forth. Countermeasures include using external resources to send data (like WeTransfer or MyAirBridge) and tools to visualize locations (google maps local view, other existing content with these locations etc.) and collecting as much as possible visual data from the location to use for extended planning of the shoot (360 cameras, drones etc.)

2.2.2.4 Recce

Once the location is approved for the shoot, the main crew, director, Director of Photography (DOP), gaffer and set designer will need to visit the space to plan their part of filming: angles, shot list, lighting and equipment, and finally, a set design. It will mean multiple trips to the locations, and extra time and expenses, especially if the location is in another country. If this process could be done remotely with additional tools for collaborations as well, it would make pre-production cheaper, faster, more efficient, and “greener”.

2.2.2.5 Lighting conditions

Planning external and to some extent internal locations are closely connected to the daylight cycle and conditions. All scenes need to be listed in order of filming during the day and consider the direction of the sun, the areas that will have shade or angles that will face the direction of sunlight. Countermeasures include external apps that predict sun direction and movement throughout the day remotely or during recce at the location, it is also possible to measure light and calculate the lighting equipment needed. To have light simulation on the location visual will allow several parties (director, dop, gaffer) to make shooting planning in advance remotely and faster.

2.2.2.6 Funding

To find funding for a film is probably the most challenging part to bring scripts and ideas to life. Even though the demand for content is growing, high budgets of production and unpredictable results force investors and media platforms to create harder entry conditions for script writers, production companies and directors. Countermeasures include alternative ways of funding like crowdfunding and private investors. Additionally, grants funding and film festivals help not-for-profit film industry development as a form of art (including developing talents and "grassroots").

2.2.2.7 Distribution

The movie that is distributed poorly or not at all will not recoup costs or generate profit. And due to high production and marketing costs, investors are under great pressure to make back their investment— as quickly as possible. Additionally, the distribution landscape is changing, shifting from classical cinema to more digital and streaming. Therefore, solid distribution and promotional plans are imperative, as well as working with external distribution companies. Having more distribution options or a tool with suggestions or “matching” options on the pre-production or post-production stage would expand distribution opportunities and therefore revenues.

2.2.2.8 Script and idea validation

Every script is being validated and scrutinized before converting into film, as it’s a foundation to a successful production. Validation is happening on two main levels - script level and financial level with market and revenue projections. Additionally, thoroughly validated scripts have more chances to attract investors. To have an official report with financial projections, market research, trends (including cast / topic / locations), etc. would boost chances to raise funding for production and make the right decision.

2.2.2.9 Copyrights

Every film has a solid legal package behind it - all crew members, cast, locations and even art objects that were in the shot have contracts or copyrights agreement. Additionally, there are different kinds of



distribution agreements and rights licenses created for each distribution channel, platform, cinema, country, etc. Automating or unifying some (or parts) of these agreements would help to make this process more transparent and straightforward.

2.3 Users' questionnaires

To capture user requirements, we opted for a qualitative inquiry approach, utilizing questionnaires as the chosen method. Questionnaires were selected due to their flexibility, allowing for various types of questions. They are easy to distribute, collect, and digitize, which is particularly crucial for a cross-country project, while also offering the advantage of providing valuable and in-depth insights.

The questionnaire on filmmaking was structured into eight concise parts, each focusing on a different facet of the filmmaking process. Part A gathered demographic data and initial responses to identify trends and categorize users. Part B, User Profiling, aimed to understand the respondents' preferred roles in filmmaking. Part C explored the types and methods of data currently used, while Parts D, E, and F delved into the Pre-production, Production, and Distribution phases, respectively. Part G addressed crucial aspects of Security & Privacy. Lastly, Part H, comprising General Questions, combined open-ended and multiple-choice formats to effectively extract a broad range of user requirements and expectations.

The questionnaire was co-designed, through an iterative process, with all partners providing valuable input based on their expertise. To further enhance the effectiveness of this approach, efforts were made to ensure the questionnaire's accessibility and relevance to a global audience. Neutral language was employed, and specific references to any country were deliberately avoided to prevent cultural biases. Additionally, the questionnaire was shared through the project's social media platforms, such as LinkedIn and Facebook, which have a broad audience reach.

Complementing these efforts, CERTH hosted the 1st SCENE Project Online Workshop. This event aimed to raise awareness of the project's mission, increase response rates, and clarify technical terms for end users. The workshop focused on understanding end-user needs and requirements for filmmaking platforms, attracting over 50 participants. It delved into the strategic implementation of AI technology in film production, showcasing tools like audience-building, location scouting, audio and lighting simulation modules, 3D-modelled locations, and blockchain technology. The interactive nature of the workshop, particularly the Q&A sessions, encouraged active participation and highlighted crucial elements of the project for industry professionals.

2.3.1 Analysis Methodology

The questionnaires were divided into two sections with different types of questions in each one. The first section included quantitative questions, which were answered through a scale or through multiple choice. These questions were analysed statistically, and their results were presented in graphs and plots along with a description of the findings.

The second part of the questionnaires included open ended questions where participants were free to answer the questions based on their opinion, experiences and understanding. To analyse the free-text questions, a thematic analysis (TA) approach was selected, known for its robustness in handling qualitative data. The TA process involves several steps:

1. Familiarization with the Data:
 - Gain a thorough understanding of the data.
2. Generate Initial Codes:
 - Extract quotes that carry meaning from the text.
 - Generate initial codes or categories by grouping these quotes.
3. Search for Themes:



- Identify overarching themes by grouping related codes.
4. Review Themes:
 - Evaluate and refine the identified themes.
 5. Define Themes and Name Them:
 - Clearly define and label the themes.
 6. Reporting:
 - Present the results of the analysis.

In the initial theme creation process, quotes are extracted to generate codes (categories) by grouping them. These codes represent initial clusters with specific meanings. Themes are then derived by grouping these codes, forming higher-level codes used to extract requirements.

Two researchers independently analysed the free-text questions, each conducting individual coding. After finalizing the coding process, these researchers collaborated to cross-check the extracted themes and compile the definitive list.

The results of both the quantitative and qualitative analysis were used to produce the functional & non-functional requirements, which are presented in a following section of this document.

2.3.2 Quantitative Results

2.3.2.1 Gender

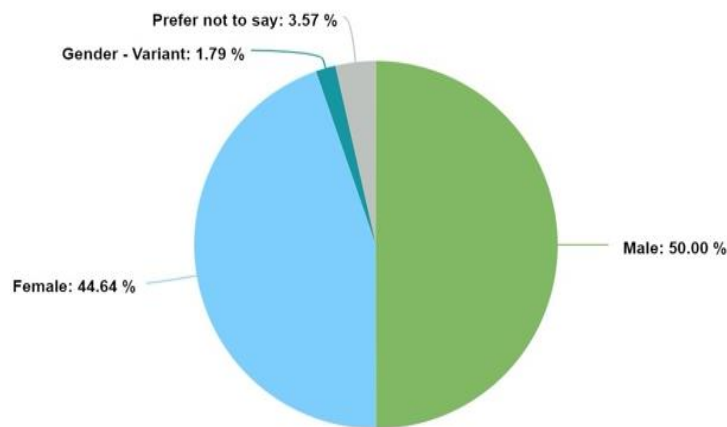


Figure 2: Gender balance among the participating end-users.

2.3.2.2 Occupation status

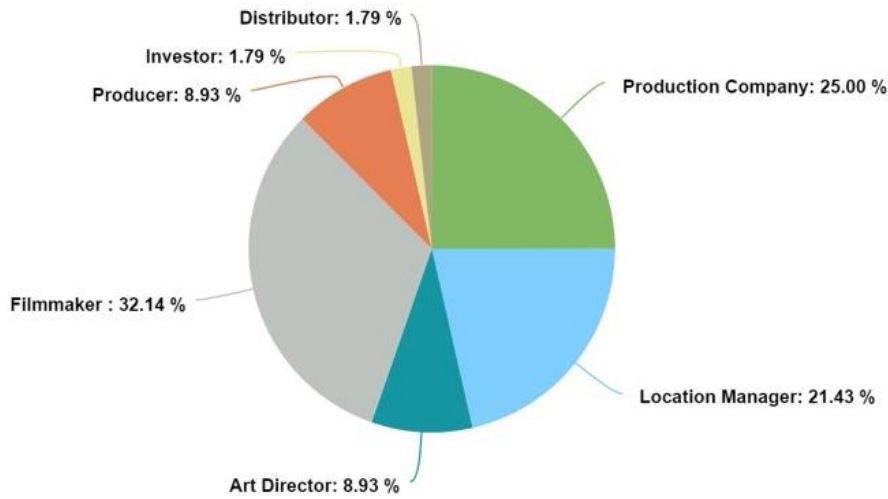


Figure 3: Occupation status distribution among the participating end-users

The above diagram depicts the distribution of professionals who answered the questionnaire. As it was expected the vast majority comprises of production companies (25%), Filmmakers (32%) and Location Managers (21.43%). Standalone producers and set designers represent almost 9% of the sample. These results make sense as the categories that make up the 80% of the sample are the ones that understand better the need and use of a platform such as SCENE.

2.3.2.3 Years of expertise in the film industry

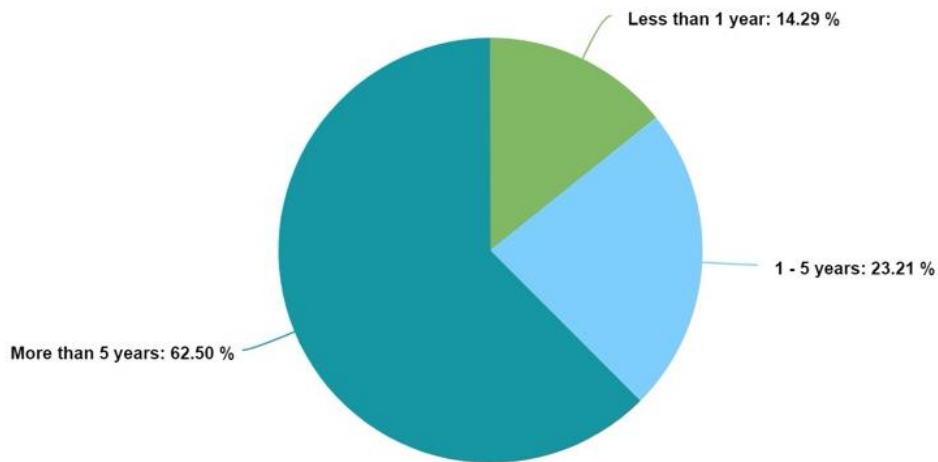


Figure 4: Years of expertise in film industry

Almost 62% of the answers represent professionals with more than five years of experience in the industry. However, it is noticeable that 14% of the sample declares that are less than a year active in the profession.

2.3.2.4 Size of the company

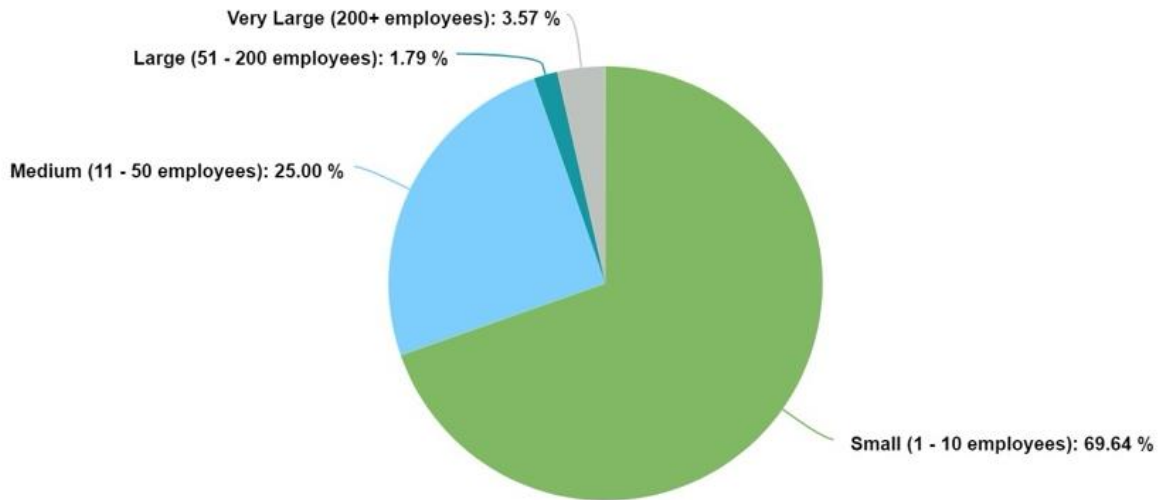


Figure 5: Size of the company

In accordance with our generic experience of the market, 70% of the companies have up to 5 employees. The main reason for this is that in the production industry, the great hiring of people occurs only when a project (Movie, TV series) is being filmed. The rest of the time the company personnel remains low and is mainly dealing with administrative work, or in the case where companies are bigger (Medium sized 11 – 50 employees) with script development and marketing of their services.

2.3.2.5 Types of data

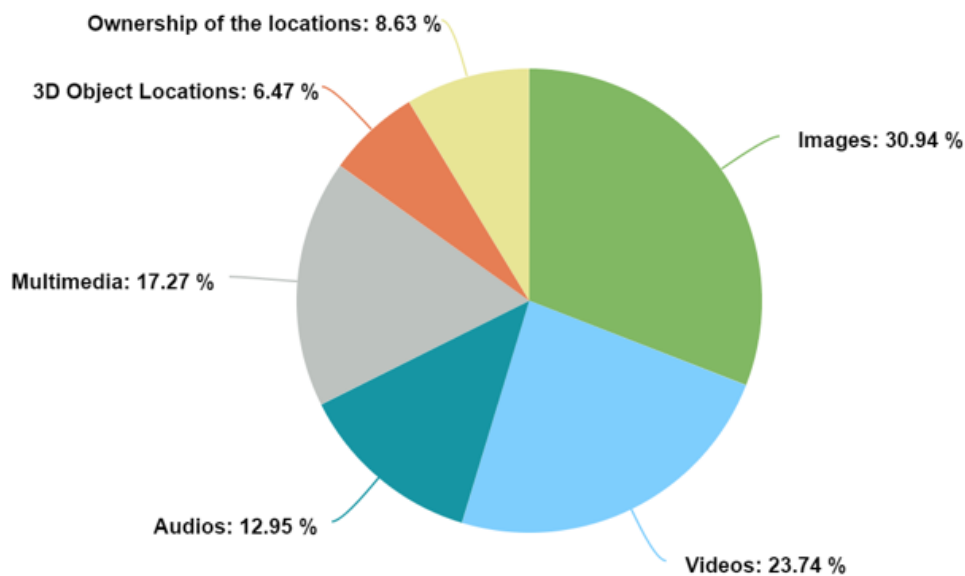


Figure 6: Types of data

We notice an even distribution of data that are being processed by the industry, with the exception of 3D objects and location ownership. This may occur also because of the small sample size and the fact that the main answers came from Greece and Cyprus. In the coming months, as the research will continue, we will aim to have other countries participating in the research more actively.

2.3.2.6 Access to and sources of data

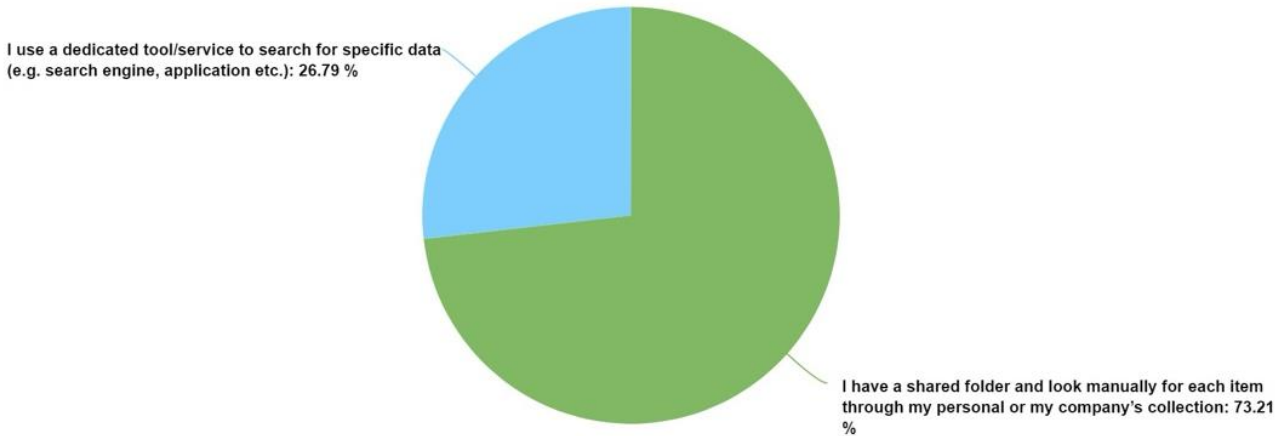


Figure 7: How do you access the data that you work with?

The diagram above, along with the one below, (i.e. access and sources of data) illustrated the fact that location managers do not rely on of the shelf applications or dedicated tools to look for data (Locations). They rely on the portfolio they have developed over the years which in many cases is considered their company property. In order to look for locations that do not much those already in their assets, they turn to ordinary and public tools available to look for such as search engines, social media platforms and generic public domain web pages.

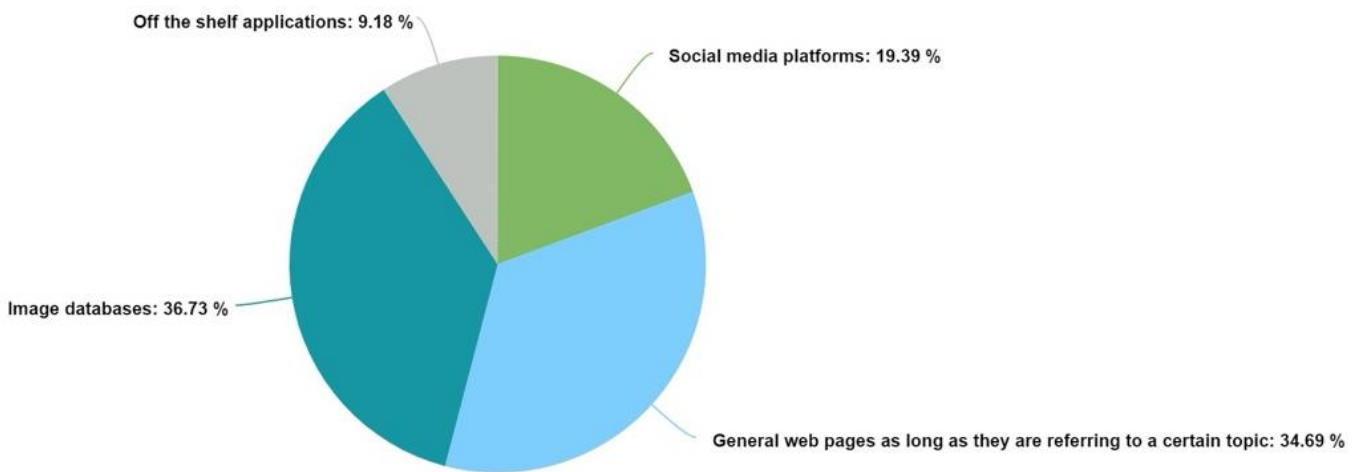


Figure 8: Variety of data collection sources

2.3.2.7 Prioritization of Locations

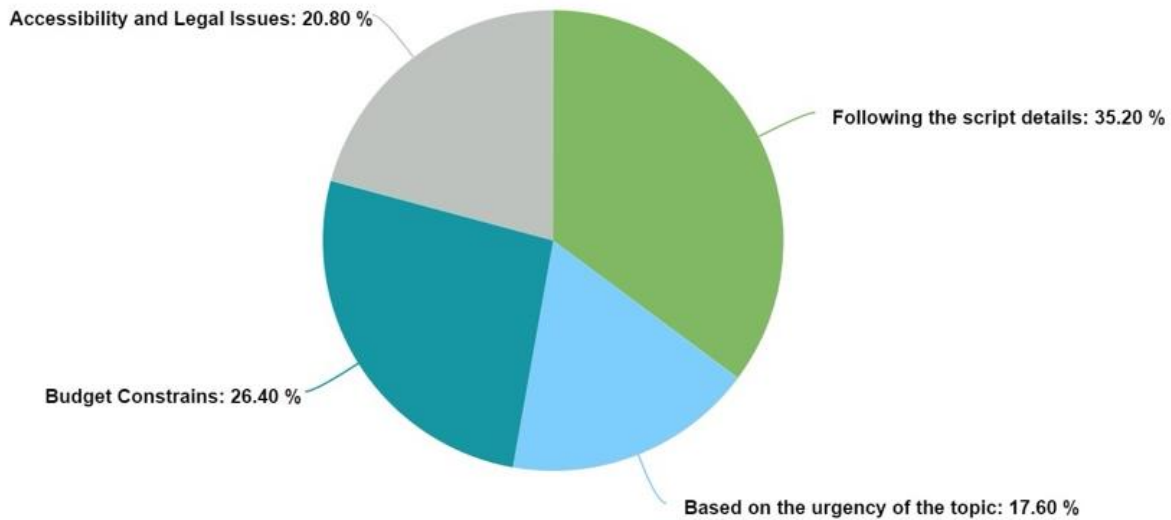


Figure 9: How do you prioritize the filming locations?

The above picture shows an even distribution of importance of the criteria that were set by the questionnaire. We notice that of great importance is the relevance to the script, however budget and accessibility are also major factors, something that should be addressed during the development of the different tools of SCENE.

2.3.2.8 Challenges during location scouting

A1	Finding suitable locations	26	16	7	7	1.91
A2	Negotiating permits and permissions	11	21	12	12	2.45
A3	Assessing logistics and accessibility	5	6	25	20	3.07
A4	Budget constraints	14	13	12	17	2.57

Figure 10: What are the biggest challenges that you face during the location scouting process?

The above table is a showcase of the level of importance of different criteria in selecting a location. We see that A3, access and logistic is of high importance with second the budget restraints. The permitting process



follows up very closely, which can prove quite exhausting & time consuming, many times when it regards cultural sites.

2.3.2.9 Management of lighting & audio simulation

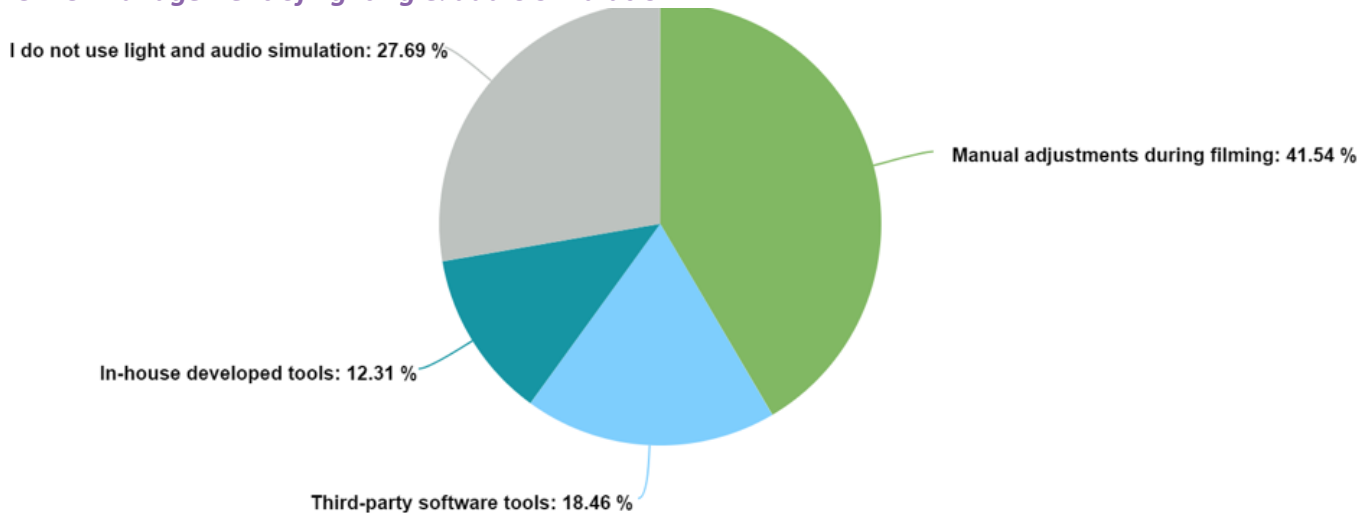


Figure 11: How do you currently manage light and audio simulation during the film production phase?

During film production, managing light and audio simulation involves specialized tools and techniques to ensure high-quality results.

Light Simulation:

Pre-visualization (preVis): Using software like Maya, Blender, or specialized preVis tools, filmmakers create 3D representations of scenes. This helps in planning lighting setups and camera angles before actual shooting begins.

Lighting Design: Cinematographers and directors collaborate to design the lighting for each scene, considering mood, atmosphere, and narrative intent. They may use software like DIALux or Capture to simulate real-world lighting effects.

On-Set Lighting: During filming, the gaffer and lighting team set up physical lights based on the pre-planned designs. They might use various types of lights, modifiers, and techniques to achieve the desired effects.

Audio Simulation:

Pre-production Planning: Sound designers and directors plan the audio landscape of the film. They create a sound script, identifying key sounds, ambience, and dialogue placement.

Recording and Foley: Dialogue is recorded in a studio, and additional sound effects might be created or recorded through Foley sessions to simulate real-world sounds that sync with the visuals.

Audio Editing and Mixing: Sound engineers use software like Pro Tools or Adobe Audition to edit and mix audio elements. This involves adjusting levels, adding effects, and ensuring synchronization with the visuals.

Audio Simulation Tools: Some specialized software, like Dolby Atmos or Avid Pro Tools, offer simulation capabilities. They help create immersive audio experiences, allowing sound to move dynamically in a 3D space, enhancing the realism of the film.

2.3.2.10 Features about lighting and audio simulation tool

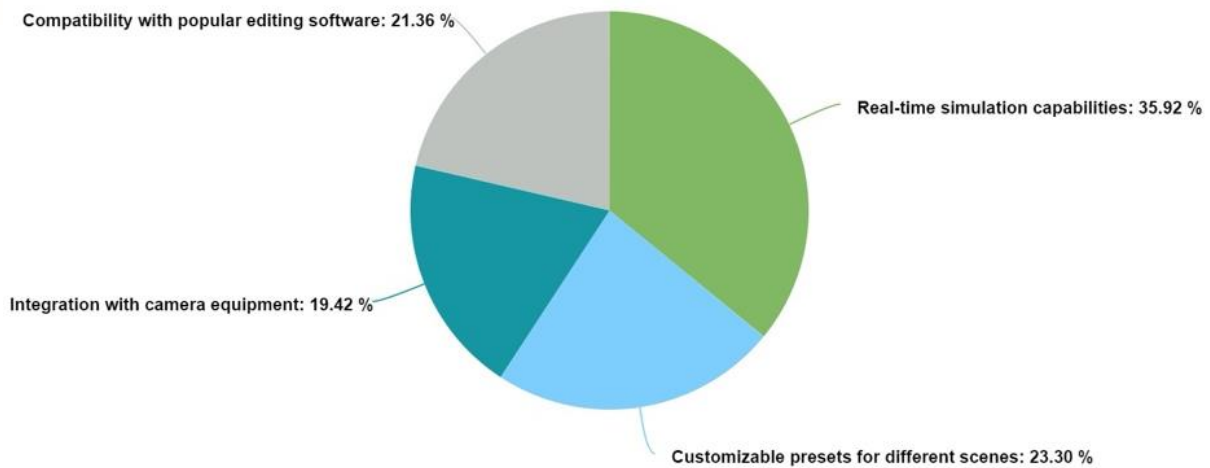


Figure 12: What features or functionalities would you like to see in a light and audio simulation tool?

During the production phase, there's constant collaboration between the various departments—cinematography, lighting, sound, VFX—to ensure that the visual and audio elements align seamlessly, and this is what exactly is shown by the answers above as we notice a somewhat even distribution of importance of each feature.

2.3.2.11 Criteria for target audience

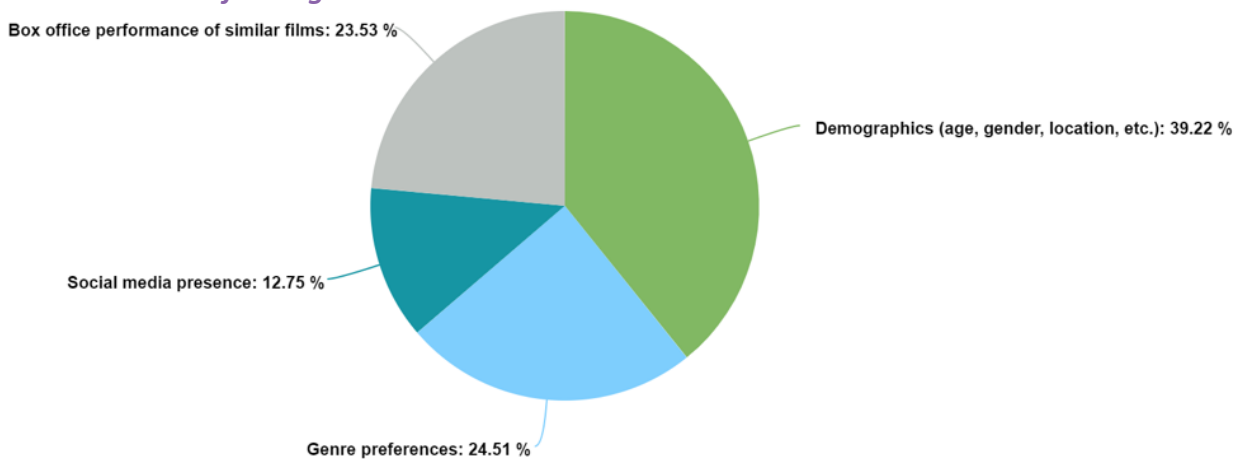


Figure 13: What criteria do you consider when selecting a target audience for your films?

When filmmakers select a target audience for their films, they often consider several criteria to ensure their content resonates effectively:

Demographics: This includes age, gender, location, income level, education, and occupation. Understanding these aspects helps in tailoring the content to match the preferences and experiences of a specific group.

Genre Preferences: Different genres attract different audiences. Filmmakers might consider whether their film falls into genres like action, comedy, drama, horror, etc., and target audiences who have historically shown interest in these genres.

Trends and Market Research: Studying market trends, conducting surveys, or analysing audience feedback from similar films can provide insights into the preferences of potential viewers.

Social Influences and Networks: Some films target audiences based on social circles or networks. For instance, a film might appeal to a certain group because of influencers or community leaders promoting it.



2.3.2.12 Feedback about audience preferences & interests

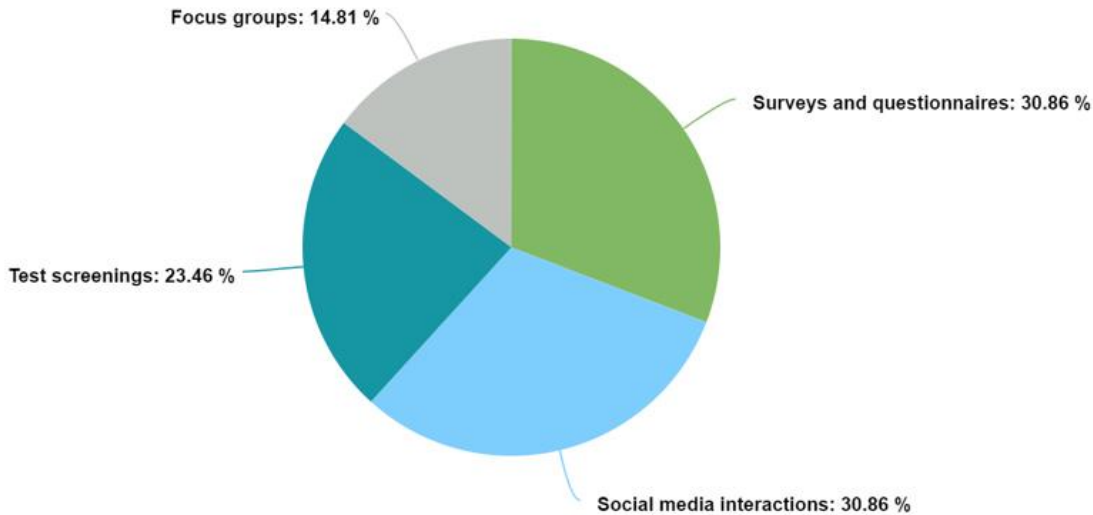


Figure 14: How do you currently gather feedback from your audience about their preferences and interests?

Surveys and Questionnaires: Distributing surveys through various channels like email, social media, or in-theatre screens to gather preferences, opinions, and demographic information.

Focus Groups: Selecting a small representative sample of the audience to discuss their thoughts, preferences, and reactions in detail.

Social Media Monitoring: Tracking social media platforms for mentions, hash tags, and discussions related to the movie to gauge audience sentiment and preferences.

Test Screenings: Showing the movie to a select audience before its official release and gathering feedback through direct interviews or questionnaires.

By combining these methods, filmmakers and studios can obtain a comprehensive understanding of audience preferences and interests, allowing them to tailor their marketing strategies and potentially refine their movies to better suit audience tastes.

2.3.2.13 Challenges in Audience engagement

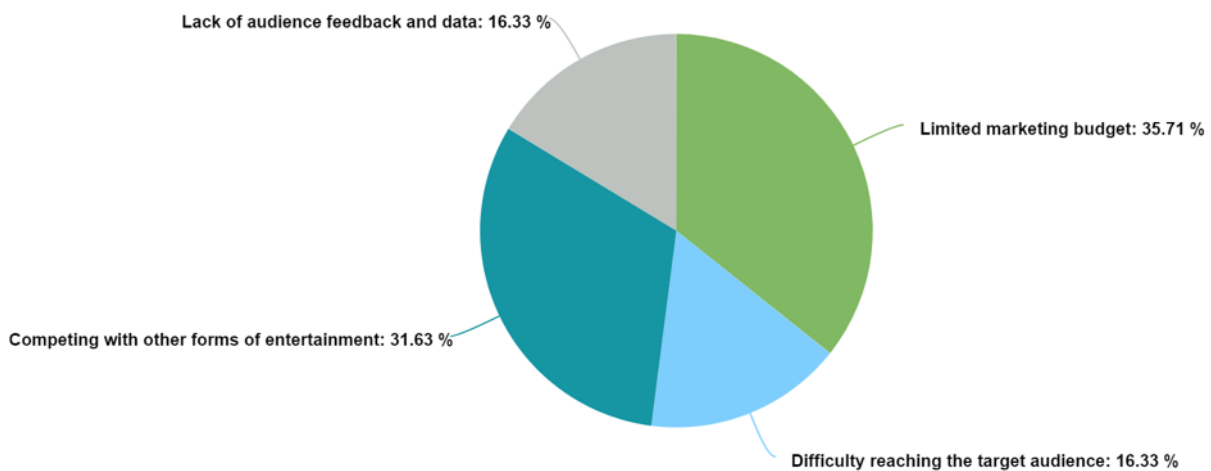


Figure 15: What challenges do you face when it comes to audience engagement and retention?

The above diagram shows two major challenges that producers face in order to retain and engage audiences.

- a) Competing with other forms of entertainment
- b) Having a limited marketing budget.

The other two although present, they score low in importance.

2.3.2.14 Preferred analytics for Audience building

The diagram below shows that all the metrics suggested in the questionnaire received an equal importance by the people who answered. This further proves the need for a dashboard that will include all the above metrics.

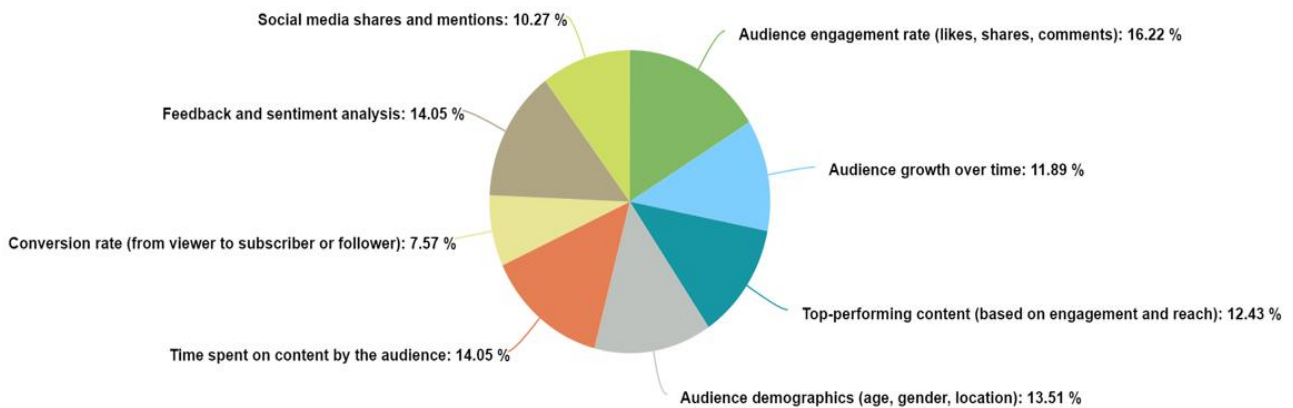


Figure 16: Which of the following metrics or analytics are essential for you to view on the dashboard of an Audience Building tool?

2.3.2.15 Intellectual Property Rights

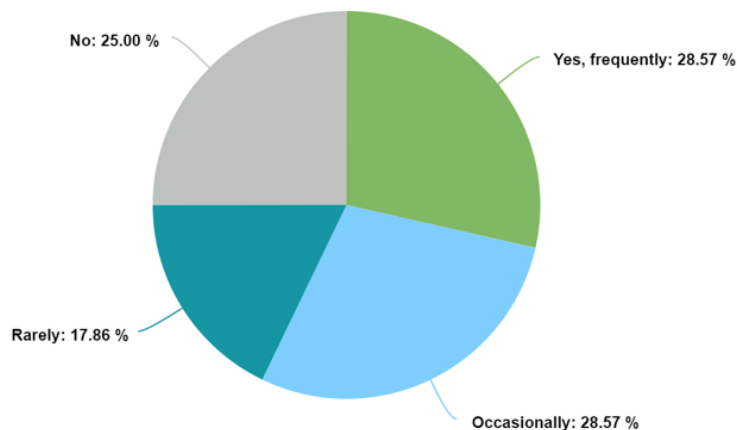


Figure 17: Have you encountered any issues related to intellectual property rights protection (IPR) in your films?

Copyright infringement is a major issue in the audio-visual industry. To navigate these issues, filmmakers often work closely with entertainment lawyers who specialize in intellectual property law. They help in securing rights, drafting contracts, and ensuring compliance with copyright and trademark laws to protect the film's intellectual property.



However, we must note here that due to the fact that answers derive from a limited geographical area the conclusions might be flawed. In the coming months as the research will continue, we will address this more thoroughly

2.3.3 Qualitative Results

The results of the thematic analysis of the free-text questions were grouped in themes and are presented in the following sub-sections.

2.3.3.1 Theme 1: Intellectual Property & Security

This super-theme summarises the concerns and ideas about the use of the blockchain tool for the appropriate and effective management of Intellectual Property Rights and Security in general. Under this super-theme, two themes were identified.

2.3.3.1.1 IPR Management

The participants referred to IPR management by expressing their understanding of SCENE's proposed functionality as a vehicle for a clearer and more centralised way of dealing with IPR in the industry. They referred to the potential of easy monitoring of IPR use for their products and the ability to safeguard its use in an more streamlined and clear way of managing IPR.

2.3.3.1.2 Trust, security and transparency

The questionnaire responder also referred to the potential of the blockchain tool provided within SCENE to increase trust between stakeholders and produced content, through modern security methods (such as block-chain) but also increase the transparency of the produced content's use.

2.3.3.2 Theme 2: Efficiency and Productivity

The second super-theme was about the power of AI tools increase productivity and efficiency by automating laborious and complicated manual procedures.

2.3.3.2.1 Efficiency and Speed Enhancement

17 participants mentioned power of AI tools in enhancing speed and increasing the efficiency. Automated processing from AI tools can reduce time needed for pre and post-production and ensure a high quality outcome with less effort.

2.3.3.2.2 Process Automation

The automation of the processes was mentioned by several participants quotes (67) who saw process automation as a driver for increased productivity and reduction of human effort. Automation was considered to increase the effectiveness of the production process and reduce human errors.

2.3.3.2.3 Process Organisation and Co-ordination

Participants mentioned the need for replacing/automating the current manual techniques used for the organisation and co-ordination of the production process (e.g. storyboards and mood-boards) through intelligent techniques.

2.3.3.3 Theme 3: Audience Analysis and Engagement

A great need for assistance in activities out of the production scope was also mentioned by the participants and specifically about activities related to the analysis of the audience preferences and their potential engagement.

2.3.3.3.1 Audience profiling

Participants directly mentioned the needs for assistance in discovering, identifying, and gaining insights on the preferences and interests of the audience. The analysis and profiling of the audience is a very hard and



resource intensive work if done manually, the potential automation of such process could guide the production of new movies and boost the movie's outreach and success.

2.3.3.3.2 Audience Engagement

Another topic that producers, film makers and funders were interested in, was the engagement of the audience with the film through personalisation and personalised recommendation that could potentially lead to audience building and engagement.

2.3.3.3.3 Marketing Strategies and Decision Making

The need for a better and more factual approach on marketing and decision making was mentioned as another opportunity that AI could assist the creative industries. Specifically, targeted marketing based on audience profiles, branding strategies based on trend analysis, communication and engagement with the broader stakeholders and decision making through consultation of AI was proposed by the participants. This kind of help and assistance could boost the industry forward, make producers and companies more sustainable and most importantly help low budget productions and start-ups gain visibility.

2.3.3.4 Theme 4: Creativity and Production Enhancement

The power of AI as a tool for generation of contextualised on-demand content was mentioned by many participants. Such uses of AI were considered as important in the modern fast-paced world, in which they have to create.

2.3.3.4.1 Content Creation

The creation of on-demand meaningful content through consultation of AI agents was expressed as remedy to the need for temporal lack of creativity and improvement of creations. The responders saw a great opportunity on systems that could assist them in plot adaptations, script generation and writing based on ideas, script analysis and script evaluation. Such tools could potentially enhance their experience, produce more fine-tuned scripts and in general boost their creativity.

2.3.3.4.2 Pre- & Post-Production Assistance

The responders also pointed out the need for an assisted production process as for many of the tasks involved in pre- & post-production it is required to spend a lot of time and effort in order to assess and pilot the available options and select the most appropriate. Such examples are the discovery and finding of filming locations, the audio-visual problem-solving (where and how to place equipment) and editing, the enhancement of the film with filters.

2.3.3.4.3 General specialised technological applications

The participants also mentioned an array of other potential applications of AI and tools that could help them during all stages of the production process. Specifically, Intelligent search of available content, Automatic data gathering and analysis, metadata generation and text to image for ideation were some of the potential tools that were proposed. Such tools could enhance the production process and subsequently have a positive impact on the audience grown and engagement.

2.3.3.5 Theme 5: Attitude towards Emerging Technologies

The final theme was related to the impact of emerging technologies to the workforce of the creative industries and a scepticism on this fast expansion of AI different aspects, creating a "violent" disturbance to the role of humans in the industry.

2.3.3.5.1 Scepticism

Several participants expressed concerns on the expansion of AI to their field and its potential applications. There were fears that such technologies could replace them and thus saw it as a potential threat.



2.3.3.5.2 Openness and Lack of Knowledge

Many participants saw the potential applications of emerging technologies to their work as a potential opportunity for enhancement and considered it as an evolution of the industry. Most of the responders in the survey though were not entirely sure about the capabilities of these technologies and could not express a strong opinion about it.

2.4 Identified Requirements

The requirements, as these were extracted from the user questionnaires, the workshop, the Grant Agreement, and the rest project documentation are presented in the following sections.

2.4.1 Functional Requirements

Table 2: The identified functional requirements

ID	Title	Description	Why (↑)	How (↓)	Constraints
FR1	Collaboration in VR setup in pre-production phase	The system must allow the users to collaborate in VR setup in the pre-production phase. This helps to convey the vision of the producers to different groups in the film-making.	G2, G3, G4	FR2, FR3, FR4, FR38	C2, C3, C11
FR2	3D model generation	The system must generate high-resolution textures, realistic lighting, detailed 3D objects	G4, FR1		C4, C5, C7
FR3	3D model interaction	The system must provide Real-time and fast interaction with the 3D model	FR1	FR2, FR38	C8
FR4	3D immersive experience	The system must be able to support VR functionalities for immersive experience with 3D models.	FR1	FR2, FR3, NFR1, NFR4, FR38	C2, C3
FR5	Location search	The system must allow the user to search for a location using keywords & coordinates	G9, NFR12	FR6, FR7, FR17, FR32, FR38	
FR6	Location automatic metadata extraction	The system must automatically extract metadata for each location, aiming to optimize the search process.	FR5	FR13, FR25	
FR7	Location Tags	The system must automatically generate tags for each location.	FR5	FR13, FR25	
FR8	Secure data storage and transmission	The system must securely store and transmit the user data.	NFR6, G7		
FR9	Platform Recommendation	The system must be able to recommend the most suitable distribution platform for a movie to the filmmaker.	G12	FR38	C1, C10

FR10	Open Architecture	Allow for an open architecture, which can be used by other initiatives and projects.	NFR4	NFR3	C4, C5
FR11	Actors Tracking	The system must be able to provide actors positions during the filmmaking phases.	NFR16		
FR12	Data type storage and Management	The system must be capable of storing and managing (insert,delete,update) various types of data (images, audio, video, 3D object locations, text, multimedia)	FR2, FR6, FR11, FR15, FR16, FR18, FR19, FR24, FR26, FR37, FR38, FR39, FR42, FR54, FR56	FR19	
FR13	Associating Multimedia with Metadata	The system must be capable of supporting the association of stored files with structured metadata information.	G11, G5, G1, FR5, FR6, FR15, FR17, FR20, FR26, FR50, NFR11, NFR8	FR25	
FR14	Web-based Connection API	The system must utilize APIs that would allow connection of different components through the internet and ensure interoperability.	G1		
FR15	3D object tagging	The system must allow the user to tag the generated 3D objects with specific keywords/vocabularies.	G4, G5, G9	FR13, FR25	
FR16	Video Producers repository	The system must provide a secure and organized repository for Video Producers that allow them to associate them with metadata for efficient management.	G5, G17	FR13, FR25, FR38	
FR17	Information retrieval from metadata	The system must provide retrieval mechanisms that allows to search multimedia with keywords, filters and free text from the metadata.	G4, G5, G8, G9, G12, G14, G17, FR19	FR25, FR29	

FR18	Video collections for Video Producers	The system must implement features allowing Video Producers to create and manage video collections for efficient organization.	G17	FR17, FR38	
FR19	Holistic Film-making Management and storage	The system must implement a datalake that will be able to support the data management and storage of the data generated in each process in the filmmaking.	G1, G5, G18, NFR10, NFR11, NFR13, FR12	FR17	
FR20	Seamless Data Access Across Operational Stages	The system must allow stakeholders from any stage of the film-making process to search and access data and metadata generated from another stage and stakeholder.	G1, G5	FR19, FR25	
FR21	Licence templates for Video Producers	The system must provide a module for Video Producers to store license templates for their videos.	G13, G14, G17	FR19	
FR22	Licence templates management for End-users	The system must implement a functionality for End-users to retrieve license templates and check the availability for video purchase. Furthermore, it must allow the End-users to store purchased licenses in the system.	G13, G14, G17	FR17, FR38	
FR23	Video recommendation to end-users	The system must provide a recommendation system that will suggest video to end-users based on their demographics, viewing history and user preferences.	G12	FR38, FR37, FR39,	
FR24	Support for video streaming	The system must support video streaming capabilities capable of supporting a reasonable number of users simultaneously with minimal delays	G17, G14, NFR13, FR23	FR38	C6
FR25	Film-making Ontology for streamlining the processes	The system must define an ontology that integrates information from every stage of the film-making process to allow.	G1		
FR26	Location scouting metadata	The system must have an extended film-making ontology that includes entities relevant with the location scouting process, like nearby facilities and location manager contact details.	G9, G11	FR13, FR25	
FR27	Location and Regional aware ontologies	The ontology must include not only traditional film-related entities, like scripts, actors, title, characters but also regional and location aware entities	G2, G9	FR13, FR25	
FR28	Ontology flexibility and integration	The system must have a component that is capable to align various ontologies into a common single ontology.	G1, G11, G19, NFR5, NFR8		

FR29	Dynamic Knowledge Graph Construction	The system must support operations (add/remove/update) that allow the creation of knowledge graphs from a pool of ontologies.	FR17	FR25	
FR30	Enhanced Search Efficiency in Knowledge Graphs	The system must have a component that allows someone to retrieve relevant data from a knowledge graph given a search query.	FR17, NFR4, NFR10, NFR11, NFR13	FR29	
FR31	Location Management	The system must have a form that allows the location managers to add, edit and delete information about specific locations.	G9, FR5	FR38	
FR32	Location Scouting User Profile	The system must support the creation of individual user profile based on user preferences (e.g. Location) and search history.	G9, FR5	FR38	
FR33	Multiple view for location scouting	The system must allow the user to create projects, where each project corresponds to a certain script, Associate the project with locations and to provide the ability to enter notes for each location.	G9	FR32, FR38	
FR34	Campaign Management	The system must support the creation, organization, and modification (editing and deletion) of targeted campaigns to engage specific audiences.	G23	FR35, FR38	
FR35	Audience Feedback and Preference Analysis	The platform must serve as a central management system, primarily focused on aggregating and analysing audience feedback and preferences. This includes the capability to collect data from social media platforms, thereby enabling a comprehensive understanding of audience interactions and responses to campaigns.	G22, G23, FR35	FR38	
FR36	End-user (Audience) Interaction	The system must enable end users (the audience) to view available campaigns, participate by providing comments, and express their preferences, thereby facilitating interactive user engagement.	G22, G23	FR34, FR35, FR38	
FR37	Integrated Audience Data Analysis and Visualization	The system must analyse collected feedback and information, using natural language processing for metadata and statistical extraction, and provide a visualization view for the interpreted data.	G23,	FR38	
FR38	Common User Interface	The system must provide a common cross-platform UI that will integrate the sub-UIs of each component and will allow	G1, G5, NFR2, NFR4,		

		all the relevant stakeholders to access the functionalities of the system from a single point of access .	NFR5, NFR6, NFR8, NFR10 FR1, FR3, FR4, FR5, FR9, FR16, FR18, FR22, FR23, FR24, FR31, FR32, FR33, FR34, FR35, FR36, FR39, FR40, FR41, FR42, FR45, FR47, FR48, FR49, FR50, FR54, FR57, FR58, FR59, FR63, FR66, FR67		
FR39	Audience User Profile	The system must support the development of personal collections which allow the user to store selected data for selected data for selected campaigns.	G23	FR35 FR36, FR38	
FR40	Decentralised, secure, and legally binding licensing agreements	The system must provide producers and consumers with a feature to create decentralized, secure, and legally binding licensing agreements.	G13, G14, G17	FR21, FR22, F38	C6
FR41	Licensing agreements terms customisation	The system must allow producers to specify and customize terms and conditions within the agreements via a Dashboard.	G13, G14, G17	FR21, FR22, FR38	C6

FR42	Licensing agreements actions	The system must provide producers and consumers a dashboard that will allow to perform a set of actions to their licensing agreements, to preview them and to view their current status	G13, G14, G17	FR21, FR22, FR38	C6
FR43	Digital Signing of Licensing agreements	The system should integrate with a mechanism that will allow the digital signing of Ricardian Contracts for both producers and consumers	G13, G14, G17	FR21, FR22	C6
FR44	NFTs management	The system must integrate with a system that will allow producers to create and sell NFTs and audience and investors to buy NFTs issued by producers in a secure way.	G13		C6
FR45	NFTs action tracking	The system should be able to integrate with a tool that facilitates the issuance and tracking of NFTs.	G13	FR38	C6
FR46	NFTs and Ricardian contracts secure storage	The system should integrate with a mechanism that will allow the secure storage of Ricardian contracts and NFTs metadata.	G13	FR19	C6
FR47	Interactive Lighting Adjustment in Reconstructed Scenes	The system must offer interactive controls, such as sliders and input boxes, within the user interface for users to adjust and modify the lighting conditions of the reconstructed scenes. This includes the ability to change directional lighting through on-screen manipulations like rotation and orientation.	G3, G4, G16	FR38	C9, C14
FR48	Intuitive User Interface for Lighting Control	The system's user interface should be user-friendly and intuitive, featuring an easily navigable layout with accessible controls for lighting adjustments. Interactive elements like buttons and sliders should provide immediate feedback to user actions.	G3, G4, G16	FR38	C9
FR49	Real-Time Feedback on Lighting Changes	The system must utilize efficient rendering techniques to provide smooth, real-time feedback to users on changes made to the lighting conditions in the reconstructed scenes.	G3, G4, G16, NFR7, NFR12, NFR13	FR38	
FR50	Text-Based Movie Recommendation	The system must allow text input for movie recommendations, integrating NLP and AI to match text descriptions with relevant movie attributes.	G12	FR17, FR38	C6, C10, C13
FR51	User Preference-Based Film Suggestions	The system must track user preferences and viewing history to dynamically suggest relevant movies and clips.	G12		C6, C10



FR52	Similar Movie Recommendations	The system must recommend movies similar to others d based on image, audio and semantic attributes.	G12		C6, C10, C13
FR53	Target Audience Identification for Film-makers	The system must analyse audience data to group and match movie attributes with the appropriate target audience.	G12, G23		C6, C10
FR54	Audience Profile Visualization for Film-makers	The system must provide visual profiles of target audiences to assist film-makers in decision-making.	G23	FR38	
FR55	Distribution Platform Matching for Movies	The system must recommend suitable distribution platforms for movies based on attributes and platform analytics.	G12		C1, C6, C10, C13
FR56	3D audio rendering	The system must be able to provide real time rendering of 3D audio	G3, G15, FR1		C16, C18, C12
FR57	Audio scene configuration	The system must allow the configuration of the audio scene (type, number of sources)	G15	FR38	C17
FR58	Personalization of audio sources	The system must allow the user to upload their own audio files for the audio simulation	G15, FR56	FR38	
FR59	Adding acoustic models	The system must allow users to provide source files for the modelling of new locations	G15	FR38	C15
FR60	Trend Prediction through Content and Interaction Analysis	The system must analyse media content and audience interaction data to predict trends, ensuring that these predictions are based on both the content viewed and how audiences engage with it.	G22		C6
FR61	Audience Segmentation and Persona Creation	The system must segment audiences and create viewer personas based on anonymized viewer information, grouping viewers with similar viewing behaviours and preferences for more accurate trend analysis.	G22	FR60	C6
FR62	Real-Time Analysis and Trend Reporting	The system must provide real-time analysis of current viewing patterns and generate reports on emerging trends, helping strategists and content creators to stay updated with audience preferences	G22	FR60	C6
FR63	Data Visualization for Insightful Trend Interpretation	The system must include data visualization tools to present trend insights and audience behaviour in a clear, understandable format, aiding decision-makers in strategy development and content planning	G22	FR38	C6
FR64	Media Quality Assessment and Metrics Generation	The system must assess the quality of various media materials, including images, 3D models, videos, and sound, and generate key performance indicators	G10		

		(KPIs) and quality metrics to quantify their quality levels.			
FR65	Post-Production Effects Library Development	The system must develop and maintain an information library that classifies and categorizes a wide range of post-production effects from various vendors, including stock visual effects (VFX), audio effects, editing tool plugins, and colour grading maps	G20		
FR66	Enhancement Tools for Post-Production and Payout	The system must provide tools for post-production and payout that enable interactive enrichment of both newly produced and heritage digital visual media, improving their aesthetic and artistic aspects	G20	FR38	
FR67	Customizable Post-Production Filters and Effects	The system must offer a range of customizable filters and effects for post-production, allowing users to enhance and modify media materials according to specific artistic requirements and quality standards	G21	FR38	

2.4.2 Non-functional Requirements

Table 3: The identified non-functional requirements

ID	Title	Description	Why (↑)	How (↓)	Constraints
NFR1	Scalability	The ability of a system to scale, in the sense that it can expand the endpoints connected to it.	G1	FR8, FR10	C4, C5
NFR2	Portability	The ability of solution to be easily carried around by end users.	FR1	FR2, FR3, FR4	C2, C3
NFR3	Replicability	The degree to which a system can be replicated by others and thus serve as an effective prototype.	FR10		C4, C5, C13
NFR4	Usability	The degree to which a system is easy to use by all its users with the minimum overhead.	FR8, FR10		C3
NFR5	Compatibility	The ability of a system to support multiple platforms-desktop, tablets, mobile phones	FR3	FR2	
NFR6	Security	Refers to the system's capability to protect sensitive information from unauthorized access, breaches, and other security threats.			
NFR7	Responsiveness	Responsiveness expresses the ability of the solution to perform its functionality in a reasonable amount of time (e.g. Low latency, quick search)			

NFR8	System Integration and Interoperability	Ensure robust and flexible integration capabilities across diverse systems to facilitate seamless data exchange and operational coordination.		FR13	
NFR9	Maintainability	This refers to the ease with which the system can be updated, modified, and maintained over time, ensuring its long-term effectiveness and adaptability to changing requirements			
NFR10	Accessibility	The degree to which the system is accessible to all users, including those with disabilities, complying with relevant accessibility standards and guidelines			
NFR11	Data Processing Efficiency	The system's ability to efficiently manage, process, and retrieve large sets of diverse data (images, audio, video, text, etc.) with minimal latency.		FR13	
NFR12	Environmental Sustainability	The system's design and operation should consider environmental impact, promoting energy efficiency and minimizing carbon footprint.			
NFR13	Performance	The system's ability to deliver consistent and stable performance, particularly in processing large volumes of data and handling complex operations with minimal delays		FR19, FR24	C2, C5, C7, C8, C10, C11, C12, C13
NFR14	Legal and Regulatory Compliance	The system must comply with all applicable legal and regulatory requirements in its operation and data handling, including international standards where relevant			
NFR15	Intellectual Property Rights Compliance	The system's adherence to intellectual property laws, ensuring the protection and proper use of copyrighted materials and content			
NFR16	Actors Tracking Precision	The tracking precision should be enough to enable lighting and audio effects functionalities as well as other query functionalities.		TR5, TR6	

2.4.3 Constraints

Table 4: The identified system constraints

ID	Title	Description	Affects (↓)
C1	Lack of streaming platform data	The streaming platforms might provide little to no data regarding user preferences about movies.	G12, FR9, FR55
C2	Lack of compatible VR HW	Users may experience challenges if their hardware is not capable of rendering the 3D model smoothly, leading to lag or reduced frame rates.	G3, FR1, FR2, FR4

C3	Motion Sickness & Accessibility issue	Users may experience discomfort or motion sickness during VR navigation, especially if the movement in the virtual environment doesn't match their physical movements. Moreover, users with physical disabilities may encounter challenges in using VR systems that require specific physical movements or interactions.	G3, FR1, FR4
C4	Standardization Challenges	The absence of universally adopted standards in the 3D modelling and cultural heritage domains can hinder interoperability with other tools and datasets.	G4, FR10
C5	Audio Simulation Accuracy	The accuracy of audio simulations may be constrained by the limitations in current audio processing and simulation technologies	FR2, FR10
C6	Data Privacy Compliance	Compliance with prevailing data protection and privacy laws, such as GDPR and CCPA, is mandatory for all user data management. However, the dynamic nature of these regulations, coupled with the possibility of location-specific legal requirements, could pose challenges. These evolving legal frameworks might restrict access to essential data, potentially impacting the performance or functionality of certain technologies.	G12, G14, G17, FR24, FR40, FR41, FR42, FR43, FR44, FR45, FR46, FR50, FR51, FR52, FR53, FR55
C7	Storage Capacity	The system must have sufficient storage capacity to handle high-resolution textures, detailed 3D objects, multimedia and extensive metadata	G4, FR2
C8	Real-Time Rendering Capabilities	The system's ability to render complex 3D environments in real-time may be limited by current rendering technology capabilities	FR3
C9	User Interface Adaptability	The system's user interface may need to adapt to different screen sizes and resolutions, which can be a constraint in providing a consistent user experience across devices.	FR47, FR48
C10	Algorithmic Bias in Recommendations	The system's recommendation algorithms may have inherent biases based on the data they are trained on, affecting the accuracy and relevance of suggestions.	G12, FR9, FR50, FR51, FR52, FR53, FR55
C11	Environmental Factors in VR Experience	External environmental factors, such as lighting and noise in the user's physical environment, may affect the VR experience's immersion and effectiveness.	G3, G4, FR1
C12	Audio Simulation Accuracy	The accuracy of audio simulations may be constrained by the limitations in current audio processing and simulation technologies	G15, FR56
C13	Non-Deterministic Algorithm Outcomes	The variability in outcomes from non-deterministic NLP algorithms may limit the system's replicability, as reproducing the exact conditions and results of the original system setup could be challenging. This includes variations in model training, data processing, and interpretation of natural language	G12, FR50, FR52, FR55



		inputs, which can lead to different outcomes even under similar conditions.	
C14	Lighting Simulation Accuracy	The accuracy of lighting simulations may be constrained by the limitations in current audio processing and simulation technologies	G3, G4, G16, FR47
C15	Need for recording equipment	The users need some equipment to contribute source files for the modelling of new locations	G15, FR59
C16	Presence of noise during the recording phase	The contributors need to access the locations in time slots where there is not a lot of external noise	G15, FR56
C17	Difficulty in configuring a 3D scene	Configuring a 3D scene in terms of listeners and audio sources' locations can be challenging for some users	G15, FR57
C18	Need for audio playback equipment	A minimum setup (e.g. headphones) is needed to experience the audio simulation	G3, G15, FR56

3 Defining Use Cases of the Platforms

Once the requirements of the platform were defined, the next step was to **specify the functionalities** of the platform.

Definition: *In software design, the functionalities of a system are also called Use Cases. Use cases encapsulate all the possible actions that a user can execute using the system.*

Methodology: Use cases can be described from multiple viewpoints, each offering a different level of detail. For this project we chose to employ the most widely used viewpoints, the summative use case diagram, the use case description, and the use case activity diagrams. The two diagrams follow the standards of the UML 2.5 modelling language.

The use cases were formulated by distilling the FRs of the system, by trying to answer what functionalities need to be in place for each FR to be fulfilled.

The section 3.1 presents the summative Use Case Diagram which included all the use cases and the relations between them, and the actors involved. The sections that follow 3.1 are devoted into presenting the extracted use cases. The formulated use cases were grouped into 6 categories, each reflecting a specific aspect of system functionality. These groups were the following:

1. Location Scouting
2. Audience Building
3. Simulation Engines
4. Post-Production Utilities
5. Distribution Engine
6. Recommender System

3.1 Summative Use Case Diagram

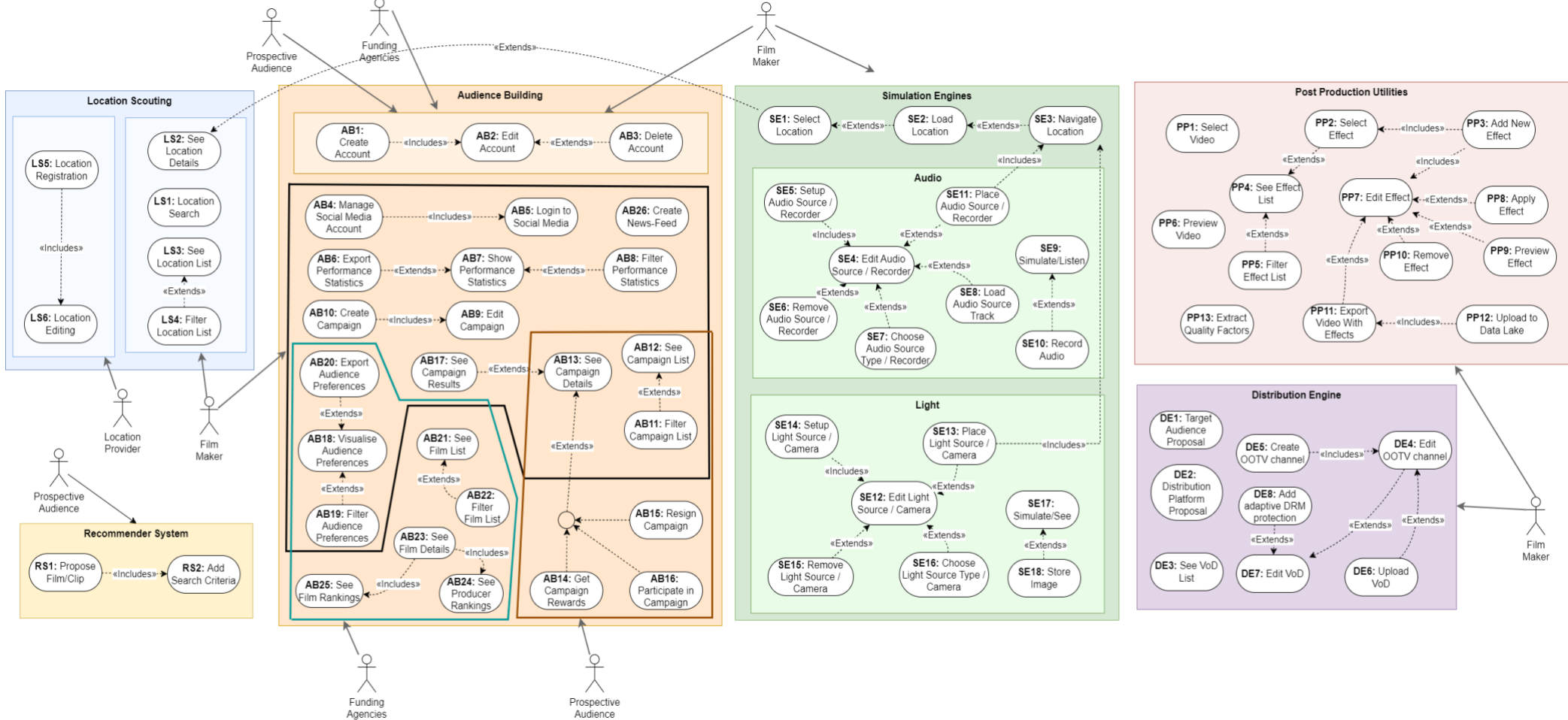


Figure 18: The summative Use Case diagram, representing all the Use Cases, the relations between them and the actors involved

3.2 Use case description

In this section we present the use cases in table forms for each group. The tables contain 6 columns, incl:

ID: The unique identifier for each use case. The naming of the IDs comes from the First letter of the words of each group, for example Location Scouting as LSx, where x is the number of the use case within this group.

Name: The name of the use case that gives a quick idea of that the use case is about.

Description: This column provides a brief overview of what the use case involves.

Actor(s): This column lists the actors involved in the use case.

Includes: This column details any other use cases that are routinely included in the execution of this use case.

Extends: This column shows if the use case extends the functionality of another use case.

3.2.1 Location Scouting

Table 5: Location Scouting Use Cases

ID	Name	Description	Actor(s)	Includes	Extends
LS1	Location Search	Search potential filming locations	Film Maker Location Scouter Set designers		
LS2	See Location Details	See the details of a filming location			
LS3	See Location List	See the list of all available filming locations			
LS4	Filter Location List	Filter the list of locations based on multiple criteria (e.g. type, capacity)			LS3
LS5	Location Registration	Add a new location to the system	Location Provider	LS6	
LS6	Location Editing	Edit an existing location	Location Provider		

3.2.2 Audience Building

Table 6: Audience Building Use Cases

ID	Name	Description	Actor(s)	Includes	Extends
AB1	Create Account	Create a new account to be able to enter into the system	Prospective Audience, Funding Agencies, Film Maker	AB2	
AB2	Edit Account	Edit the user account			
AB3	Delete Account	Delete the user account			AB2
AB4	Manage Social Media Account	Manage the connection to the social media account	Film Maker	AB5	
AB5	Login to Social Media Account	Login to the social media account in order to link it with the system	Film Maker		
AB6	Export Performance Statistics	Export, on the file system, the performance statistics analysed from data of the social media account	Film Maker		AB7
AB7	Show Performance Statistics	Present on screen the performance statistics analysed from data of the social media account	Film Maker		
AB8	Filter Performance Statistics	Filter performance statistics, based on multiple criteria	Film Maker		AB7



ID	Name	Description	Actor(s)	Includes	Extends
AB9	Edit Campaign	Edit a campaign	Film Maker		
AB10	Create Campaign	Create a data collection campaign to engage the audio and get their preferences	Film Maker	AB9	
AB11	Filter Campaign List	Filter campaigns based on multiple criteria	Film Maker, Prospective Audience		AB12
AB12	See Campaign List	See the list of the campaigns	Film Maker, Prospective Audience		
AB13	See Campaign Details	See the details of a campaign	Film Maker, Prospective Audience		
AB14	Get Campaign Rewards	Collect the rewards that you got through your participation in a campaign	Film Maker, Prospective Audience		AB13
AB15	Resign Campaign	Resign a campaign that you participated in	Film Maker, Prospective Audience		AB13
AB16	Participate in Campaign	Participate in a campaign	Film Maker, Prospective Audience		AB13
AB17	See Campaign Results	See the summative results of a campaign	Film Maker		AB13
AB18	Visualise Audience Preferences	Visualise through graphs, statistics and plot the preferences of the audience	Film Maker, Funding Agencies		
AB19	Filter Audience Preferences	Filter the audience preferences based on multiple criteria	Film Maker, Funding Agencies		AB18
AB20	Export Audience Preferences	Export the audience preferences on the file-system	Film Maker, Funding Agencies		AB18
AB21	See Film List	See a list of all the available films on the film "show-room"	Funding Agencies		
AB22	Filter Film List	Filter the films based on multiple criteria	Funding Agencies		AB21
AB23	See Film Details	See the details of a film	Funding Agencies		AB24, AB25
AB24	See Producer Rankings	See the rankings of a film producer	Funding Agencies		
AB25	See Film Rankings	See the rankings of a specific film	Funding Agencies		
AB26	Create News-Feed	Create and distribute a news feed	Film Maker		



3.2.3 Simulation Engines

Table 7: Simulation Engines Use Cases

ID	Name	Description	Actor(s)	Includes	Extends
SE1	Select Location	Select a filming location from a list of locations	Film Maker		LS2
SE2	Load Location	Load the details and the 3D model of the selected location	Film Maker		SE1
SE3	Navigate Location	Navigate around the 3-dimensional space of the location model	Film Maker		SE2
SE4	Edit Audio Source / Recorder	Edit a placed audio source or a recorder	Film Maker		
SE5	Setup Audio Source / Recorder	Add a new audio source or a recorder	Film Maker	SE4	
SE6	Remove Audio Source / Recorder	Remove a placed audio source or a recorder	Film Maker		SE4
SE7	Choose Audio Source Type / Recorder	Choose the type of the audio source or a recorder	Film Maker		SE4
SE8	Load Audio Source Track	Load an audio track into an existing audio source	Film Maker		SE4
SE9	Simulate/Listen	Simulate the sound produced from the audio source and captured by the audio recorder	Film Maker		
SE10	Record Audio	Record the audio simulation	Film Maker		SE9
SE11	Place Audio Source / Recorder	Place the audio recorder or audio source into the 3D model	Film Maker	SE3	SE4
SE12	Edit Light Source / Camera	Edit a placed Light Source / Camera	Film Maker		
SE13	Place Light Source / Camera	Place the Light Source / Camera into the 3D model	Film Maker	SE3	SE12
SE14	Setup Light Source / Camera	Add a new Light Source / Camera	Film Maker	SE12	
SE15	Remove Light Source / Camera	Remove a placed Light Source / Camera	Film Maker		SE12
SE16	Choose Light Source Type / Camera	Choose the type of the Light Source / Camera	Film Maker		SE12
SE17	Simulate/See	Simulate the image produced from the light source and captured by the camera	Film Maker		
SE18	Store Image	Store the simulated image	Film Maker		SE17



Post Production Utilities

Table 8: Post-Production Utilities Use Cases

ID	Name	Description	Actor(s)	Includes	Extends
PP1	Select Video	Select and upload a video you want to add effects on	Film Maker		
PP2	Select Effect	Select a specific effect	Film Maker		PP4
PP3	Add New Effect	Add the effect to the video	Film Maker	PP2, PP7	
PP4	See Effect List	See the list of available effects	Film Maker		
PP5	Filter Effect List	Filter the effects list based on multiple criteria	Film Maker		PP4
PP6	Preview Video	Preview the video with the effect(s) applied to it	Film Maker		
PP7	Edit Effect	Edit all the details and parameters of the added effect	Film Maker		
PP8	Apply Effect	Apply the effect to the video	Film Maker		PP7
PP9	Preview Effect	Preview the effect before you add it to the video	Film Maker		PP7
PP10	Remove Effect	Remove an added effect	Film Maker		PP7
PP11	Export Video With Effects	Export the video, with the effects, on the file system	Film Maker		PP7
PP12	Upload to Data Lake	Upload the video to the data lake	Film Maker	PP11	
PP13	Extract Quality Factors	Extract the automatically produced quality factors for the final video	Film Maker		

3.2.4 Distribution Engine

Table 9: Distribution Engine Use Cases

ID	Name	Description	Actor(s)	Includes	Extends
DE1	Target Audience Proposal	The distribution engine proposed a target audience for a specific film	Film Maker		
DE2	Distribution Platform Proposal	The distribution engine proposed a distribution platform for a specific film	Film Maker		
DE3	See VoD List	See the list of the Videos On Demand of your OOTV channel	Film Maker		
DE4	Edit OOTV channel	Edit your OOTV channel	Film Maker		DE7
DE5	Create OOTV channel	Create an OOTV channel	Film Maker	DE4	
DE6	Upload VoD	Upload a Video on Demand onto your OOTV channel	Film Maker		DE4
DE7	Edit VoD	Edit a Video on Demand onto your OOTV channel	Film Maker		
DE8	Add adaptive DRM protection	Add Adaptive digital rights management (DRM) protection to your video	Film Maker		DE7

3.2.5 Recommender System

Table 10: Recommender System Use Cases

ID	Name	Description	Actor(s)	Includes	Extends
RS1	Propose Film/Clip	The system will be proposing films or clips to a prospective audience user based on their profile and the search criteria	Prospective Audience		
RS2	Add Search Criteria	The user adds their criteria for the film/clip search	Prospective Audience	RS1	

3.3 Activity Diagrams

Traditionally, an activity diagram depicts the control flow from a start to an end point showing the various decision paths available while the activity is executed. Activity diagrams specify the flow of control for each use case, trying to pinpoint the way the sequence of actions is needed to be for a user to be able to successfully conduct a use case.

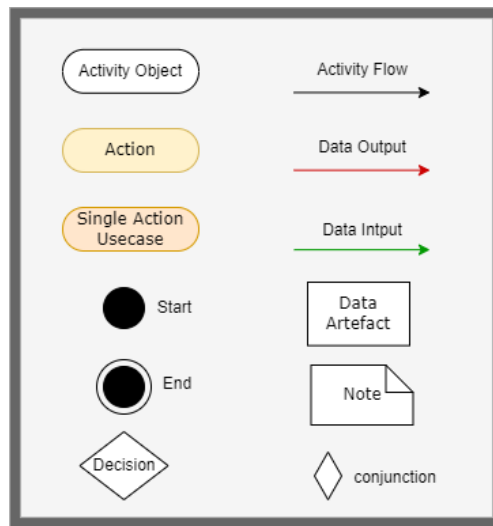


Figure 19: The notation used on the Activity Diagrams

Not all use cases are portrayed by the activity diagrams because either they include a single action (example, show a notification) and thus omitted or because they do not include interaction with a human actor and thus do not need to have a predefined flow.

In this deliverable we will present a couple of examples of the activity diagrams of the use cases, and all the use cases will be described with detail in the next deliverable (T2.3) were all the specifications for the use cases will have been clarified.

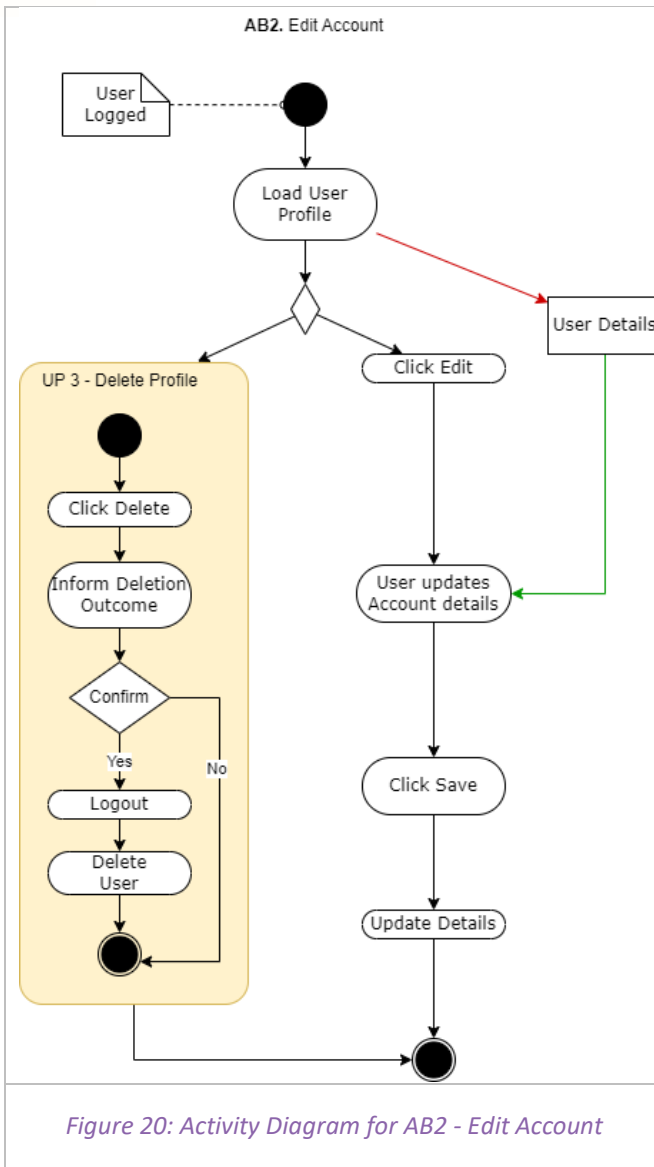


Figure 20: Activity Diagram for AB2 - Edit Account

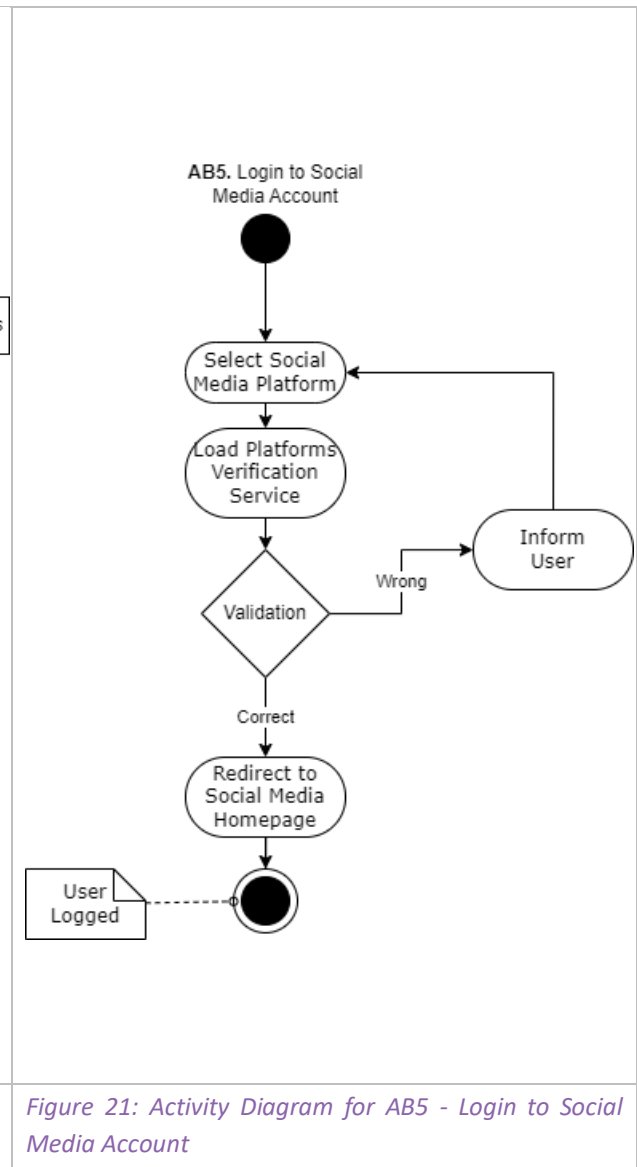


Figure 21: Activity Diagram for AB5 - Login to Social Media Account

4 Technical and legal requirements

4.1 Technical requirements

From a technical standpoint, the technical requirements detail the specific needs of the various tools or subsystems within the SCENE platform to meet the criteria outlined in Section 2. Each partner responsible for creating or developing a tool or subsystem formulates these requirements. This process involves reviewing the general requirements and use cases, and then establishing precise technical specifications, such as ensuring real-time data synchronization or necessitating a stable internet connection.

Table 11: List of SCENE technical requirements

ID	Title	Description	Why (↑)	How (↓)
TR1	Device must be suitable to wear (for the VR support)	The system should have a weight that does not make the end-users uncomfortable to wear and be able to perform intended activities without direct power (battery-power should be sufficient). Moreover, it should have a	G2, G3, G4	FR2, FR3, FR4, NFR2, NFR5

		reasonable size roughly similar to a modern-day mobile phone.		
TR2	Machine Learning computing capabilities	The main microcontroller will be capable of implementing machine-learning models.	FR2, FR3	FR2
TR3	Real-Time 3D Data Processing	The system should be capable of processing 3D scan data in real-time. This includes the ability to construct and render 3D models on the device or transmit the data efficiently to a cloud platform for processing, enabling immediate use or analysis of the scanned data.	G4, G6, FR2, FR3, FR4, FR8	FR2
TR4	Data import and Export and GIS Integration	The system should be compatible with common 3D file formats (e.g., OBJ, FBX, STL) to facilitate data import and export. It could also have the capability to import geospatial data from Geographic Information System (GIS) formats for accurate site mapping.	FR3, FR4	
TR5	User Interface (UI) and Navigation	The system should have a user-friendly interface that facilitates efficient navigation and easy access to modelling tools. Besides this, the system should also facilitate smooth and intuitive controls for navigating through the 3D environment, including zoom, pan, and rotate functionalities.	FR3, FR4	
TR6	Tracking Devices	Tracking devices must be wearable and based on the Ultra-Wideband (UWB) technology.	FR11, NFR16	
TR7	Tracking Infrastructure	The Actors Tracking solution requires a deployment of an infrastructure composed of fixed UWB devices (called anchors), Gateways (GWs) and a localisation manager.	FR11, NFR16	
TR8	Recording equipment	The contributors who want to provide source files for the modelling of a new location need some recording equipment. Two different cases are addressed a) the use of a low-budget portable digital recorder that supports ambisonics b) the use of conventional microphones for monophonic recording	FR59	
TR9	Audio playback	To experience the audio simulated output requires, the use of headphones is suggested. Users can also experience it through a pair of	FR56	

		stereo speakers. The use of built-in speakers of laptops and smartphones cannot provide satisfactory results.		
TR10	Internet connection	Since the audio output will be served, a stable internet connection is required	FR56	

4.2 Legal & ethical requirements

The project's legal and ethical requirements are distinct from its other requirements because they apply to the entire SCENE platform, forming a foundational base relevant to all its aspects. These requirements also influence the final development of the SCENE platform, as the technical aspects must adhere to relevant laws. Furthermore, given their unique importance, these requirements will lead to specific use cases, ensuring a more secure implementation for all stakeholders and their data.

4.2.1 Security requirements: Privacy and Data Protection

This section provides an overview of the Privacy and Data Protection framework to be used in SCENE. The project involves the collection of personal data, in different countries of the European Union such as Greece, Cyprus and Italy, where the pilot sites are located. Moreover, although being under the same European regulation, the national laws of EU member states might have differences. Therefore, a close follow up of data protection requirements in each pilot site will be carried out.

The collection, processing and transmission of personal data must be analysed under the principles of the GDPR (General Data Protection Regulation, EU Regulation 2026/679) and especially the respective national laws. Any additional regulations at European or national level that are not in the GDPR and apply to Data Protection or any other sensitive information must be also taken into account.

4.2.1.1 EU Legislation and regulation

On 15 December 2015, the European Parliament, the Council, and the Commission reached agreement on the new data protection rules, establishing a modern and harmonised data protection framework across the EU: The **General Data Protection Regulation**. The Regulation is an essential step to strengthen citizens' fundamental rights in the digital age and facilitate business by simplifying rules for companies in the Digital Single Market. A single law intended to do away with the existing fragmentation and costly administrative burdens, leading to savings for businesses. The final text was formally adopted by the European Parliament and Council at the beginning 2016. Therefore, the rules became applicable two years later. As a Regulation and not a Directive, it had immediate effect on all EU Member States after the transition period and did not require any enabling legislation to be passed by governments. The Commission should work closely with Member State Data protection authorities to ensure a uniform application of the new rules. The Regulation updated and replaced the current Data protection rules that were based on the 1995 Data Protection Directive.

The GDPR strengthens the existing rights and empowers individuals with more control over their personal data. Most notably, these include:

- Easier access to your own data: individuals have more information on how their data is processed and this information should be available in a clear and understandable way
- A right to data portability: it is now easier to transfer your personal data between service providers.
- A clarified "right to be forgotten": when you no longer want your data to be processed, and if there are no legitimate grounds for retaining it, the data will be deleted.



- The right to know when your data has been hacked: companies and organisations must notify the national supervisory authority of serious data breaches as soon as possible so that users can take appropriate measures

By unifying Europe's rules on data protection, lawmakers create business opportunities and encourage innovation though:

- One continent, one law: The regulation establishes one single set of rules which makes it simpler and cheaper for companies to do business in the EU.
- One-stop-shop: businesses only have to deal with one single supervisory authority.
- European rules on European soil– companies based outside of Europe have to apply the same rules when offering services in the EU.
- Risk-based approach: the rules avoid a burdensome one-size-fits-all obligation and rather tailor them to the respective risks.
- Rules fit for innovation: the regulation guarantees that data protection safeguards are built into products and services from the earliest stage of development (Data protection by design). Privacy-friendly techniques such as pseudonymisation are encouraged, to reap the benefits of big data innovation while protecting privacy.

4.2.2 The new Artificial Intelligence Act

On December 2023, Parliament and Council negotiators reached a provisional agreement on the Artificial Intelligence Act. The main goal is to ensure that AI systems are developed and used in a secure, ethical, and responsible way accomplishing the fundamental rights of EU citizens while, at the same time, promote innovation. Therefore 3 main aspects are targeted:

- *Ensuring AI security*: security requirements for AI systems in terms of robustness, reliability, and resilience to cyber-attacks.
- *Protect fundamental rights*: AI systems are not allowed if vulnerate fundamental rights, such as privacy, freedom of speech and discrimination. The new law establishes a framework based on risk, so that the higher the risks the stricter the requirements for AI systems, which intends to promote robust, secure, and ethical AI systems.
- *Promote responsibility and transparency*: transparent requirements for AI systems, so that users can be informed about how the system work and how their data are used. This measure intends to help promoting citizen's confidence on AI.

The AI Act has set out clear definitions for the different actors involved in AI: providers, deployers, importers, distributors, and product manufacturers. Moreover, the AI Act also applies to providers and users of AI systems located outside of the EU, if output produced by the system is intended to be used in the EU.

In terms of structure, there is a General Body at EU level composed of member states as well as of Commission members. Furthermore, EU member States must designate one (or more) national authorities in charge of supervising the implementation of the regulation.

The impact on global competitiveness is still unclear. AI systems not aligned with the AI Act would be implemented in other areas of the world. Depending on whether the non-EU countries join a similar initiative/regulation to promote 'fair play' and fundamental rights the AI innovation in Europe might be severely affected.

In terms of labour market is also unclear and sometimes contradictory. From an optimistic perspective, AI is able to create new job positions in areas such as development, data management, engineering and

cybersecurity. It can also help automatizing routinary tasks, allowing the workforce to focus more on more creative and strategic tasks. According to a McKinsey study, AI can create between 10 to 15 million new job positions in the EU by 2030. On the other side, from a pessimistic perspective, AI can generate job loss in areas such as production, customer service, logistics and administration. According to an OECD study, AI would be able to automate between 10% to 15% of all job positions in the EU by 20230. In summary, the impact of AI on Europe is complex and would not only depend on EU regulation and national legislation, but also on how companies and workers (employees) adapt to this working environment.

The new Law establishes a series of requirements for AI systems which represent a serious risk for the fundamental rights, such as those used for decision making that have legal or significant effects on the users. There are 4 main categories:

- **Unacceptable risk** (prohibited): The Act prohibits AI models posing an unacceptable risk (e.g., the use of real-time remote biometric identification in public spaces or social scoring systems)
- **High risk** (conformity assessment): The Act allows high-risk models but must comply with various requirements and undergo a conformity assessment, which should be completed before the model is released on the market. The models need to be registered in an EU database. Some requirements refer to an appropriate risk management system, logging capabilities and human responsible to oversee the process. Data governance should be applied to the data used for training, testing and validation. Other features include mechanisms to ensure the cyber security, robustness, and fairness of the model. Some examples of this category encompass AI for critical infrastructures, hiring processes, employee ratings, automated insurance claims, etc.
- **Limited risk** (transparency): The Act requires transparency for these models (e.g., a user must be informed whether they are interacting with a human or an AI system). A typical example is represented by current chat bots.
- **Minimal risk** (code of conduct): The remaining models are considered of minimal or no risk by the Act; here the implementation of a Code of Conduct around ethical AI is recommended.

According to this categorization, the AI systems that will be developed in SCENE fall under the limited or minimal risk categories. The general-purpose AI (GPAI) models have basically to adhere to transparency requirements, which includes:

- Providing technical documentation
- Comply with EU copyright law.
- Disseminate detailed summaries about the content used for training.

In terms of timing, the AI Act is still provisional and is expected to be fully applicable by 2026. Some intermediate steps are envisioned, and the SCENE partners will follow this transition to accommodate their developments to the new Law, if needed.

4.2.3 Legal Requirements

Table 12: List of Legal requirements

ID	Title	Description
L1	GDPR - Privacy by design principle: Proactive not Reactive - Preventative not Remedial	The system must incorporate all means that are necessary to prevent privacy or security breaches from occurring. This design anticipates and prevents invasive events before they happen. In this context, the system should incorporate a variety of measures to effectively check the validity of all information inputs and all actions.

L2	Obtain Data Subject consent	The system should have the means to obtain Data Subject consent. This includes but not limited to an information sheet and a consent form to be displayed with a "tick box" to confirm that "I have read and fully understood the SCENE platform and I agree to abide by the principles described there" or an equivalent phrasing.
L3	Encryption of personal data	The system must encrypt all personal data by default using standardized encryption mechanisms with securely managed encryption keys.
L4	Expiry date of personal data	The system must associate an expiry date to all collected personal data.
L5	Deletion of expired personal data	The system shall delete (in an unrecoverable way) all the collected personal data after they expire.
L6	Provide a readable, understandable and easily accessible privacy policy for the users.	Users should be informed on the privacy policy of SCENE.
L7	Terms of use	The system must provide its terms of use.
L8	View of collected personal data	The system must provide the ability (direct or indirect) to the Data Subject to view what personal data have been collected.
L9	Correction of collected personal data	The system must provide the ability (direct or indirect) to the Data Subject to make corrections to personal data that have been collected.
L10	Provide a single point of contact for the users	Users need contact data to address their requests

4.2.4 Ethical requirements

Table 13: List of Ethical requirements

ID	Title	Description
E1	Information on consent source	The system should provide information on how it gained consent for data preservation and sharing.
E2	Information on end user identity protection	The system should provide information to the end users on how their identity is protected.
E3	Information on secure handling of sensitive data	The system should describe how sensitive data will be handled to ensure they are stored and transferred securely.
E5	Compliance of SCENE Artificial Intelligence to the general ethical principles	The Artificial Intelligence components of SCENE must comply with the general ethical principles, based on the European Group on Ethics in Science and New Technologies. These include the following: non violate human dignity, respect of human autonomy, compliance to human rights and universal values, contribution to fairness, equal opportunities, and solidarity, respect the outcome of democratic decision making, AI pursuant to the principles of the rule of law, guarantee the safety and integrity of users, compliance to the laws and regulations on data protection and privacy, prevention of harmful impact on the environment.

E6	Easy to understand user interfaces	The system should offer an easy-to-understand user interface. The app(s) should allow for information to be provided in a plain/easy-to-understand language.
E7	Gamification based on non-personal data.	Gamification should be related to the collection and processing of non-personal data only. The SCENE gamification tools should avoid asking or encourage persons to share their personal data, since it could be considered as a non-ethical/dark pattern.
E8	Management of notifications and warnings.	The system should provide the end users with a configuration panel to allow them to decide how often they will receive notifications and the type of notifications. Similar functionality should be provided for the warnings.

5 Limitations

The main limitation of the work presented in this deliverable is the response rate in the questionnaire. To be more specific, the questionnaire survey was answered by 58 people many of which expressed not understanding exactly the technical aspects and the terminology of the SCENE project. Despite the efforts for disseminating the SCENE questionnaire the number of people is considered limited. There may be multiple explanations to why this happened. The most prominent is that the low number of participants was due to the length of the questionnaire that contained 49 questions. However, all of them were considered crucial to gather information for the SCENE platform during all the different stages of production.

Another important matter to be considered, is the fact that the questionnaire answers were coming mainly from Greece and Cyprus. Out of the 58 responses only six were from Spain, Italy and the U.K. It is understood that for a non-biased sample and a diversity of stakeholders from the film industry, we need a diverse set of responses from all over Europe. In any case, the platform development (which is mainly impacted by the requirements) is going to be iterative, and it will be refined.

Finally, it is reported a sense of uncertainty among the Greek audio-visual sector end users as most of them were sceptical at the use of technology in their work. To be more precise, fear in the possibility of job replacement along with lack of knowledge was constantly communicated to the Athens Film Office members each time they tried to present the SCENE project and its mission. In order to familiarise these people with the project, the Athens Film Office hosted on 15.12.2023 - The Declaration of Filmmakers in collaboration with the Greek Film Centre and EKOME- National Centre of Audio-visual Media and Communication. This event brought together voices from Europe and beyond to discuss key industry issues like intellectual property rights and the impact of AI on filmmaking. There, the Film Officer Mr. Stathis Kalogeropoulos got the opportunity to introduce the SCENE EU project, outlining its mission and future potential for the audio-visual sector, highlighting that SCENE is here to enhance their work and not replace people.

6 Conclusions & future work

D2.2 “End-User needs & requirements R1” is part of task T2.2 “End-User needs & requirements” and presents the process and the results for extracting the SCENE EU platform’s requirements and use cases, the users’ requirements, and the general system’s technical and legal requirements. Through the multiple stages of the requirements elicitation process, we were able to dig deeper into the project’s real goal and potential. To this end, the project goals and constraints were identified. Moreover, the requirements were categorized into functional, non-functional, technical, legal, and ethical requirements and needs. For the last part, the consortium identified the project’s stakeholders. This provided a better insight into the technical and business aspects of the project, which resulted in the definition of the different use cases that will be implemented in each pilot of the project. All the above served to elaborate on the SCENE system’s

functionalities (use cases) and why (requirements). The project’s target seems to be aligned with the audio-visual sector’s needs. SCENE platform’s requirements were compiled so that they can achieve this overarching goal and potentially bring real change. The outcomes of this deliverable will guide the rest of the process to ensure alignment with the project’s goal and the users’ requirements. The next steps are first to realize how this system description will be implemented (in terms of architecture), to add any other use cases that will be revealed during the implementation stage which may enhance the user experience, and to specify the system verification plan. To further refine our understanding and ensure a comprehensive representation of user needs, we plan to conduct 2 international workshops in the coming months. These workshops aim to gather diverse perspectives from various regions and provide valuable feedback on our current trajectory. Concurrently, we will intensify our efforts in disseminating the questionnaire and conducting targeted interviews, especially focusing on stakeholders who might have been under-represented in our initial data collection. This proactive approach is designed to enrich our dataset and mitigate any location bias, thereby ensuring a more inclusive and representative set of end-user perspectives. Finally, the questionnaire will be revisited to consolidate the feedback that we have collected from the end-users so far. The figure below illustrates the timeline of the aforementioned activities. By Month 18 (M18) of the project, D2.3 will be submitted, serving as the second revision of the present document.

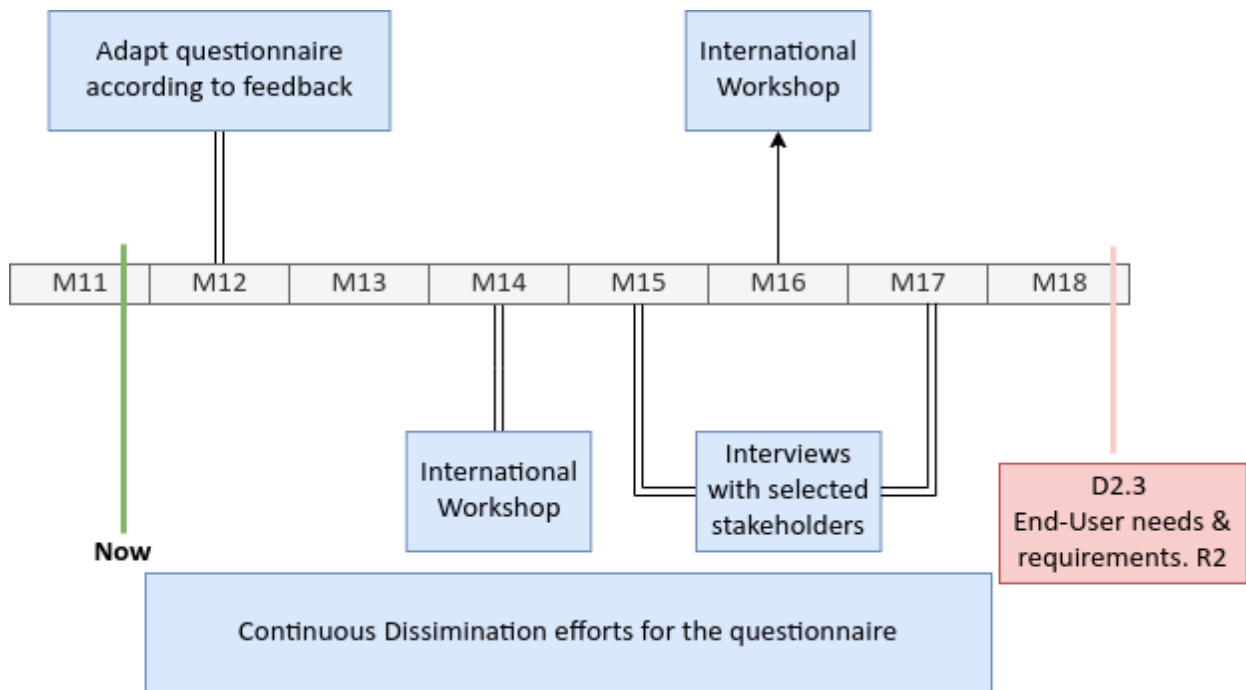


Figure 22: Roadmap towards second revision of end-user needs & requirements.



Annex - End-User Needs & Requirements Questionnaire

Part A: Demographics and initial questions

Q1 Gender (Single Selection)

- Male
- Female
- Gender - Variant
- Prefer not to say

Q2 Occupation Status (Single Selection)

- Production Company
- Location Manager
- Art Director
- Filmmaker
- Producer
- Investor
- Distributor

Q3 Years of expertise in the film industry (Single Selection)

- Less than 1 year
- 1 - 5 years
- More than 5 years

Q4 Size of the company (Single Selection)

- Small (1 - 10 employees)
- Medium (11 - 50 employees)
- Large (51 - 200 employees)
- Very Large (200+ employees)

Part B: User Profiling

The SCENE project is designed to elevate the European filmmaking process by integrating AI, blockchain, and 3D representations of cultural sites into the production and distribution cycle to protect cultural heritage and intellectual property. The platform offers tools for effective content management, precise location scouting, and immersive audio-visual simulations, targeting efficient filmmaking practices that resonate with today's diverse global audiences. By leveraging SCENE's intelligent recommendation and distribution systems, filmmakers can anticipate and fulfil audience preferences reflecting Europe's cultural richness. You can also find a summary in the project's leaflet <https://thesceneproject.eu/wp-content/uploads/2023/06/SCENE-Leaflet-30052023-Web.pdf>

Q5 Mention any organization that could use the services provided from the SCENE platform. (Open Ended)

Q6 In which phase of the film-making process are you involved? (Slider)

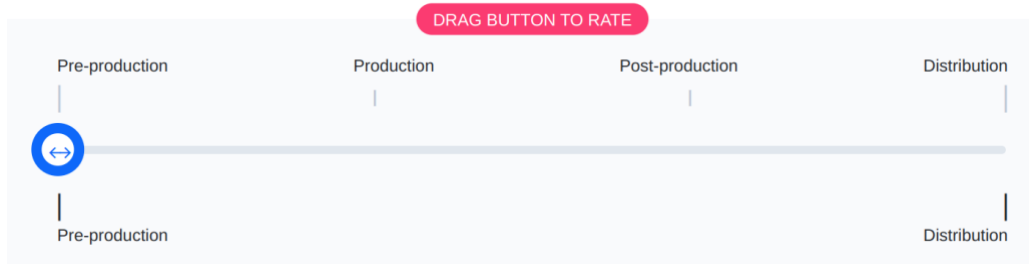


Figure 23: Digital view of Q6. User has 4 options.

Q7 Which phase of the filmmaking process is most crucial for your organization? (Slider)

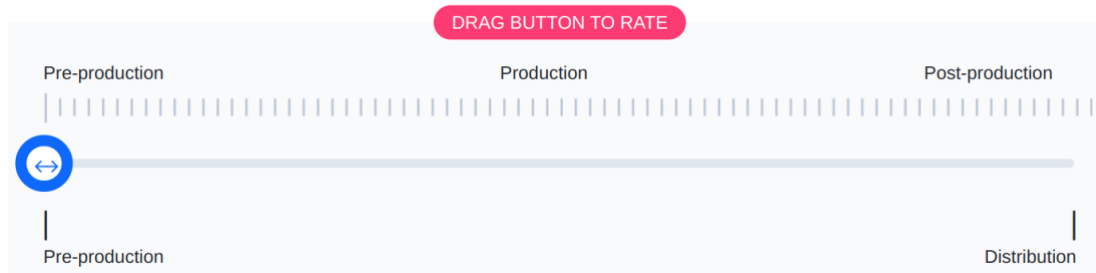


Figure 24: Digital view of Q7. The user can select values in between.

Min: 0 - Max: 100 - Step: 1

Value: 0 - Pre-production

Value: 33 - Production

Value: 66 - Post-production

Value: 100 - Distribution

Part C: Type of data and methods currently used

Q8 Under your role do you work with data? (Single Selection)

- Yes
- No

Q9 If yes, what type of data do you work with? (Multiple Selection)

- Images
- Videos
- Audio
- Multimedia
- 3D Object Locations
- Ownership of the locations

Q10 How do you access the data that you work with? (Single Selection)

- I have a shared folder and look manually for each item through my personal or my company's collection.
- I use a dedicated tool/service to search for specific data (e.g. search engine, application etc.)



Q11 Are you using specific attributes (e.g. time, location, format etc.) to search the data? (Single Selection)

- Yes, there are some keywords or categories.
- I don't know.

Q12 Select the initial sources from which the data are collected (Multiple Selection)

- Social media platforms
- General web pages as long as they are referring to a certain topic
- Image databases
- Off the shelf applications

Q13 Indicate how important social media platforms are to your work (Slider)

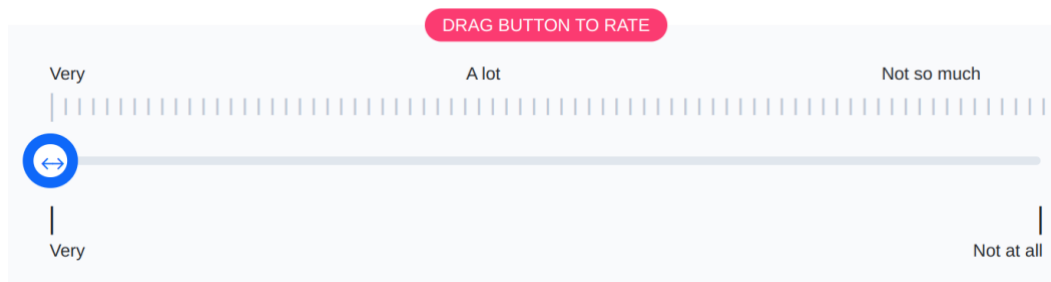


Figure 25: Digital view of Q13.

The user can choose values within a range.

Min: 0 - Max: 100 - Step: 1

Value: 0 - Very

Value: 33 - A lot

Value: 66 - Not so much

Value: 100 - Not at all

Q14 Indicate how important general web pages are to your work (Slider)

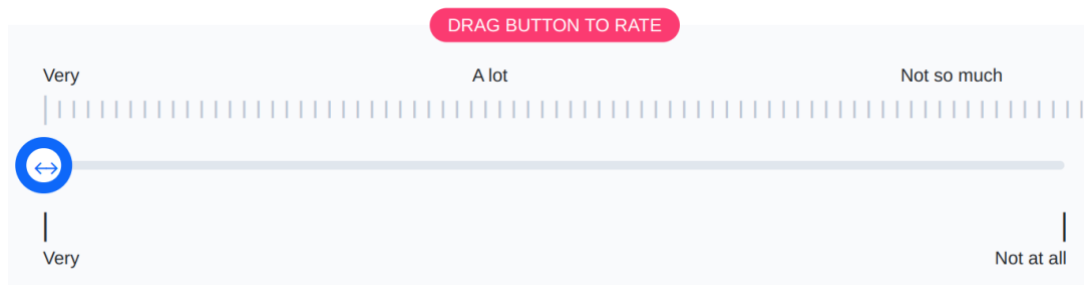


Figure 26: Digital view of Q14.

Min: 0 - Max: 100 - Step: 1

Value: 0 - Very

Value: 33 - A lot

Value: 66 - Not so much

Value: 100 - Not at all

Q15 Indicate how important image databases are to your work (Slider)

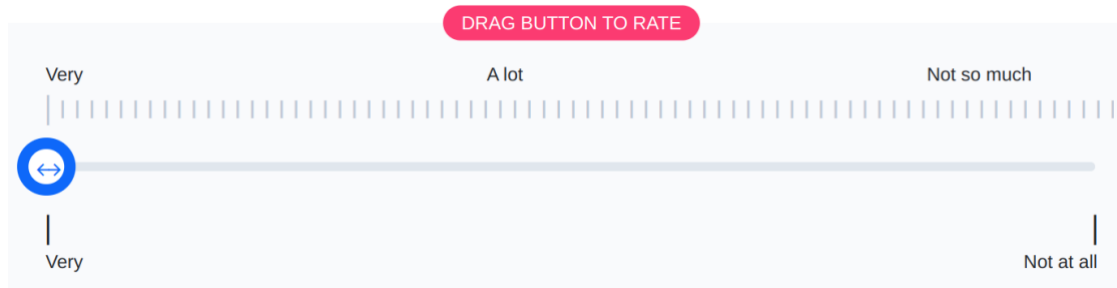


Figure 27: Digital view of Q15.

Min: 0 - Max: 100 - Step: 1

Value: 0 - Very

Value: 33 - A lot

Value: 66 - Not so much

Value: 100 - Not at all

Q16 Indicate how important off the shelf applications are to your work (Slider)

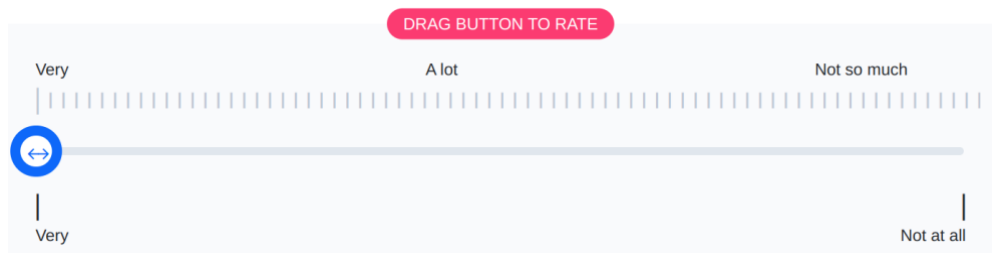


Figure 28: Digital view of Q16.

Min: 0 - Max: 100 - Step: 1

Value: 0 - Very

Value: 33 - A lot

Value: 66 - Not so much

Value: 100 - Not at all

Part: D Pre-production

Q17 Phase How many hours do you spend engaging in location scouting activities for film production? (Single Selection)

- 0 hours (Never)
- Few days/hours per year (Rarely)
- Few hours per month (Occasionally)
- Few hours per week (Frequently)
- Few hours per day (Very Frequently)



Q18 How does the prioritization of locations take place? (Multiple Selection)

- Following the script details
- Based on the urgency of the topic
- Budget Constrains
- Accessibility and Legal Issues

Q19 What are the biggest challenges you face during the location scouting process? (Ranking)

Choice/ Rating	0	1	2	3
Finding suitable locations				
Negotiating permits and permissions				
Assessing logistics and accessibility				
Budget constraints				

Q20 Are you using any platform/tool for location scouting? (Single Selection)

- Yes
- No

Q21 Do you think that tagging 3D object locations with specific keywords or vocabularies related with the previous challenges might help automatize, promote and speed up the location scouting process? (Single Selection)

- I'm not sure, I prefer to do it manually
- Maybe, but only in the following challenges
- Yes definitely, common vocabularies will be useful

Q22 How do you currently gather information about audience preferences for film projects in order to build your target audience? (Multiple Selection)

- Surveys and questionnaires
- Social media analysis
- Market research reports
- Focus groups

Q23 How do you think an AI-based tool could assist in building your target audience? (Open Ended)

Part E: Production Phase

Q24 How do you currently manage light and audio simulation during the film production phase? (Multiple Selection)

- Manual adjustments during filming
- Third-party software tools
- In-house developed tools
- I do not use light and audio simulation



Q25 What features or functionalities would you like to see in a light and audio simulation tool? (Multiple Selection)

- Real-time simulation capabilities
- Customizable presets for different scenes
- Integration with camera equipment
- Compatibility with popular editing software

Part F: Distribution Phase

Q26 Would you find value in a platform that offers a distribution engine to help identify target audiences for your film projects? (Single Selection)

- Yes, it would be very useful
- Maybe, I would like to learn more
- No, I prefer traditional methods

Q27 What criteria do you consider when selecting a target audience for your films? (Multiple Selection)

- Demographics (age, gender, location, etc.)
- Genre preferences
- Social media presence
- Box office performance of similar films

Q28 Would you be interested in using a recommender system that suggests films or clips to your audience? (Single Selection)

- Yes, definitely
- Maybe, I would like to learn more
- No, I prefer traditional methods
- Not applicable in my case

Q29 How do you currently gather feedback from your audience about their preferences and interests? (Multiple Selection)

- Surveys and questionnaires
- Social media interactions
- Test screenings
- Focus groups

Q30 What challenges do you face when it comes to audience engagement and retention? (Multiple Selection)

- Limited marketing budget
- Difficulty reaching the target audience
- Competing with other forms of entertainment
- Lack of audience feedback and data

Q31 Which of the following metrics or analytics are essential for you to view on the dashboard of an Audience Building tool? Please select all that apply (Multiple Selection)

- Audience engagement rate (likes, shares, comments)
- Audience growth over time
- Top-performing content (based on engagement and reach)
- Audience demographics (age, gender, location)



- Time spent on content by the audience
- Conversion rate (from viewer to subscriber or follower)
- Feedback and sentiment analysis
- Social media shares and mentions

Q32 Which social media platforms do you currently use or plan to use for your audience building campaigns? (Multiple Selection)

- Facebook
- Instagram
- Twitter
- YouTube
- LinkedIn
- TikTok

Q33 Which key performance indicators (KPIs) do you consider essential to monitor and visualize in a dashboard for your audience building campaigns? (Multiple Selection)

- Number of followers/subscribers
- Engagement rate (likes, comments, shares)
- Click-through rate (CTR)
- Conversion rate (e.g., from social media to website)
- Reach/impressions
- Return on investment (ROI)

Part G: Security & Privacy

Q34 Have you encountered any issues related to intellectual property rights (IPR) protection in your film projects? (Single Selection)

- Yes, frequently
- Occasionally
- Rarely
- No

Q35 What categories of rights would you encode in a license agreement with a consumer? (Multiple Selection)

- Film production rights
- Distribution rights
- Royalties and revenue streams
- Intellectual property rights

Q36 Is it possible to have multiple different right holders for the same object? (Single Selection)

- Yes
- No

Q37 Is your object or right divisible to smaller partition? (Single Selection)

- Yes
- No

Q38 What is the usual size range of the file you have to deal with? (Single Selection)



- Less than 1 kilobyte (KB)
- 1 kilobyte (KB) to 1 megabyte (MB)
- 1 megabyte (MB) to 1 gigabyte (GB)
- More than 1 gigabyte (GB)
- Not sure

Q39 What format best describes the file you are referring to? (Single Selection)

- Text file (e.g., .txt, .docx, .csv)
- Image file (e.g., .jpg, .png, .gif)
- Audio file (e.g., .mp3, .wav, .flac)
- Video file (e.g., .mp4, .mov, .avi)

Q40 How do you think a Blockchain-based module could assist for IPR protection and licensing control? (Open Ended)

Q41 How do you currently manage the licensing and auditability of multimedia content used in the post-production phase? (Multiple Selection)

- Manual documentation and tracking
- Digital asset management systems
- Contracts and legal agreements

Part H: General Questions

Q42 Do you think AI tools might be useful to other activities of your work other than those mentioned above? If yes, please specify. (Open Ended)

Q43 How open is your organization to adopting new technologies and digital tools? (Single Selection)

- Very open, actively seeking innovative solutions
- Open, willing to explore new possibilities
- Neutral, depends on the specific benefits and costs
- Reluctant, prefer traditional methods and tools

Q44 Are there any specific tools or features you would like to see in a platform like SCENE? (Multiple Selection)

- Integrated location scouting database
- AI-powered audience analysis and targeting
- Real-time light and audio simulation tools
- Blockchain-based IPR protection and licensing control
- Advanced distribution engine for audience identification
- Personalized film recommender system
- Real-time tracking of actors' positions during shooting



Q45 42. Rank the below tools/features from not important (1) to most important (7) (Ranking)

	0	1	2	3	4	5	6
Integrated location scouting database							
AI-powered audience analysis and targeting							
Real-time light and audio simulation tools							
Blockchain-based IPR protection and licensing control							
Advanced distribution engine for audience identification							
Personalized film recommender system							
Real-time tracking of actors' positions during shooting							

Q46 Who in your opinion is expected to use the SCENE platform (as end-user)? (Multiple Selection)

- Location Scouters
- Film Offices
- Set designers
- Directors
- Production Company
- Artistic Director
- Film-maker
- Producer
- Investor
- Distributor

Q47 Is the Green Dimension in your company strategy? (Single Selection)

- Yes
- Not yet
- I don't think it will clear impact on our sector

Q48 Would you like to stay updated with our latest news by subscribing to our newsletter? (Single Selection)

- Yes
- No

Q49 Please share your email address below (Open Ended)
