wr-AI-ter: Enhancing Ownership Perception in AI-Driven Script Writing

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ABSTRACT

The integration of artificial intelligence (AI) into creative domains is increasing, presenting both challenges and opportunities. In screenwriting, personal artistic expression is a fundamental aspect of the creator's identity and work. The current use of AI in such creative processes can sometimes overshadow the creator's vision and lead to a reduced sense of ownership over the final product. We introduce wr-AI-ter, an interactive application consisting of four basic stages: Ideation, Structure, Refinement, and Export. While some related work focuses on experts The application is intended to aid users with varying levels of screenwriting proficiency in generating screenplays using artificial intelligence, while preserving their sense of authorship. We conducted a user study with 23 participants, who had different expertise (screenwriting, documentary filmmaking, and VFX artistry). The results indicate that AI has the potential to accelerate the screenwriting process and improve the quality of scripts without compromising the sense of ownership.

CCS CONCEPTS

• **Applied computing** → **Performing arts**; • **Computing methodologies** → *Natural language generation*; • **Human-centered computing** → *Empirical studies in HCI*; HCI design and evaluation methods.

KEYWORDS

natural language generation, natural language evaluation, human-computer interaction, computational creativity, ownership, screenplay

1 INTRODUCTION

Since *Large Language Models* (LLMs) were released to the general public, more and more creative professionals have been testing the possibilities of integrating text models into the storytelling process. While general conversational AI platforms, like *ChatGPT* [27], provide a foundation for creative experimentation, they often fall short when it comes to directing the narrative toward a specific artistic vision. The fine balance of reflecting a creator's distinctive voice and style against the guidance of AI is challenging, and current technologies can sometimes overpower users. Our goal is to direct research efforts towards the development of an AI assistant to improve the creative screenwriting process. This is a crucial consideration as we observe a tendency in existing AI solutions to overstep this balance, dominating rather than assisting. Film and series production is typically a highly collaborative process. Creative teams often come together in so-called "writers' rooms", bringing together diverse perspectives and ideas to shape narratives [17]. Incorporating AI into a shape similar to this collaborative model holds immense promise for refining and accelerating the creative workflow, potentially reducing the reliance on extensive human teams without compromising on the richness of the output. Our study focuses primarily on young filmmakers, a group with varying levels of skill and experience. This group includes aspiring novices and seasoned professionals. Novice writers often do not possess formal training in screenwriting, which necessitates significant structural and process-oriented guidance during the creative process. In contrast, professional writers prioritize tools that enhance productivity and offer sophisticated functionalities that align with their advanced skills. Regardless of their experience level, all group members are united by a common goal: They each have a distinct vision for a short-form video project that they aspire to realize through a carefully crafted screenplay. One of the biggest obstacles these screenwriters face is getting from a vague concept to a first draft — a concrete manifestation of their abstract ideas. There is a need for a tool that can assist to overcome the hurdle of writer's block, simplifying the task of composing a preliminary draft, and achieving this goal in a timely manner. This intuitive assistant should not only facilitate the development of their screenwriting skills but also enable them to apply narrative best practices in an organic, unforced manner. Such a tool must provide a user-friendly interface, which avoids overwhelming users — especially beginners — with an abundance of complex features. Conversely, more advanced "power users" may seek out sophisticated features

tailored to their elevated level of expertise. Based on these considerations, we developed an application called wr-AI-ter[1] and examine the following question: How can artificial intelligence be seamlessly integrated into the collaborative scriptwriting process to improve the quality of screenplays for artistic videos while preserving their ownership? The aim is to offer an understanding of how such an integration can elevate the story-crafting experience.

2 BACKGROUND

2.1 Story Structures

The art of storytelling, which extends across diverse cultures and historical epochs, intrinsically relies on structured narrative frameworks. One of the earliest formal explorations of narrative structure can be attributed to Aristotle. In his book "Poetics", he provided foundational insights that have withstood the test of time [2]. The "three-act structure" is a straightforward yet widely applicable concept that can be found in a lot of narratives. Based upon the simple three-act structure, *Gustav Freytag's pyramid* framework introduces a more detailed breakdown of narrative progression. This model uses a five-act structure that has been observed not only in the classics but also remains present in current storytelling [14]. Freytag's five-act structure is methodically outlined as follows:
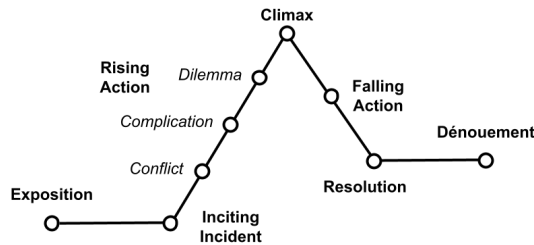

Figure 1: Illustration of Gustav Freytag's pyramid, upon which our wr-AI-ter app is based [14, 25].

Act I - Exposition: This initial act serves as the doorway through which the audience enters the narrative world. In this act, the main characters are introduced, the setting is established, and the audience is acquainted with the initial situation of the storyline.
2. Act II - Rising Action: As the narrative progresses into the second act, the primary challenges and conflicts that the characters will face are introduced and gradually developed. This act consolidates the narrative's foundations, setting the stage for the unfolding drama.
3. Act III - Climax: The narrative reaches its zenith in the third act, often portrayed as the story's most intense and dynamic part. Here, the protagonist encounters a major decision or obstacle, which will dramatically alter the course of events and heighten the stakes of the conflict.
4. Act IV - Falling Action: After the climax, the fourth act deals with the repercussions of the decisions and actions. This act builds towards the ultimate confrontation or crisis, paving the way for the final resolution.

[1]https://github.com/Think-42/wr-AI-ter

5. Act V - Dénouement: The final act provides closure as the primary conflicts are resolved, and the story naturally progresses toward its conclusion. This act ensures that the narrative arc is brought to a satisfying end, leaving the audience with a sense of completion. Freytag's model offers a more nuanced approach than the three-act structure. It emphasizes the step-by-step escalation of narrative tension and the subsequent resolution, which are key to crafting a compelling and cohesive tale. Another popular framework is the hero's journey structure [7]. The original has 12 stations. However, it has been further developed in different directions and there are different variants with even more stations. When developing our tool, it was important not to overwhelm the user, but still give them enough influence. For this reason, we have chosen the 5-act structure as the basis for our tool, which can be adapted by the user at any time.

2.2 Quality of Screenwriting

Determining the quality of screenwriting is complex due to the interplay of numerous subjective and objective factors. For example, personal taste, historical context, and the intended message of the screenplay can significantly influence the perceived quality. However, for a scientific analysis, it is imperative to establish a metric in the form of a set of evaluation criteria. These make the script comparable even if they are subjectively evaluated. It is worth noting that the criteria proposed in this paper are tailored specifically for this research and are not sufficient markers of a screenplay's overall quality in general.

Structure: The effectiveness of a screenplay can be greatly influenced by its structure. Established structures such as the hero's journey or the save the cat narrative structure can be used to create basic tension elements. However, the structure can be more intricate than just overarching story arcs. It may involve the incorporation of an initial "hook" or a narrative frame to captivate readers, in which the end references the beginning.

Surprise: Surprise and unpredictability are central to a gripping narrative. Each plot point should follow logically from its predecessor, as encapsulated by the "therefore/but" principle [4]. This principle accentuates causality and conflict, making the narrative suspenseful. Additionally, knowledge deficits can enhance the overall perceived surprise. Humour and exaggeration can also be used to achieve short-term surprises. Plot twists or surprises can increase engagement levels by introducing obstacles that protagonists must overcome [9, 18].

Emotionality: The emotional resonance of a screenplay is important in determining its impact. Research suggests that videos often go viral when the right combinations of emotions are presented [18]. The Pleasure-Arousal-Dominance Model [24] highlights certain emotional combinations that enhance the likelihood of a video gaining widespread attention. While an exhaustive analysis of each screenplay's emotional intricacies exceeds this paper's scope, a holistic assessment of emotionality is evaluated. Factors like relatability and a potent emotional climax are encompassed within this criterion.

Meaning: Narratives typically convey a deeper meaning or message beyond their literal content. When leveraging AI in the screenwriting process, it is essential for the feeling of ownership that

the meaning is not overshadowed. Elements like the clarity and subtlety of the story's message, the integration of its underlying theme, and its alignment with the author's vision are included in the meaning.

These quality characteristics are examined in our user study to find out whether using wr-AI-ter can enhance the screenwriting process.

3 RELATED WORK

3.1 Generative Pre-trained Transformer

Our approach utilizes Generative Pre-trained Transformer (GPT) models developed by OpenAI. ChatGPT [27], a prominent implementation based on GPT, employs the transformer architecture. This configuration links layers to allow the model to store and use past inputs for generating future responses. The model leverages stacked self-attention [33] to prioritize crucial data elements effectively. Unlike other models, which consider the entire input data, the attention mechanism strictly focuses on specific essential segments during output generation [3].

In advanced configurations, it computes an attention score for each word pair in a sentence, enhancing its capability to discern long-range dependencies in varied-length sequences [22, 33].

After training on a text dataset, the model is refined by focusing on specific tasks. For instance, GPT models are trained to predict subsequent words in sentences, a process called language modeling [28]. As for the ChatGPT, the model uses this transformer architecture to train itself to generate text like a human would by predicting the next words in a sequence [20]. Although transformer architecture is fundamental to GPT models, the high performance is not solely due to this design. Large-scale computational resources [33] and extensive fine-tuning also play critical roles in achieving high performance [28].

3.2 AI-Screenwriting

Several contemporary online tools deliver AI-screenwriting services. These tools often serve a specific market and are robust in certain tasks. Some of them utilize linear and sequential story writing [10, 30, 32]. These tools are focused on the text chronologically. This is important if users wants to start writing the end of a story but cannot because these tools require chronological writing order. Furthermore, the tools may suggest rewriting a particular passage, but they take very little input from the user to guide the generation process. The ways of interactions and co-creation with AI are explored only minimally. Another constraint revolves around the system's lack of context awareness. The system often interprets only the selected text section and does not consider the holistic story arc [32].

Some systems use similar interaction approaches, like ChatGPT's chat-based interaction style [10]. Others offer many functions and appear to be generic text tools rather than being specifically tailored to the screenwriting tasks [16, 34].

While much research has been conducted on generating individual story elements, such as story beat generation [12] or character development [29], as well as generating parts of a story, such as the ending [15], or even creating coherent entire stories [1, 6, 13], there is also research that allows for custom story development

through specialized tools [8]. Collaborative writing (co-writing) is an important aspect of writing with AI tools, raising questions about authorship, co-authorship and ownership of the texts produced. While some research focuses on collaborative storytelling with human actors and AI narrators [5], other research explores the question of co-authorship [21, 26]. In this context, a ghostwriter effect can be observed, where users do not claim ownership or authorship of AI-generated texts, but also do not publicly attribute AI authorship [11]. This highlights the significance of collaboration between users and AI, as well as the use of co-writing tools, to enhance a sense of authorship among users.

Yuan et al. investigated how LLMs can support writing short stories [35]. They developed Wordcraft tool which enables novel co-writing experiences, responds to writers' requests expressed in natural language, and helps unblock writers in the creative process. Although users reported a high level of ownership over the works they co-created with AI, it is important to note that Wordcraft was designed solely for short stories and not full scripts and the stories often lacked contextual awareness.

DeepMind's Dramatron project aimed to develop AI-driven software that enables screenwriters to co-author full-length movie and theatre scripts [25]. The authors focused on long-term coherence, ensuring that elements such as character traits remain consistent and that the storyline maintains logical continuity throughout the script. The system employed the hierarchical use of language models instead of directly generating an entire script. This was achieved through a series of well-constructed prompts and prompt-chaining techniques. For instance, the system would first generate the characters, followed by a rough plot outline, before writing the whole script. This hierarchical approach allowed for a more structured and coherent narrative and the findings highlighted the potential of AI-assisted script writing. However, a noteworthy observation was made during their post-session evaluation. The participants were requested to assess various statements derived from the Wordcraft survey questions. These included "I feel I have ownership over the created script(s)" and "I am proud of the final output". As depicted in figure 9 (bottom) these statements received the lowest scores on a Likert scale [25] even though the same statements in Wordcraft were answered very positively by the participants. This observation was important for shaping the direction of our research which seeks to build upon DeepMind's findings by exploring methods that allow users to collaborate with AI while retaining a sense of ownership over generated screenplays. While we incorporate hierarchical elements (similar to Dramatron), all such elements are transparent and modifiable by the user throughout the process. Moreover, our approach emphasizes interactions, facilitating back-and-forth ideation — akin to a "ping-pong" — between the user and the AI. Also, our interaction patterns are less generation-based and more directed towards assistance.

4 PROTOTYPING

4.1 UX Design

Our primary area of interest is the plotting phase of script generation, which spans from the initial idea to the first draft screenplay and usually serves as a great starting point for further refinement. Tools such as [25], which use AI to write screenplays, are often

aimed at theatre and film professionals. Our tool, on the other hand, is intended to be a first stepping stone to a mature screenplay for writers with different levels of experience. The challenge is to provide value for experts without overwhelming inexperienced users. For preparing the tool development we conducted in-depth interviews with three professional screenwriters. Our UX design is grounded in insights into their unique working approaches. We break down screenplay development into four fundamental stages: **Ideation**, **Structure**, **Refinement**, and **Export**. Each stage is crucial for producing coherent and captivating scripts. An experienced screenwriter might run through these stages unconsciously but usually touches upon each stage in this order. We will delve into the specifics of each phase in the following.
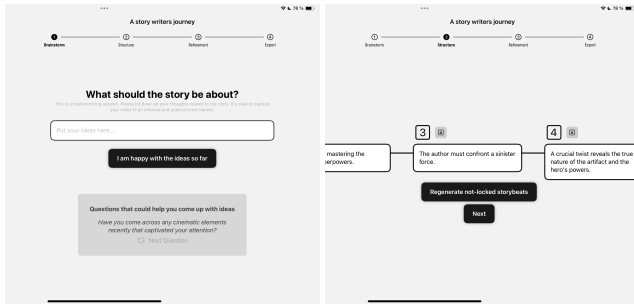

Figure 2: Ideation phase: Initiated with an initial concept, logline, or textual input (left). Restructuring story beats for enhanced narrative development. Beats are editable, with the ability to lock, and all non-locked beats can be reimagined (right).

4.1.1 Ideation (development of concepts and exploration of ideas). The first stage, ideation, focuses on generating and nurturing initial ideas, themes, and concepts for a screenplay. Inspiration is often seeded from everyday experiences such as reading books, watching films, or engaging in active conversations. Interestingly, these ideas tend to arise spontaneously, seeming to find the screenwriter rather than being actively pursued. The ideation stage is highly fluid and can stretch over extended periods, sometimes even years. During this phase, screenwriters may choose not to physically document their ideas, instead bearing them mentally until they are ready to continue. This phase involves brainstorming, the free flow of thoughts, and playing with different narrative ideas. Deploying creative techniques such as mind mapping and group brainstorming can help unlock and express ideas and overcome writer's block. This stage might also involve the creation of a so-called logline: a concise summary that encapsulates the story's message (see figure 2, left).

4.1.2 Structure (building of story arcs and plot progression). The second stage in the process, structure, consists of organizing the overarching plot and narrative structure by converting the logline into a comprehensive story arc [23]. It involves thoroughly examining subplot development and interplay, such as the workings of the A-Plot (core story) and B-Plot (story, which runs parallel) [31]. To aid this task, screenwriters can take advantage of narrative frameworks like the three-act structure or the Hero's Journey,

which guide them in arranging story elements coherently and logically. There is significant emphasis on character development at this stage, ensuring each character plays a significant role in the broader narrative. Screenwriters often only start writing once the core idea intuitively resonates and appeals to them. If the concept fails to resonate, the story is either sent back to the ideation stage or discarded. (see figure 2, right).

4.1.3 Refinement (crafting scenes and details). The third stage, script writing, involves translating the well-structured story into specific scenes, beats, and dialogues. This stage is iterative, involving countless revisions and refinements to effectively convert the story idea into an engaging and captivating script. There is a wide array of approaches to the refinement stage. Some screenwriters write down detailed scenes directly, while others focus on story beats that get more detailed with each iteration. Furthermore, at this stage, additional emphasis is put on "show, don't tell" [19], thereby enhancing the visual storytelling aspect of the script. This stage also requires crafting the roots of compelling dialogues that reveal character traits and further the storyline (see figure 3). The writer can now expand beyond the original five-story beats limitation, adding as many story beats as desired (by clicking the plus button between two story beats; see Figure 3). In addition to the liberty to add unlimited story beats, the writer is also equipped to delete or rearrange story beats using a set of arrows for sequential control. Collectively, these expanded control features comfortably enable the writer to conceive and develop a complete story like flashcards in the analog world could. In this phase, three AI features are introduced, designed to assist writers in enhancing their stories (see figure 5).
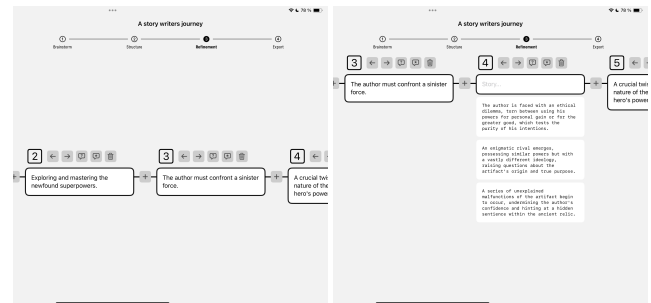

Figure 3: Refinement phase of generated story beats: The left image depicts the starting point in the refinement process, where users can click on the "plus" icon to insert new beats. The right image shows the outcome when the "plus" icon is clicked, presenting three suggested ideas for insertion.

4.1.4 Export (finalization and delivery of the first draft). The export stage marks the conclusion of the scriptwriting process for the first draft. It involves finalizing and preparing the script for external viewers. This step requires exporting the script into an industry-standard readable format to share with producers, directors, and other stakeholders. It is important to note that projects with higher production costs, such as cinema-length movies or TV series, would not result in a first draft screenwriting at this stage, but rather a "treatment". A treatment often covers a title, the logline, a narrative

description of significant events (story beats), and visual elements like a mood board. In our work, we strive to support screenwriters, specifically for short-form videos, at every important juncture of the script development process. For instance, composing a treatment for a 2-minute short film would be superfluous. Therefore, we provide the option to generate both treatments and scripts (see figure 4). Our aim was not to replace these tools but to complement them. We envisioned our software as a useful precursor, facilitating the scriptwriting stage. Therefore, it is possible to save the file in the open-source "fountain" format, which can be easily imported into specialized software tools such as "Final Draft" for further script development. The introduction of export and import features was a priority from the start of this project to ensure seamless integration into existing screenwriting workflows, especially for screenplay experts who are already familiar with professional scriptwriting software.
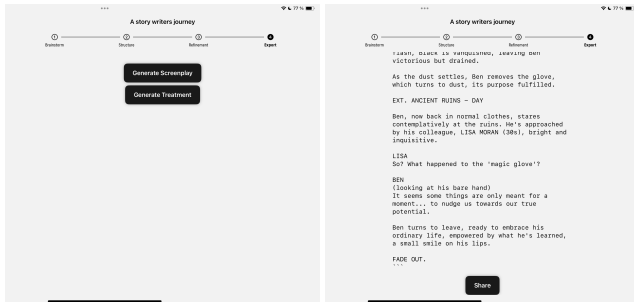
Figure 4: Export screen, offering a choice between screenplay and treatment as export formats (left). Generated screenplay (right).

4.2 Story enhancing Features

In the refinement stage, three AI features are implemented to assist writers in enhancing their stories:

4.2.1 Integrating Creative Inputs into New Story Beats. When a writer introduces a new story beat, an input field promptly appears between existing beats, triggering an AI request for creative inputs displayed in a text box (see figure 3). These inputs encompass various forms, such as specific story ideas, concise quotes, evocative words, uncommon emotions, atmospheric moods, and inventive ideas. They aim to inspire the writer's creativity without overshadowing or confining their original concept. Users cannot directly select or insert these suggestions into the text box, a deliberate decision fostering the expression of resonating ideas in the writer's own words. This process may introduce subtle changes, enriching the narrative's uniqueness over time. It also encourages active engagement, steering away from complete reliance on AI-generated story beats. This design principle safeguards the writer's ultimate control over the narrative, preventing undue authorship by the AI. The system presents three creative inputs at a time, striking a balance between manageability and diversity, ensuring a continuous stream of inspiration. Users can regenerate suggestions at will by deleting an empty story beat and clicking the "plus" button.

4.2.2 Analysis of Questions and Answers of Story Beats. According to [23], a successful story beat typically resolves a question while introducing a new one. This pattern of raised and resolved questions is essential for evaluating story tension. If successive scenes fail to raise questions, audience interest may diminish. Conversely, unresolved questions may lead to dissatisfaction. To assist screenwriters, the AI provides visualizations of questions and answers between beats. By clicking the question mark icon, the AI analyses beats, identifies questions, and highlights answers (see figure 5, left). Unanswered or poorly answered questions are not linked (see figure 5, left). Generated questions can inspire creativity, particularly unanswered ones. Writers can choose to answer or leave them open-ended. This analysis can identify gaps in tension, sparking ideas for a more engaging story. Visualizing questions and resolutions allows writers to experiment with pacing and narrative flow.

Figure 5: Refinement Phase: Introducing story enhancing features: "Analysis of Questions and Answers of Story Beats"-feature (left) and "Emotion Enhancement"-feature (right).

4.2.3 Emotion Enhancement. At this stage, the AI also evaluates and provides feedback on each story beat's emotional content. Activating this feature by clicking the speech bubble icon with a star in the story beat toolbar triggers an AI analysis of dominant emotions in the beat. The analysis extends to secondary and tertiary emotions, enriching understanding. For example, a beat about a person fleeing may reveal fear as dominant, with secondary emotions like anger also significant. This analysis uncovers emotional subtleties crucial for character development and audience engagement, offering suggestions to enhance identified emotions or highlight other aspects. These creative prompts can inspire modifications to enhance emotional resonance, especially for specific story beats (see Section 4.2, right).

4.3 Implementation

The software's development involved programming primarily in Swift and SwiftUI. In addition to the front-end development, our software also features an AI-powered backend. This component is implemented with the help of the OpenAI API, with a particular emphasis on leveraging GPT-4, which serves as a Large Language Model (LLM) engine. The decision to utilize this service stemmed from the recognition that crafting and training a model of our own — to a level that it could generate natural-sounding language — would be an immense undertaking. Therefore, an assessment led

to the selection of GPT-4. The criteria for this choice hinged on the model's ability to fulfill the specific requirements outlined in this paper. Although the functions for generating story beats and formulating a script still worked well with GPT-3.5-Turbo, it became evident from the story enhancing features (see section 4.2) that GPT-4 is better suited for these use cases due to its larger context window and extended knowledge base.

To make the OpenAI backend accessible in our application, we developed a custom wrapper that incorporated significant portions from the open-source package "OpenAI by MacPaw", published as open source on GitHub[2]. This package was adapted to our specific requirements to accommodate requests from all AI modules of our software because they would be sending similar requests over time.

System Message The system message instructs the AI on its roles and defines expectations. It effectively conveys how the user wants the text to transform and how we want the AI to handle the session as it creates the story. This and the subsequent prompts were crafted over multiple iterations to fully use the AI's capabilities and achieve the desired output. In line with OpenAI best practices, the prompts are specific about the desired output and provide clear instructions regarding the expected result.

User Message While the system message usually represents the instructions for how the AI should act and behave, the user message contains the text specific to this story.

Functions Along with the user and system messages, we also send an API function definition to advise how our expected results should appear. This AI module, in particular, has a compact and straightforward structure and is beneficial for understanding the basic functionality.

Preliminary Evaluation During the development stage, this feature incorporates wild and unconnected ideas, creating coherent and chronological stories. For example, for contradictory ideas, the AI found ways to combine these ideas effectively. If the brainstorming lacked depth and attention to detail, the output story became more generic and described an abstract story structure. However, it is not necessarily a drawback since it allows and prompts users to fill in the missing details. The AI's ability to transform even the most chaotic brainstorming session into a structured narrative with a consistent plot can help screenwriters overcome common challenges, like writer's block or ordering many ideas into a useful and smooth structure. Therefore, this feature could become an invaluable tool that can aid in developing, refining, and completing a screenplay.

5 USER STUDY

5.1 Demographic

The recruitment of participants for this study was strategically conducted from both the private sector and academic environments, notably including the University. All participants were aged between 18 and 39 and possessed a foundational academic education. To facilitate inclusivity and eliminate potential language barriers, the study was executed bilingually, in both German and English languages. Furthermore, an assurance was given to all study participants that the dissemination of the study's findings would strictly

[2]https://github.com/MacPaw/OpenAI

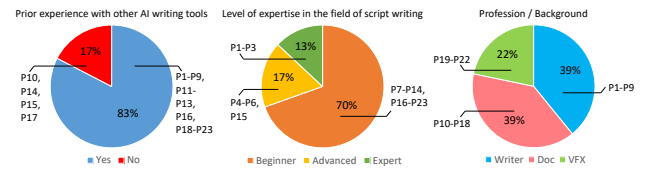maintain their anonymity. A total of 23 individuals (referred to

Figure 6: Participants' experience and background prior to engaging with the wr-AI-ter App: familiarity with other AI writing tools (left), expertise in script writing (middle), and professional background of screenwriting (Writer), documentary filmmaking (Doc), and VFX artistry (right).

as P1-P23) participated in the study. Among these, 13% identified themselves as experts possessing extensive experience in screenwriting, while 17% were either advanced students or individuals with moderate screenwriting experience. The majority, constituting 70%, were categorized as beginners, having minimal or no prior experience in screenwriting, as depicted in figure 6.

Participants were selected from three distinct domains to encompass a broad spectrum of expertise: screenwriting (P1-P9), documentary filmmaking (P10-P18), and VFX artistry (P19-P23). This diverse recruitment strategy was instrumental in evaluating the software's applicability across various disciplines within the filmmaking and screenwriting industry.

17% of the participants reported no previous experience with AI writing tools, whereas a substantial 83% had prior experience utilizing such technologies. This distribution underscores the software's dual objective: to serve as an introductory tool for novices aspiring for formal education in filmmaking and screenwriting and to offer advanced features for seasoned practitioners seeking to enhance their existing workflows. Notably, all individuals lacking prior experience with AI tools were engaged in documentary filmmaking (P10, P14, P15, P17), highlighting a specific area of potential growth and adaptation for AI-assisted creative writing tools.

5.2 Methodology

To ensure optimal comparability with the Dramatron framework, our methodology adapted the same questions highlighted in [25, 35], employing 5-point Likert-type scales.

This approach was selected to enable a direct comparison with previous studies, providing a strong basis for evaluating our enhancements aimed at promoting a greater sense of ownership among users. Our investigation focused on three key areas: the inherent quality of the script as demonstrated by a sense of **pride** in its creation, the individual sense of **ownership** over the script, and the **ease** of use and usability. This three-part focus highlights our dedication to enhancing not only the technical capabilities of our application but also the user's creative experience and satisfaction, with a primary emphasis on ownership.

Following an engagement period of approximately 30 minutes, during which participants were tasked with composing at least one screenplay, a study was conducted. In this study, participants

conveyed their levels of agreement with a series of statements on 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree), addressing the following questions:

Q1. I feel I have ownership over the created script(s)
Q2. I'm proud of the final outputs
Q3. I found it easy to write with the AI system
Q4. I was able to express my creative goals while writing with the AI system
Q5. I found the AI system helpful
Q6. I felt like I was collaborating with the AI system
Q7. The script(s) written with the AI system feel unique
Q8. I enjoyed writing with the AI system
Q9. I was surprised by the responses from the AI system

Furthermore, participants were invited to share their experiences in a few-word response, focusing on their interactions with the AI tool during the screenplay writing process. This qualitative feedback, coupled with the quantitative data from the Likert scale questions, provides a comprehensive understanding of the users' perceptions and experiences, thereby offering valuable insights into the effectiveness of our application in enhancing the screenwriting process through AI collaboration.

6 RESULTS

This section outlines the observed strengths and weaknesses of our wr-AI-ter App with quantitative and qualitative data from free-form questions.

6.1 Quantitative Study Results

The data presented (see figure 9, top) summarizes participants' responses to the quantitative evaluation, employing 5-point Likert scales. These scales were used to quantitatively evaluate the aspects of ownership, pride in the results, and ease of use for questions Q1-Q3 from participants P1-P23. Additionally, responses to questions 4-9 from participants P10-P23 were also assessed. The presentation of agreement and disagreement is based on [25].

6.1.1 Ownership (Q1). A significant proportion, 57%, of respondents acknowledged a sense of ownership (see figure 7) over the written script (43% agreed and 13% strongly agreed). Notably, VFX artists demonstrated the highest agreement rate at 80%, followed closely by screenwriters at 78% (44% agreed and 33% strongly agreed). Conversely, a substantial majority of documentary filmmakers, 78%, reported a lack of ownership (67% disagreed and 11% strongly disagreed).

6.1.2 Proud (Q2). A modest 39% of participants conveyed pride in the final outputs (26% agreed and 13% strongly agreed). VFX artists again showed the most significant approval at 80% (60% agreed and 20% strongly agreed) with the question. Among documentary filmmakers, 44% felt pride (33% agreed and 11% strongly agreed), in contrast to the group of scriptwriters where 33% disagreed, albeit without any instances of strong disagreement (see figure 8, bottom).

6.1.3 Ease (Q3). About 48% of participants affirmed the ease of using the wr-AI-ter application for writing (39% agreed and 9% strongly agreed). A higher acceptance was observed among VFX

I feel I have ownership over the created script(s) (ours)

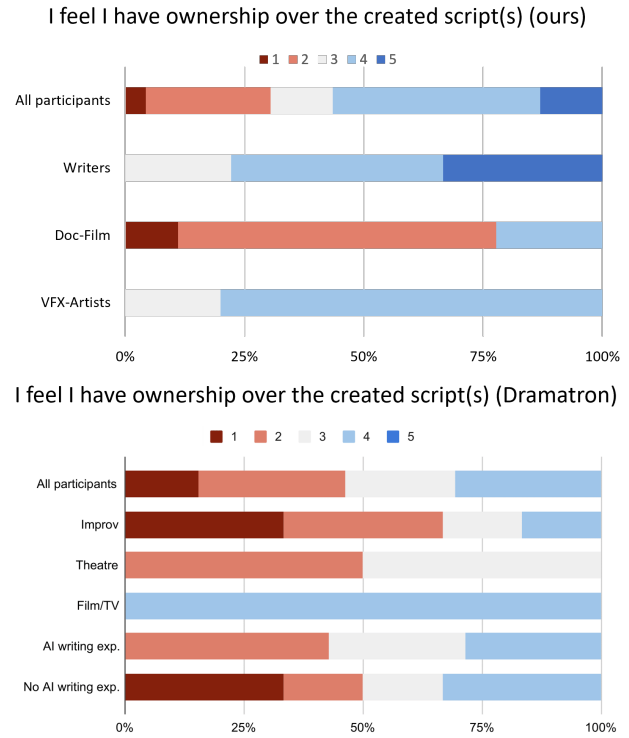I feel I have ownership over the created script(s) (Dramatron)

Figure 7: Quantitative evaluation of ownership overall participants' responses on wr-AI-ter App (top) and of Dramatron [25] (bottom) on a Likert scale from 1 (strongly disagree) to 5 (strongly agree).

artists, at 60% (40% agreed and 20% strongly agreed), and screenwriters, at about 56% (33% agreed and 22% strongly agreed). Documentary filmmakers, however, showed minimal agreement at only 11%, with 44% expressing disagreement with Q3. It is notable that none of the respondents strongly disagreed with the ease of use (see figure 8, top).

6.1.4 Expression (Q4). Only 21% of all participants concurred on the aspect of expression (14% agreed and 7% strongly agreed), while 29% were in disagreement, and notably, no participants expressed strong disagreement. A considerable 50% remained neutral, undecided on whether they agreed or disagreed with Q4 regarding expression.

6.1.5 Helpfulness (Q5). A substantial 71% of the participants endorsed the tool's utility (28% agreed and 43% strongly agreed). In contrast, a minor 14% disagreed with the tool's helpfulness, highlighting its perceived efficacy among the majority.

6.1.6 Collaboration (Q6). In terms of collaboration, 43% of participants recognized its value (14% agreed and 29% strongly agreed). Only a small fraction, 14%, expressed disagreement, underscoring a positive reception towards collaborative aspects facilitated by the tool.

I found it easy to write with the AI system

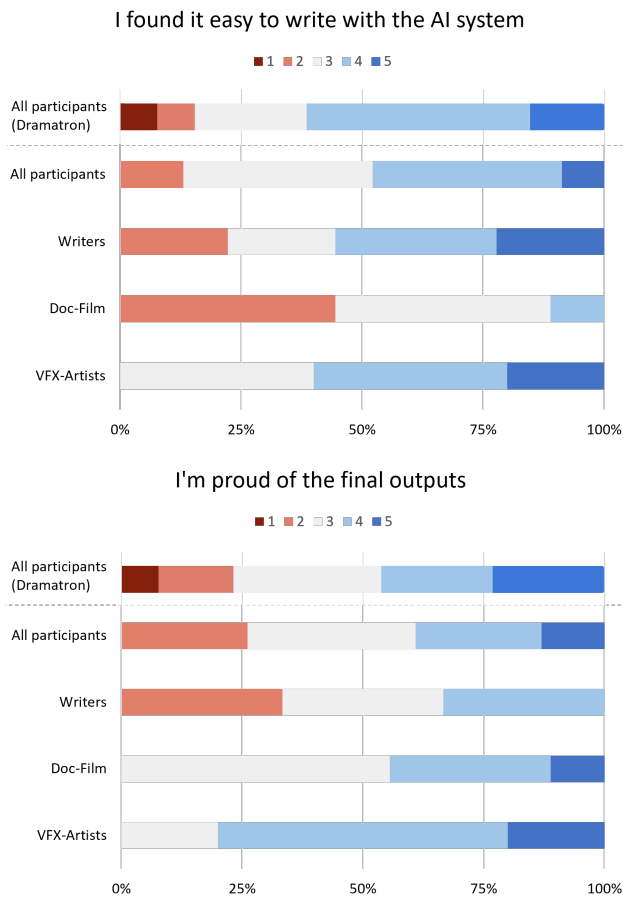## I'm proud of the final outputs

Figure 8: Participants' responses to the questions Q3: Ease (top) and Q2: Pride (bottom) on Likert scales from 1 (strongly disagree) to 5 (strongly agree). First rows in both bar charts show Dramatrons results while the rest of the charts show our results.

6.1.7 Uniqueness (Q7). Merely 14% of respondents agreed that the results produced by the application were unique. A significant portion, 50%, remained ambivalent, neither agreeing nor disagreeing with Q7 about the uniqueness of the outcomes. Meanwhile, 35% of participants did not find the results unique (21% disagreed and 14% strongly disagreed).

6.1.8 Enjoyment (Q8). An overwhelming 71% of users enjoyed their interaction with the tool (42% agreed and 28% strongly agreed) with the sentiment of enjoyment. However, there was a small contingent of 14% who did not agree and didn't share a positive experience. No participant strongly disagreed with Q8.

6.1.9 Surprise (Q9). Only 35% of the study participants were surprised by the outcomes generated by the tool (21% agreed and 14% strongly agreed). Meanwhile, a dissenting 21% did not find the results surprising (14% disagreed and 7% strongly disagreed), reflecting a diversity of reactions to the tool's capabilities.

6.2 Free-form Answers

74% of respondents offered concise, open-ended responses. Reviewing the input received reveals a set of common trends and motifs across the responses of participants.

- Positive reception of impulses and ideas: Many participants (P1-P9) mentioned the app's ability to generate impulses or ideas as a positive feature, indicating that it served as a source of inspiration or a prompt for further development.
- Tool for brainstorming and plotting: Multiple users (P12, P20) saw the app primarily as a useful tool for brainstorming and plotting, suggesting that it's effective for generating ideas and story elements quickly or to "check if ideas make sense or fit in a system" [P12]. Though it was not as useful for finalizing scripts.
- Desire for greater AI responsiveness and depth: There was a recurring desire for the AI to be more responsive to user input and to allow deeper exploration of ideas (P2, P3, P5). Users wanted the AI to not just provide obvious answers but to engage more creatively and substantively with their inputs.
- Usability and interface: Some users (P6, P7) commented on the intuitive nature of the AI's integration and guided software experience, but also noted that the interface could be improved for better user experience, especially for beginners who are not sure about where to start.
- Character development: A participant (P8) mentioned the need for better character development, indicating a desire for more sophisticated features that can handle complex elements of storytelling.
- Generic output: There was a critique about the generic and predictable nature of the stories (P19), which suggests a need for the app to produce more varied and less formulaic content.
- Scriptwriting integration: Several participants (P1, P9) wished for the app to have better capabilities within the final scriptwriting process, not just the initial plotting or idea generation stages.
- Need for human editing: There was an acknowledgment (P23) that while the app helps to create content, human intervention is still necessary to refine and finalize the scripts.

Overall, while users appreciated the app's ability to provide creative inspiration and its ease of use, they also highlighted areas for improvement, such as deeper AI interaction, more complex character development tools, and improvements for better user interface.

7 DISCUSSION

7.1 Insights from the Quantitative Answers and Comparison to Dramatron

After realizing that more than half of Dramatron's respondents did not feel **ownership** of the scripts generated by the AI, this was the core intention for the development of our wr-AI-ter app. Our results showed a higher sense of ownership (57%) for the results generated by wr-AI-ter, reflecting our intention to enhance this important feeling through the design of the app. One interpretation was that Dramatron is not seen as a professional scriptwriting tool,

but rather as a learning tool to practice writing or as a resource [25]. This is in direct contrast to our tool, which was developed with the intention of at least not being in conflict with being a learning tool. Nevertheless, 57% of participants agreed that they considered the written script to be their own. Interestingly, the majority (80%) of VFX artists agreed (none disagreed). Similar results were found for the screenwriters (78% agreed, none disagreed). Documentary filmmakers, on the other hand, disagreed with a clear majority of 78%, 22% agreed. One plausible explanation for the lower scores among documentary filmmakers could be attributed to the stringent research requirements inherent in their profession prior to filming. In scriptwriting, the concepts of ownership and authorship are closely related, and the legal aspects surrounding these issues are currently unresolved. A heightened awareness of these complexities within the documentary filmmaking community may influence perceptions of ownership.
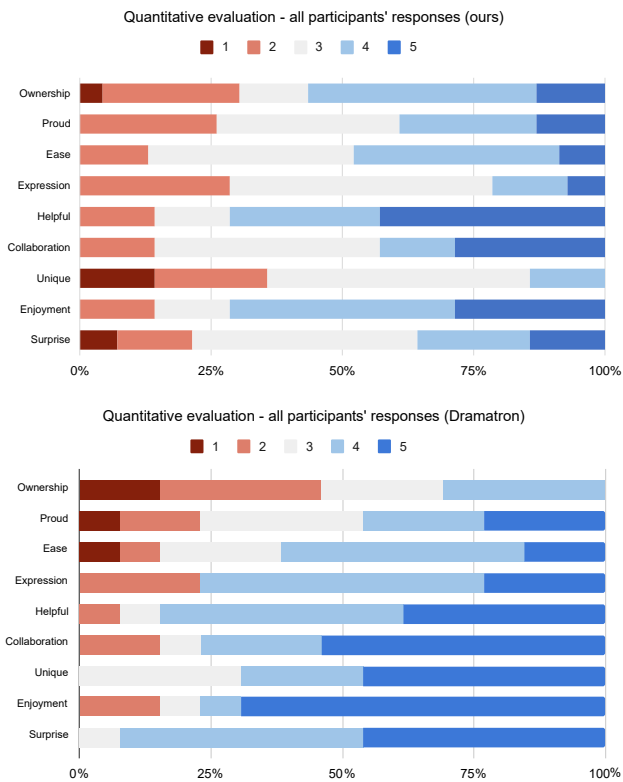

Figure 9: Quantitative evaluation of the wr-AI-ter App (top) and Dramatron [25] (bottom) on Likert scales from 1 (strongly disagree) to 5 (strongly agree).

However, **pride** of outcome was lower for wr-AI-ter (46%) compared to Dramatron. VFX-Artists had the highest agreement beeing proud of the final outputs (60%), while Documentary filmmakers agreed only to 11%. This could be due to the greater focus on the technical aspects of VFX artists. However, in comparison to Dramatron, participants did not express a strong disagreement towards

being proud of the final result while using our tool (see figure 9).

Ease of use was a split opinion for Dramatron (61% agreement), while wr-AI-ter experienced a lower agreement (48%). This could indicate that the user interface and interaction design of wr-AI-ter need to be refined and further errors in the first prototype need to be corrected.

Expression is pivotal in creative processes. In our study, half of the participants neither agreed nor disagreed. The rest were distributed on both sides. Dramatron's capacity for expressing creative goals was affirmed by 77% of its users, a contrast to the 21% in our study. GPT-4 is designed to produce results that tend toward safer, more conventional ideas. However, this could also lead to users feeling less able to express their creative goals in some cases.

Both tools were seen as **helpful**, with Dramatron receiving an 84% approval rating in this regard, compared to wr-AI-ter's substantial 71%. This demonstrates the value users find in AI as a tool for aiding the creative process.

However, the sense of **collaboration** with the AI system was more pronounced in Dramatron's evaluation (77% agreement) compared to our findings (43% agreement), highlighting a potential area for wr-AI-ter to enhance its interactive features to foster a stronger sense of partnership between the user and the AI.

The perception of **uniqueness** presents a significant divergence, with Dramatron's outputs being considered unique by 69% of participants, in contrast to wr-AI-ter's 14%. In the free-form response, P19 explicitly complained about the generic and predictable nature of the stories (P19). This indicates a potential area for wr-AI-ter to improve, perhaps by integrating other models then GPT-4 capable of generating more varied and distinctive content. However, it also shows that, as with expression, the reason for a lower value can also be found in the choice of LLMs themselves.

The **enjoyment** levels (71% for wr-AI-ter) remain high, albeit slightly lower than Dramatron's 77%, indicating that both tools successfully create engaging and enjoyable experiences for their users. The differences in enjoyment could be attributed to the lower value of user-friendliness. The impairment caused by bugs can dampen the pleasure of trying out the tool.

The difference in the element of **surprise** between wr-AI-ter and Dramatron (35% vs. 92%) suggests that while Dramatron's outputs were more unexpected, wr-AI-ter may need to explore ways to enhance the novelty and unpredictability of its outputs. The diminished sense of surprise could suggest that wr-AI-ter's outputs are somewhat predictable or less innovative than expected. A possible other interpretation could be that the results were not surprising to most participants, likely due to their prior experience with LLMs. Especially since the launch of ChatGPT, a large number of people have come into contact with text generation and the effect of the surprise is therefore much smaller. Therefore, Q9 is no longer comparable with the answers of the participants in the Dramatron survey, as LLMs were even less well known at that time. In addition,

the surprise decreases the more the users themselves are responsible for the result. Accordingly, a lower value in surprise could be due to the higher value in ownership. Despite this, the level of enjoyment remains comparably high, indicating that the user experience is largely positive, even if the outputs are less surprising.

To **summarize**, the study of our wr-AI-ter app provides a nuanced understanding of user satisfaction in different aspects compared to the results of the Dramatron evaluation. Notably, Dramatron's evaluation highlighted strong positive responses in aspects of surprise and perceived uniqueness of AI-generated scripts. This contrasts with our findings, where only 35% of participants were surprised by the outcomes and a mere 14% agreed that the results were unique. On the other hand, when compared to Dramatron, our app increased the perception of ownership.

Moreover, the varied responses across different user groups (VFX artists, screenwriters, documentary filmmakers) underscore the importance of tailoring AI tools to meet the specific needs and expectations of different creative domains. For instance, the high rate of ownership and pride among VFX artists suggests that wr-AI-ter may be particularly adept at meeting the needs of users in visual effects fields, whereas documentary filmmakers' lower scores on these dimensions indicate a gap in meeting their specific requirements.

7.2 Insights from free-form Answers

The qualitative feedback provided by participants through free-form answers offers invaluable perspectives on the wr-AI-ter App's functionality, usability, and its role in the creative process. Several key themes emerged from these responses, each shedding light on different facets of user interaction and satisfaction with the tool.

7.2.1 Creative Inspiration and Impulses. A significant number of participants highlighted the app's ability to generate creative impulses and ideas, serving as a source of inspiration. This positive reception underscores the tool's potential as a catalyst for creativity, suggesting that its value extends beyond mere content generation to include sparking new thoughts and facilitating the creative brainstorming process. Enhancing the app's capability to offer diverse and thought-provoking prompts could further leverage this strength.

7.2.2 Desire for Deeper AI Interaction. Users expressed a desire for more responsive AI interactions that allow for a deeper exploration of ideas. This feedback points to a potential area for improvement in making the AI's responses more nuanced and tailored to individual inputs. By improving the app to allow deeper interactions with the AI, perhaps more unique stories could be created and the sense of collaboration could be increased.

7.2.3 Usability and User Interface. Comments on the app's usability and interface suggest that while the integration of AI is intuitive, there is room for enhancement, especially for beginners. Disagreement on ease of use could also come from bugs within the prototype. Simplifying the user interface and providing clearer guidance on starting and navigating the creative process while ensuring the tool is bug-free, can make the tool more accessible and reduce barriers

to entry for all users, regardless of their technical proficiency. Although there were no comments from the documentary filmmaker group in this regard, it can be noted that this group had the highest rejection of the question regarding simplicity. It is therefore reasonable to assume that this group would be the most likely to benefit from improvements to the user interface and that the Ease of Use question would improve as a result.

7.2.4 Character Development and Storytelling Tools. The need for improved character development tools was specifically mentioned, indicating a demand for features that support more complex elements of storytelling. This is a feature that Dramatron offers and should be considered for integration into the wr-AI-ter app. Incorporating advanced functionalities that aid in crafting detailed characters and intricate narratives could significantly enhance the app's appeal to writers focused on developing rich, engaging stories.

7.2.5 Tool for Brainstorming and Plotting. The app is perceived as a valuable tool for brainstorming and plotting, helping users to quickly generate ideas and assess their viability within a story's framework. This perception reinforces the app's role in the early stages of creative work, suggesting that further emphasis on supporting the initial conceptual phases could be beneficial.

7.2.6 Concerns over Generic Outputs. Feedback about the generic and predictable nature of some outputs highlights a challenge in content diversity and originality. Addressing this issue by integrating perhaps more advanced prompts for GPT-4, capable of producing varied and unique content, could increase user satisfaction and the perceived value of the application's contributions to the creative process.

7.2.7 Integration with Scriptwriting Processes. Participants expressed a wish for better integration of wr-AI-ters features within the last step of script generation. Users desire more control over the generation of their ideas. Expanding the tool's functionalities to encompass more aspects of scriptwriting could transform it into a more comprehensive aid for writers.

7.3 Ownership and the Role of Co-Writing

Participants emphasized the importance of the writer's contribution in revising and completing the script. This suggests that the application should continue to enhance, rather than replace, the creative skills of its users. Our study shows that targeted UI design and interactive features can significantly improve writers' sense of ownership, even when AI plays a major role in content creation. This finding is in contrast to Dramatron, where participants reported lower feelings of ownership despite its advanced AI capabilities [25]. Additionally, our results compare favorably to those from Dramatron but are slightly less positive when compared to Wordcraft. The Wordcraft project showed that users can experience a strong sense of ownership when creating short stories [35]. This could mean that the format and scope of creative tasks can influence the user's experience with AI tools.

8 LIMITATIONS AND FUTURE WORK

The development of wr-AI-ter focused on maintaining author ownership. To improve expression and surprise, a balance must be found

between the author's ideas and the AI's advice. The participants in our study came from diverse areas with varying requirements for the screenwriting process. The study's results indicate that AI tools can support screenplay development with maintaining the feeling of ownership for some professional groups. An exception were the documentary filmmakers, who attach great importance to factual fidelity, which was not the focus of this paper. These differences influenced the results of our study, but also showed us the need to take more care for these aspects in the future. User feedback on the wr-AI-ter app highlights its capacity to support and enrich the creative process. At the same time, possible enhancements are identified in terms of responsiveness, user-friendliness, uniqueness, and support for script-writing.

Future improvements should focus on refining the user interface by adding more features, such as character development capabilities within the interface (a feature already included in Dramatron). One limitation worth noting is the AI's responsiveness, which is dependent on GPT's response time through the OpenAI API. Ensuring smooth functionality and addressing bugs remains a top priority. Another area for improvement is the element of surprise. While it is true that users are already familiar with AI-generated content and are therefore less surprised by default, there is also an opportunity to increase the novelty of the generated content by carefully improving the prompts provided to GPT-4. Furthermore, GPT-4 tends to produce output that gravitates towards safer, more conventional ideas. Exploring alternative models for generating more original concepts could prove fruitful. Nevertheless, GPT-4's robust capabilities in formulating story beats, crafting dialogue, and enriching narratives position it as a valuable asset in the refinement process.

9 CONCLUSION

This paper explored integrating AI into scriptwriting to enhance screenplay quality without losing artistic ownership. The developed AI tool wr-AI-ter aids writers from the initial concept to a first draft, which can be further improved using the tool or imported into traditional writing tools. Our tool offers creative co-writing and emotional analysis to make storytelling more interactive. We designed the tool by interviewing experienced screenwriters and identified four key stages: Ideation, Structure, Refinement, and Export. Additionally, we incorporated several AI features for story enhancements. This allows the integration of creative input, analysis of questions and answers in the story, and feedback on the emotional content of each part of the story. In addition, the integration into standard screenplay formats enables further editing in common screenwriting tools. User feedback highlighted the tool's potential but also suggested areas for improvement. Future efforts will aim to refine the tool, making it more versatile and user-friendly, supporting screenwriters in realizing their visions. Taken together, our findings indicate that AI tools can support screenplay development while maintaining the feeling of ownership. The results of our study implicate that users appreciate the app's ability to provide creative inspiration and its ease of use. The tool promotes the creative skills of its users but does not replace them.

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