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# The economics of AI in cinema: financial performance of AI-themed films and the rise of artificial intelligence film festivals

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**Introduction:** The recent adoption of artificial intelligence (AI) in the film industry has changed production processes, narrative styles, and the audience interaction. The use of AI, automated editing, computer-generated imagery (CGI), and scriptwriting is redefining both the creative power of cinema and the economic forces. It is important to distinguish between the following two classes of AI films examined in this study: (1) AI-themed films produced using traditional film-making techniques, which portray artificial intelligence as a narrative subject, and (2) AI-themed films produced with AI technologies, in which AI tools are employed in the production process itself. This study analyzes the financial results of AI-themed movies and the emergence of Artificial Intelligence Film Festivals (AIFFs) from the lens of Media Convergence Theory.

**Methods:** This study employs a quantitative approach to assess the financial aspects of 32 AI-themed movies chosen from Hollywood and Asian cinemas. It investigates production costs, box-office sales, and prizes awarded, using descriptive and correlation analyses as its main statistical techniques. Moreover, the research examines the financial characteristics of 16 selected Artificial Intelligence Film Festivals, including geographical areas, time periods, production costs, return on investment (ROI), and revenue stream distribution. Financial data were cross-verified across multiple databases to ensure reliability. The study also forecasts the economic influence of AI on the film industry for the coming decade.

**Results:** The study assesses the cost of production, film income, and awards of 32 films with the theme of AI, 1927–2023, revealing high correlations between costs of production and financial outcomes ( $r = 0.822$ ,  $p < 0.001$ ) and weak correlations between awards and costs of production ( $r = 0.211$ ,  $p = 0.246$ ) and awards and revenue ( $r = 0.313$ ,  $p = 0.082$ ), showing the complexity of the success of a film. Also, the research investigates 16 AIFFs and identifies key financial trends, such as a production budget of US\$15,000–35,000 and a 20% annual ROI, driven by ticket sales, sponsorships, and branding. The results demonstrate that AI integration increases cost-efficiency, streamlines workflows, and boosts audience attendance, transforming the economic sustainability of film production. Applying Media Convergence Theory, the study analyzes how technological, cultural, and economic convergence influences filmmaking. AI-driven automation bridges traditional and digital production, AIFFs create hybrid storytelling platforms, and new business models emerge through AI integration.

**Discussion:** This study is limited by its reliance on publicly available financial data, web-scraping, and industry blogs, which restrict access to comprehensive reports from major studios and AI-film festivals, along with a small sample size

of 32 AI-themed films and 16 AI-film festivals. Future research should explore AI-driven streaming models, predictive financial planning using machine learning, and the ethical and legal frameworks necessary for AI's expanding role in cinema.

#### KEYWORDS

media convergence, AI filmmaking, media economics, Hollywood, audience engagement, artificial intelligence film festival (AIFF)

## 1 Introduction

The rapidly rising landscape of artificial intelligence (AI)-themed cinematic films through technological advancements in technical aspects of different production processes, a variety of AI characteristic representations, discussing topics of future ethical dilemmas, visual narratives, and captivating new dimensions of storytelling techniques impacted the economic dynamics and financial success of cinema production and filmmaking through the integration of AI innovations to reduce the costs of production, predicting analysis models for the expected return on investment (ROI), workflow and time efficiency, and financial planning. Nisanoğlu (2021) explores in his thesis the representation of artificial intelligence in science fiction films, relationships with humans, and its societal and cultural impact through analysis of specific movies such as *Blade Runner* (2001) and *Ex Machina* (2014), where the findings demonstrate two different perspectives of AI integration, such as the potential collaboration of robots (cyborgs) to be workers, protection, and other functional roles as controlled by creators. In contrast, it raises common ethical considerations such as the dominance of AI power dynamics, loss of control, and self-independence. The research study examines AI application in film production, focusing on the relationships among technical parameters, visual effects (VFX), computer-generated imagery (CGI), audience interaction, and the economics of preproduction, production, and postproduction processes, with a focus on improved workflow, time optimization, and cost.

Before proceeding, it is essential to clarify the scope and conceptual framing of this study. The intersection of artificial intelligence and cinema encompasses two distinct dimensions: (1) the thematic representation of AI in film narratives and (2) the technological employment of AI in the filmmaking production process. While these dimensions can theoretically produce multiple combinations, this study focuses specifically on two classes of films that share AI as a central narrative theme but differ in their production methods:

**Class 1—AI-themed films produced without AI technologies:** The first part of this study (Section 3.1) evaluates 32 AI-themed films from Hollywood and Asian cinema spanning 1927 to 2023. The majority of these films—particularly earlier productions such as *Metropolis* (1927), *Blade Runner* (1982), *2001: A Space Odyssey* (1968), and *The Matrix* (1999)—portray artificial intelligence as a narrative subject but were produced using traditional filmmaking techniques without AI-driven tools. These films represent the historical evolution of AI representation in cinema and its economic performance over nearly a century.

**Class 2—AI-themed films produced with AI technologies:** The second part of this study (Section 3.2) examines 16 Artificial Intelligence Film Festivals (AIFFs), whose submission criteria explicitly require filmmakers to integrate AI tools and techniques in their preproduction, production, and postproduction processes. The films

submitted to these festivals are both thematically engaged with AI and technologically produced using AI—for instance, employing AI-driven visual effects, automated editing, generative imagery, and AI-assisted scriptwriting. A notable example is “One More Pumpkin,” which was created entirely using OpenAI’s Sora software.

This distinction is critical for readers to understand the study’s dual focus: Section 3.1 examines the economic performance of AI as a cinematic theme over decades of traditional filmmaking. In contrast, Section 3.2 explores the emerging economic landscape in which AI serves as both the subject and the means of film production. Together, these two classes capture the evolving relationship between AI narratives and AI technologies in cinema, providing a comprehensive view of AI’s economic impact on the film industry from both thematic and production perspectives.

According to Prajapat et al. (2023), there is a major shift in the way artificial intelligence has been portrayed in movies; instead of depicting technological advancement and intelligence, the concept is showing ethical issues, such as the consequences of developing emotional intelligence, decision-making, neural sensors, and their impact on the perceptions of people in movies such as *Metropolis* (1927), *Blade Runner* (1982), and *Ex Machina* (2014). They analyze the impact of perceived storytelling techniques and cinematic visual narratives on audience engagement, a critical determinant of a film’s financial success, including box-office revenue, awards, and profits. Yu and Zhang (2023) examines AI-themed films through the lens of Zen Buddhism, where movies such as *Blade Runner* (1982), *The Ghost in the Shell* (1995), *Matrix* (1999), and *Ex Machina* (2014) reflected society and culture through new dimensions of entertainment and visual narratives of AI portrayals, classifying the reflections into three categories: the early representation of nature and environments, the authenticity of reality, and the independence of cyborgs in decision-making without the creator’s control, demonstrating the crucial need for future research to expand the scope of AI representation to explore more about technological advances in production, audience behavior, and return on investments.

Throughout history, the economic dynamics of filmmaking production have been a critical factor in the industry through resource optimization, financial planning, marketing strategies, and the channels of distribution impacting the shaping of movie production dramatically, narratively, and experimentally through specific utilization of technological innovations and storytelling techniques where high-budget films access big studios to leverage the most advanced available visual effects, CGI software, and the use of stars and fame of actors to maximize profits and attract a wider audience. In contrast, low-budget films depend on the quality of the represented drama and narratives, as well as on cost-effective production techniques and programs. The ongoing developments of artificial intelligence and digital media emphasize the need to balance the creativity of technical aspects, scripting, resource allocation, planning, business modeling, predictive techniques, and the rising streaming platforms to achieve critical

recognition, compete for awards and prizes, enhance audience engagement, and achieve high box-office revenues and return on investment.

[Jeacle \(2009\)](#) conducts an economic evaluation of Edinburgh Theater's box-office between 1929 and 1973 to examine the relationship between social, cultural, and financial factors, audience attendance, ticket sales, and weather on the cinema as an economic firm and business entity. This provides valuable insights into exploring the dynamics of AI-themed films. [Bagella and Becchetti \(1999\)](#) employs an experimental investigation on Italian movies between 1985 and 1996 through their box-office numerical evaluation, where the findings demonstrated that factors such as the fame of actors, cast, producers, and the level of comedy impacted the financial success of the selected movies, highlighting the complex and multifaceted dynamics of media and filmmaking economics, same as [McKenzie \(2012\)](#) states in his comprehensive literature review.

[Hababou et al. \(2016\)](#) analyzes 898 films through data envelopment analysis (DEA) to examine the correlations between the film's financial success, audience engagement, production, marketing, box-office data, awards, and nominations, where the findings demonstrated the strong correlation between those factors and emphasized the need for resource optimization to enhance the economic and return on investment for the movies. [Brewer et al. \(2009\)](#) examines the US film industry through the cost of production, box-office revenue, the fame of actors, number of screens, advertising and marketing, and the critiques between 1997 and 2001 through the available data on the cloud of Web 2.0 where the findings also emphasize the strong correlation between the factors highlighting the importance of resource optimization and strategies in the success of films. [Smith and Smith \(1986\)](#) analyzes 600 films produced before 1980 through experimental design to discover the factors that led to their success, where the findings demonstrate the role of awards, stars, cost of rental studios, and year of production as important factors in determining the success of the selected films and emphasize that the understanding of qualitative methods and audience perception can predict the expected success of movies. [Chen \(2023\)](#) states the strong correlation between cost control, film budgeting, and the success of films in balancing innovations, creativity, and the value of visual narratives perceived by the audience, where findings show that low-budget movies could still achieve success and awards same as the movies that Disney and Warner Bros developed through managing the costs, strategic planning, and creativity.

[Simonton \(2009\)](#) demonstrates the complex nature of movie economic success through common factors such as budget, costs, marketing, advertising, audience, critiques, culture, and society. The findings show that even higher-cost production led to higher box-office revenue. Still, it did not guarantee awards and prizes, underscoring the need to balance creativity, value, and profits in the cinema industry. Later, [Simonton et al. \(2012\)](#) employed an empirical analysis of specific films between 1997 and 2001 on a database, assuming the best 250 movies by that time, where the research study's findings confirmed the positive correlation between the cost of production and profits. However, it also demonstrated that sex appeal, violence, expensive enhanced technical aspects, and visual effects do not warrant the film's dramatic value and quality in the eyes of critics and audiences. [Ferrari and Rudd \(2008\)](#) develops a quantitative multi-factor model which can enhance the risk management and financial success of cinema production through refined strategic planning and strategies to improve the return on investments, where the majority of his findings of the empirical investigation of selected films

demonstrated negative numerical values as financial loss, which led to the development of a model offering potential opportunities and possibilities to cost and budgeting management. [Gunter \(2018\)](#) finds that higher cost of production does not correlate with higher profits and box-office revenue through an experimental study where movies such as *Paranormal Activity* and *Blair Witch Project* were low-budget, achieving financial success, emphasizing the complexity of predicting a film's ROI and the crucial need of balancing creativity, budgeting, resources, and strategies in different filmmaking processes.

[Young et al. \(2008\)](#) points out that studios, producers, and filmmakers adjust their investments to movies expected to achieve higher incomes and ROIs. At the same time, complexity and uncertainty predict a film's financial success. [Zhang \(2023\)](#) examines two contrasting movies of their ROI (high and low) such as *Eternals* and *E. T. the Extra-Terrestrial*, through common factors, such as cost of production, studios, technical aspects, advertising, marketing, site, word of mouth, critics, and number of screens, finding that low-budgeting movies through high quality of drama and visual narratives can achieve the same financial success as high-budgeting movies which depends on stars, fame of crew and producer, and expensive CGI techniques.

The integration of AI in filmmaking and cinema production through several enhancements, such as script writing, directing assistance, in-camera visual effects (ICVFX), futuristic environments, real-time lighting settings, editing automation, and CGI through machine learning algorithms, neural networks, and natural language processing; [Parikh \(2019\)](#), [Anantrasirichai and Bull \(2022\)](#), and [Oksanen et al. \(2023\)](#) offer new dimensions that lead to cost production reduction, workflow and time efficiency, personalized strategies for audiences, variety of distribution channels, effective marketing and advertising, and predictive analysis models impacting the economic and financial success of movies. [Dhiman \(2024\)](#) stated that the rapid rise of AI technologies and innovations through different technical aspects of filmmaking and the wide variety of distribution channels over Web 2.0 and Web 3.0 played a transformative role in filmmaking where reduction in cost production, accessible and user-friendly techniques and tools to develop VFX, sound design modulation, and CGI as a new dimension of storytelling techniques, enhanced marketing and advertising strategies, and audience engagement impacting the cultural and economic landscape of cinema same as demonstrated by [Sun \(2024\)](#) where AI integration to cinema production increases ROI and box-office revenue to 20 and 40%.

Artificial intelligence is transforming filmmaking and cinema significantly through several aspects of preproduction, production and postproduction processes, which have heavily impacted the technical creativity of producers, filmmakers, and studios through automated scriptwriting tools, AI-powered video editing, digital pre-visualization, cost-effective CGI and VFX, automated dubbing and subtitling, casting, virtual actors, efficient scene planning, AI-enhanced marketing, automated sound design, and budget optimization, leading to a reduction in the cost of production to 30–40% approximately to the financial managers, box-office analysts, and production accountants, distribution and sales executives, and market research analysts through their management facilities such as automated ticketing, registration, AI-driven marketing campaigns, cost-efficient content curation, resource allocation optimization, virtual and hybrid event integration leading to 20% increase in audience engagement in 2023 and 2024, in Hollywood and Asian cinema where AI dominated 58% of the total of the global AI in cinema production and filmmaking

industry as US\$1.4B in 2024, of which 40% of the revenue is captured in North America (United States and Canada) of almost US\$0.5B through companies, such as Runway ML, NVIDIA, Unity Technologies, OpenAI, Side-FX, Autodesk, Weta Digital, Digital Domain and Cinelytic, with expected growth of 25.7% as a compound annual growth rate (CAGR) to rise up to US\$14.1B by 2033. Ultimately, the rise of fully independent generative AI films through the emergence of the new wave of Artificial Intelligence Film Festivals, such as Runway AI-Film Festival, AI International Film Festival, Reply AI-Film Festival, Expo AI-Film Festival, and Tribeca Festival, where the total market share of generative AI is expected to grow from US\$351.1 M in 2024 up to US\$3.66B within 27.2% CAGR as analyzed by [MarketResearch.biz \(2024\)](#).

[Murschetz et al. \(2020\)](#) stated the new role of AI in the predictive analysis of film success through factors and variables such as costs, actors, marketing, box-office revenues, and awards by employing tools, such as classification and regression trees (CART), gradient boosting, and random forests, offering valuable insights and predictions to the ROI of films before releasing them, first-week box-office performance, potential possibilities for prizes, and resource optimization which significantly helps investors, stakeholders, and producers to better decision-making and risk management to their filmmaking different processes of production, same as [Ghiassi et al. \(2015\)](#) dynamic artificial neural network (DAN2) model for predicting film ROI within a success rate of 94%, leading to the rise of the Artificial Intelligence Film Festivals globally in the last 4 years, such as AIFF by Runway, World AI Cannes Festival (WAICF), Meta Morph AI-Film Awards, Tribeca Film Festival in New York, Artifact AI-Film Festival with MK2 in Paris, Reply AI-Film Festival in Venice, +Rain Film Festival in Barcelona, AI-Film Festival in Amsterdam, Neu Wave AI-Film Festival in Los Angeles, AIFF Montpellier, and Larissa Lumina AIFF in Athens.

## 1.1 Problem of the study

The research study explores two main problems: the lack of quantitative methodological approaches to evaluating the economic performance of AI-themed films in cinema, such as Hollywood and Asian cinema. Second, the shortage of conducted studies academically on the rapid rise of Artificial Intelligence Film Festivals in the last 4 years, allowing researchers to minimize the research gaps, offering valuable insights to filmmakers, film finance managers, investors, production accountants, distribution and sales executives, and market research analysts to the historical and future trends of financial success between the integration of filmmaking processes, AI innovations, and economic dynamics.

## 1.2 Aim of the study

The primary objective of the research study is to quantitatively evaluate the economic performance of 32 selected AI-themed films in Hollywood and Asian cinema over the last 96 years by comparing their production cost, box-office revenues, and achieved awards. Additionally, the study aims to explore the financial dynamics of 16 selected Artificial Intelligence Film Festivals between 2020 and 2024 and to investigate the future predictions of expected growth to the generative AI economic impact on the filmmaking industry in the following 10 years, offering insights into future trends, budget allocations, AI techniques integration in filmmaking aspects, and financial

strategic planning for producers, media businesses, investors, and stakeholders from the economic dynamics perspectives of cinema production.

## 1.3 Theoretical framework

Media Convergence Theory suggests that traditional and digital media are merging due to technological advancements, leading to new forms of storytelling, production methods, and audience interactions. [Jenkins \(2006\)](#) explains that integrating media, technological advances, and different communication channels in the rapidly rising digital landscape leads to technological shift, cultural, and economic convergence, which influences storytelling techniques, visual narratives, business strategies, models, and structures, the adaptation of media companies, and audience engagement across new platforms, streaming services, Web 2.0, and social media. [Latzer \(2013\)](#) contributed the theory to examine in depth its implications for media economics, identifying the technological, economic, political, and sociocultural level of convergence through the rising technological developments in telecommunications and mass media, resulting in hybrid platforms, integrated services, new business models, organizational changes, new media policies, media consumption, and production practices. [Baranova et al. \(2020\)](#) applied the theory to explore the significant changes in media content development and creation, as well as the distribution and commercialization of the content, which leads to the rise of new business models, discussing the opportunities and challenges in the rapidly evolving media landscape, emphasizing that Media Convergence fosters new strategies, enabling media organizations to adapt them to their economic development. The theory is applied to evaluate the merging of traditional and digital filmmaking development and workflow in Hollywood, Asian Cinema, and the new wave of artificial intelligence film festivals, reshaping the ecosystem through audience behavior, distribution channels and strategies, and different production processes.

## 1.4 Research questions

The integration of AI in the filmmaking industry has impacted production processes both narratively and economically, and the study aims to conduct a quantitative economic evaluation of selected movies in Hollywood and Asian cinema to examine the correlations among production costs, box-office revenues, and achieved awards. Additionally, the research aims to explore the evolving landscape of Artificial Intelligence Film Festivals, including regional distribution, growth over time, AI techniques in filmmaking, production economics, resource allocation, statistical patterns, ROI, financial sustainability, revenue stream distribution, and the future predictions for AI filmmaking economics.

RQ1: To what extent do cost production, box-office revenues, and awards correlate in the selected 32 AI-themed films in Hollywood and Asian Cinema?

RQ2: What are the financial dynamics of the selected 16 Artificial Intelligence Film Festivals through production economics, resource allocation, ROI, financial sustainability, and revenue stream distribution?

RQ3: How does Media Convergence influence the technological, cultural, and economic aspects of AI-themed filmmaking,

particularly in production workflows, distribution channels, audience engagement, and emerging industry practices?

## 2 Methodology

### 2.1 Research design

This study employs a quantitative approach to assess the financial aspects of 32 AI-themed movies chosen from Hollywood and Asian cinemas. It investigates production costs, box-office sales, and prizes awarded, using descriptive and correlation analyses as its main statistical techniques. Moreover, the research examines the financial characteristics of 16 selected Artificial Intelligence Film Festivals, including geographical areas, time periods, production costs, return on investment, and revenue stream distribution. The study also forecasts the economic influence of AI on the film industry for the coming decade.

### 2.2 Sampling

The sampling approach adopted for this research study was purposive, selecting 32 films with AI themes and 16 AI Festivals based on the financial data available on Web 2.0, variety of budgets, popularity, geographical location, technological aspects of AI, importance, and relevance of the topic between 1927 and 2024.

### 2.3 Data collection

The data for this research were gathered systematically from publicly available sources, using a diverse range of methods to cover all aspects and to achieve reliable results. Financial and box-office revenues were first retrieved through web-scraping from credible industry databases and market intelligence platforms. Alongside this, the researchers conducted an exhaustive study of film criticism, industry reports, and published analyses to obtain qualitative data from reputed journals, press releases, and academic literature. The evolving role of AI in cinema was better understood by examining festival AI sources, sponsorship records, and market research studies. Data from Internet Movie Database (IMDb, 2024), Mojo (2024), Empire (2024), and TheNumbers (2024) accurately captured the trend of AI in cinema. The use of this multifaceted data collection method made it possible to have a strong and thorough presentation of audience engagement, economic trends, and critical reception, thus creating a complete analysis of AI movies.

#### 2.3.1 Data verification

To ensure the reliability and accuracy of the financial data employed in this study, a multi-step verification process was adopted. First, box-office revenue and production cost figures were cross-referenced across at least two independent databases (IMDb, Box Office Mojo, and TheNumbers) to identify and reconcile discrepancies. Where figures were reported as ranges (e.g., estimated budgets), the midpoint was used in statistical calculations, and the full range was reported in Table 1 for transparency. Second, for the AI-film-festival financial data, the publicly available information on official festival websites was supplemented by press releases and industry reports. Third, all data entries were independently verified by two

members of the research team to minimize transcription errors. While the study acknowledges that reliance on publicly available data represents a limitation, these verification procedures were implemented to maximize data integrity within the constraints of available sources.

### 2.4 Data analysis

The research study's data have been analyzed using descriptive and correlation analysis statistical methods in IBM Statistical Package for Social Sciences (SPSS) Statistics version 30.0.0 software, including graphs and charts that visually represent the findings, including AI-film budget over time, ROI distribution, distribution channel dynamics, budget, and revenue correlation. For the Artificial Intelligence Film Festivals, the collected data for the financial dynamics has been evaluated in graphs and charts through their regional distribution, growth in the number of festivals, AI technological integration in production, production costs by festival tier, ROI, financial sustainability, revenue stream distribution, and the future predictions of the economic impact of AI on filmmaking and cinema production.

#### 2.4.1 Note on cross-decade financial comparisons

The financial figures (production costs and box-office revenues) presented in Table 1, as sourced from the original databases span nearly a century (1927–2023) and are reported in nominal US dollars (US\$). The authors acknowledge that inflation-adjusted figures would provide more precise cross-era comparisons. However, the primary analytical approach of this study relies on ROI ratios (profit as a percentage of production cost) and Pearson correlation coefficients, which use paired values from the same time period for each film, thereby mitigating the distortion that inflation would introduce in raw dollar comparisons. Additionally, the descriptive statistics in Table 2 and the correlation analysis in Table 3 operate on relative measures rather than absolute dollar values across decades. Readers should interpret the raw budget and revenue figures in Table 1 with awareness that earlier films' figures would be substantially higher in inflation-adjusted terms. For reference, US\$1 in 1927 is equivalent to approximately US\$17.50 in 2023 dollars, and US\$1 in 1968 is equivalent to approximately US\$8.80 in 2023 dollars (US Bureau of Labor Statistics, Consumer Price Index [CPI] Inflation Calculator).

## 3 Results and discussion

### 3.1 Quantitative evaluation of economic performance in 32 AI-themed films in Hollywood and Asian cinema

Findings presented in Table 1 illustrate the 32 AI-themed film budgets spanning the evolution of economic production from 1927 to 2023. They showcase low-budget movies from 1927 to 2000 with budgets below US\$20 M, while a notable dramatic increase in high-budget films between 2013 and 2023 to over US\$180 M suggests huge volatility and significant integration of AI narratively and experimentally in cinema production. As shown in Figure 1, the findings demonstrate the quantifiable measures of cost production and box-office

TABLE 1 Evaluation of the economic performance of 32 AI-themed films.

Movie title	Cost production (US\$)	Box-office revenue (US\$)	Profit (US\$)	Awards and nominations
(1) The Creator (2023)	80 M	104 M	24–31 M	Two wins (best visual effects)—Other pending nominations
(2) After Yang (2022)	9–15 M	1.8–2.5 M	–7.2–12.5 M	Cannes Film Festival Un Certain Regard Award and one nomination (Independent Spirit Awards)
(3) Jung-E (2022)	Netflix 20 M estimated	N/A	N/A	N/A
(4) M3gan (2023)	12 M	180.7 M	168.7 M	Two nominations—Saturn Awards nomination and Independent Spirit Awards
(5) Artifice Girl (2023)	2 M estimated	N/A	N/A	Tribeca Film Festival selection
(6) Ex Machina (2014)	15 M	36.9–37.7 M	22.7–25.3 M	Academy Awards—Visual Effects
(7) Her (2013)	23 M	47.4–48.3 M	24.4–25.3 M	Academy Awards—Best Original Screenplay
(8) I, Robot (2004)	120 M	353.1 M	\$233 M	Nominated—Best Visual Effects (Oscar)
(9) AI (2001)	90–100 M	235.9 M	135.9 M	Two Academy Awards nominations
(10) BladeRunner 2049 (2017)	150–185 M	259.2–267.5 M	109.2 M Est.	Academy Awards—Cinematography and Visual Effects
(11) Chappie (2015)	49 M	102.1 M	53.1 M	N/A
(12) Transcendence (2014)	100 M	103 M	3 M estimated	N/A
(13) Wall-E (2008)	180 M	521.3–532.5 M	341.3–352.5 M	Academy Awards—Best Animated Feature
(14) Robot & Frank (2012)	2.5 M	3.3 M	0.8 M	Alfred P. Sloan Prize at Sundance Film Festival
(15) Big Hero 6 (2014)	165 M	657.8 M	492.8 M	Academy Awards—Best Animated Feature
(16) Upgrade (2018)	3 M	16.6–\$17 M	13.6–14 M	Won the South by Southwest (SXSW) Film Festival award—Audience Award and the Best Sci-Fi Film by the Online Film Critics Society
(17) Alita: Battle Angel (2019)	170 M	404.9 M	234.9 M	Won Saturn Awards
(18) Morgan (2016)	8 M	8.8 M	0.8 M	N/A
(19) Metropolis (1927)	5 M estimated	1.2 M estimated	Negative initially	Considered a pioneering Sci-Fi Masterpiece
(20) Short Circuit (1986)	15 M	40.7 M	25.7 M	Nominated for Saturn Awards
(21) Robocop (1987)	13 M	53.4 M	40.4 M	Special Achievement Oscar—Video Editing
(22) Bicentennial Man (1999)	100 M	87.4 M	–12.6 M	Nominated for Oscar—Best Makeup
(23) The Machine (2013)	1–1.5 M	1.76–2.26 M	0.76–1.25 M	Bafta Cymru awards and The Best UK feature at Raindance
(24) Automata (2014)	15 M	5.1–6.1 M	8.9–9.9 M	N/A
(25) UnCanny (2015)	1 M Est.	Limited <0.5 M	N/A	Best feature—Boston Sci-Fi Film Festival
(26) Archive (2020)	3–5 M estimated	Limited <1 M	N/A	Bafta Award Nomination
(27) 2001: A Space Odyssey (1968)	10.5 M	146 M	135.5 M	Academy Award—Best Visual Effects
(28) Demon Seed (2017)	5–9 M	2–6 M	3 M estimated/N/A	N/A
(29) Virtuosity (1995)	30 M	24–37 M estimated	6–7 M estimated	N/A
(30) Matrix (1999)	63 M	466.6 M	403.6 M	Four Academy Awards (Best Film Editing, Best Sound, Best Sound Editing, and Best Visual Effects) and two British Academy of Film and Television Arts (BAFTA) Awards (Best Sound and Best Achievement in Special Visual Effects)
(31) Ghost in the Shell (2017)	110–120 M	169.8 M	59.8–49.8 M	One Hollywood Professional Association award—Outstanding Color Grading; two Empire Awards (nominations for Best VFX, Makeup, and Hair-Styling)
(32) Tau (2018)	3–10 M estimated	6–7 M estimated		Directing Streaming and Netflix

revenues through IMDb (2024), Mojo (2024), Empire (2024), TheNumbers (2024), and web-scraping tools such as ChatGPT (2024), ClaudeAI (2024), and MicrosoftCopilotAI (2024), and primary academic researches on Google Scholar and Web of Science such as Huckvale (2024), Danesi (2024), Bamman et al. (2024), and Singh and Rokde (2024) which facilitate in identifying the top 10 ROI movies as M3GAN (2023), 2001: A Space Odyssey (1968), Matrix (1999), Upgrade (2018), Robocop (1987), Big Hero 6 (2014), I, Robot (2004), Wall-E (2008), Short Circuit (1986), and Ex Machina (2014), ranging between 148 and 1,439% ROI percentage with four movies before the 2000s and six films between 2004 and 2023 showcasing significant high returns at least double the production costs.

The findings illustrate the economic landscape of AI-themed cinema through 32 selected movies between 1927 and 2023, showcasing a significant segmentation in production costs, ranging from micro-budgeting of US\$1 M and US\$3 M to macro-budgeting in the range of US\$150–\$165 M. The highest ROI of 1,405.8% was in the M3GAN (2023) film, where the cost of production was US\$12 M. The box-office revenue was US\$180.7 M, achieving a profit of US\$168.7 M. In comparison, films, such as Big Hero 6 (2014) represent high-budget production of US\$165 M and box-office revenue of US\$657.8 M, achieving an ROI of 298% and profit of US\$492.8 M. In contrast, Transcendence (2014) cost US\$100 M and achieved a profit of US\$3 M with less than 3% ROI despite the investment in filmmaking. The pie chart (Figure 1, lower panel) shows the ROI distribution through five sections: loss, low, medium, high, and very high. The dominance of the medium category is shown in yellow color, ranging from 50 to 200%, followed by green color, representing a low return on investment (0–50%). The loss (negative return) in blue, high (200–500%) in orange color, and very high (over 500%) in purple showcase the smallest proportions.

The notable shift of distribution channel dynamics from radio, theater, museums, and television to Web 2.0, social media, websites, and platforms such as Netflix, Amazon Prime Video, Apple TV+, and Hulu in such movies as Jung-E (2022) and Tau

(2018) and the rise of film festivals where movies such as Robot & Frank (2012), After Yang (2022), and Artifice Girl (2023) play a crucial role in audience engagement, motivation for awards and prizes, and the financial success of movies through box-office revenues across decades. Figure 2 illustrates the evolution of distribution channel dynamics in the selected AI-themed films, showing that audience engagement, award motivation, and financial success levels rose from 20 and 50% through radio, theater, museums, and television from the 1930s to the 2000s, with the rise of Web 2.0, social media, and streaming platforms between the 2000s and present, to almost 85–95%.

Contemporary market dynamics in the last 10 years where movies such as Her (2013), Ex Machina (2014), The Creator (2023), Jung-E (2022), Artifice Girl (2023), and M3GAN (2023) through enhanced studios using artificial intelligence techniques and tools in VFX, CGI, motion graphics, animations, real-time lighting, automation in editing, and sound design modulation, where budgeting was ranging between US\$2 M, 12 M, 15 M, 24 M, and up to 80 M showcase resource optimization, strategic planning, and moderate budgeting for filmmaking production processes.

In Table 2, descriptive statistics show an average production cost of US\$50.28 M million (SD = 60.195), indicating varied budgeting strategies across the selected AI-themed films. The average box-office revenue is US\$127.30 M (SD = 176.039), and the award's mean is 0.75 (SD = 0.440), indicating inconsistent financial performance across films. It is notable that the standard deviation exceeds the mean for both production costs and box-office revenues. This is attributable to the highly right-skewed distribution of film budgets and revenues in the sample, which spans nearly a century (1927–2023) and includes both micro-budgeting independent productions (e.g., UnCanny, estimated at US\$1 M) and major studio blockbusters (e.g., Wall-E, US\$180 M). Such high variability relative to the mean is a well-documented characteristic of film industry financial data (Gunter, 2018; McKenzie, 2012) and reflects the inherently volatile and heterogeneous nature of cinematic investment. The coefficient of variation (CV) for production costs is 119.7% and for box-office revenues is 138.3%, confirming substantial dispersion. This does not invalidate the statistical analysis; rather, it underscores the diverse economic landscape of AI-themed cinema and supports the use of correlation analysis to identify relationships despite this variability.

The findings listed in Table 3 shows a strong positive correlation between cost of production and box-office revenue, where higher-budget films led to higher profits, as Pearson's  $r = 0.822$  and  $p$ -value  $< 0.001$ . There was a weak correlation between awards and the cost of production and box-office revenue, where  $r = 0.211$  and  $0.313$ , respectively, and a

TABLE 2 The economic performance of selected 32 AI-themed films.

Variable	Mean	Standard deviation (SD)
Cost of production (US\$M)	50.28	60.195
Box-office revenues (US\$M)	127.30	176.039
Awards (binary: 0/1)	0.75	0.440

N = 32 for all variables.

TABLE 3 Correlation analysis.

Variable	Statistical measure	Cost of production	Box-office revenues	Awards
Cost of production	Pearson r	1	0.822**	0.211
	Significance (2-tailed)	—	<0.001	0.246
Box-office revenues	Pearson r	0.822**	1	0.313
	Significance (2-tailed)	<0.001	—	0.082
Awards	Pearson r	0.211	0.313	1
	Significance (2-tailed)	0.246	0.082	—

\*\*Correlation is significant at the 0.01 level (2-tailed). N = 32 for all variables.

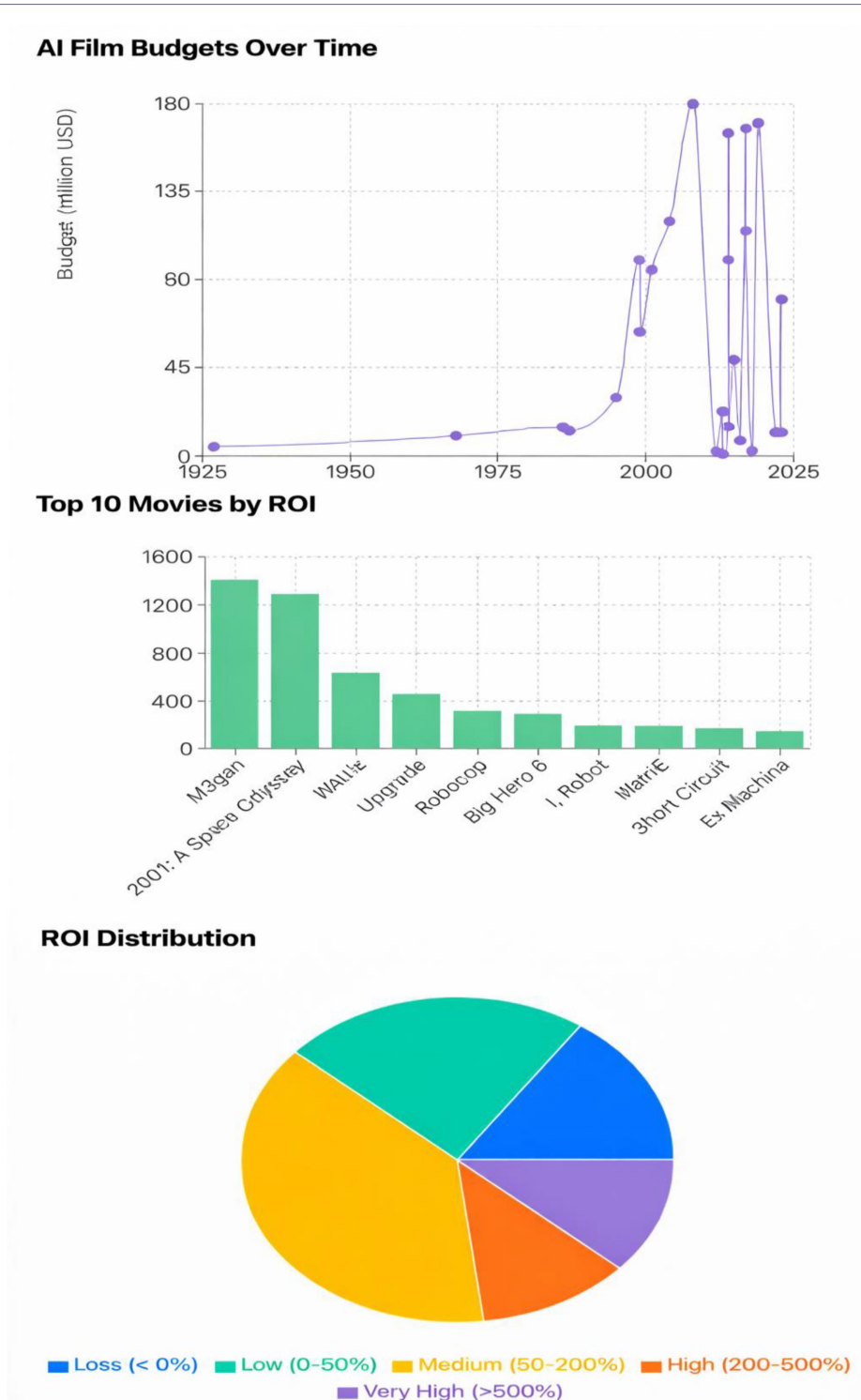


FIGURE 1 Budgets, top ROI, and distribution.

p-value of 0.246 and 0.082 (marginally significant), a showcase of the complexity dynamics nature of critics, quality of drama, and audience engagement of films aligning with the quantitative table findings such as Big Hero 6, M3GAN, and Transcendence films, where significant budgeting achieves higher revenue. At the same time, it does not guarantee award recognition or profits like Transcendence films. Balancing resource optimization, visual narratives, storytelling quality, and budgeting in movies, like M3GAN, are maintained while achieving the highest ROI

among the selected 32 AI-themed movies. As shown in Figure 3, the scatter plot of budget vs. revenue confirms a strong linear relationship between production investment and box-office returns across the sample.

### 3.2 The artificial intelligence film festival

The integration of artificial intelligence in cinema production has been evolving narratively and experimentally through the ongoing and

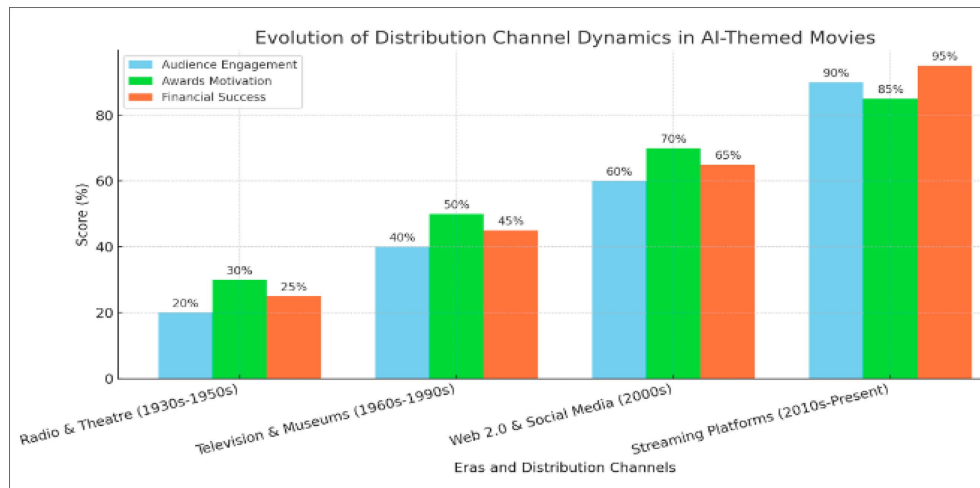


FIGURE 2  
Evolution of distribution channel dynamics in AI-themed movies.

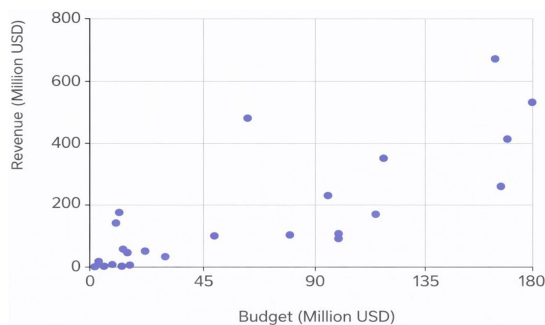


FIGURE 3  
Budget vs. revenue correlation.

rapidly rising technological advances through machine learning, natural language processing, deep learning, and neural network algorithms, offering new dimensions to a variety of technical aspects in generating VFX and CGI, accessibility, enhanced workflow and time efficiency, prediction metrics, financial and strategic planning, and cost-effective tools, leading to the emergence of Artificial Intelligence Film Festivals showcasing the recent tools, techniques, visual narratives, storytelling, and software, and management requiring the utilization of AI in the submitted films through their filmmaking preproduction, production and postproduction processes. The study explores the financial dynamics of 16 selected festivals, such as the Artificial Intelligence Film Festival (AIFF) by Runway AIFF (2024), Austin Film AI Festival (2024), Tribeca AI Film Festival (2024), Bucheon International Fantastic Film Festival (2024), Amsterdam AI Festival (2024), Reply AI Festival (2024), Sundance Film Festival (2022), AIFF Montpellier (2024), MetaMorph (2024), Larissa Larissa (2024), Neu Wave Film Festival (2024), +Rain AI Film Festival (2024) by Universitat Pompeu Fabra, Busan International Film Festival (2024) and Expo AI Film Festival (2024), through analyzing their regional distribution, growth in number, AI technological integration in production, production costs by festival tiers, ROI, financial sustainability, and revenue stream distribution, offering a comprehensive view of the economic potentials, financial viabilities and market segmentations.

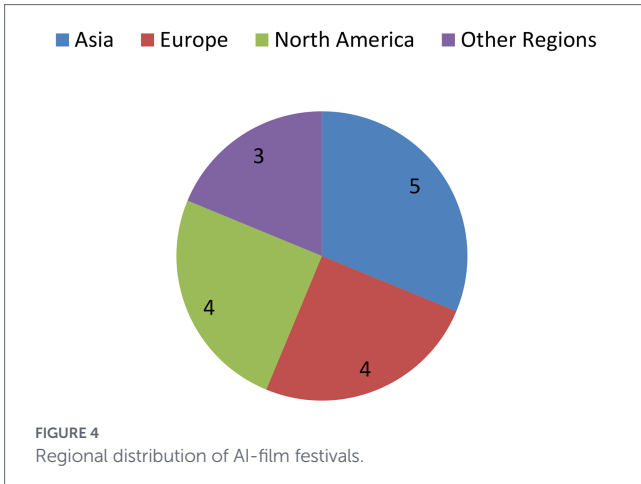
### 3.2.1 Geographic distribution, submission criteria, and market development

As presented in Figures 4, 5, the geographic distribution of the selected 16 Artificial Intelligence Film Festivals demonstrates technological development's dominance and presence in North America (Tribeca and Sundance), Europe (Amsterdam and Méliès), and Asia (Busan, BIFAN, and Dubai), through almost 81.25% of the prominent festivals showcasing the highly advanced companies such as Runway, NVIDIA, IMAX, Media Monks, Adobe, OpenAI, Descript, DeepMind, Synthesia, Zegami, and Avia Technologies as discussed by Sahoo et al. (2024) within high and stable nominal Gross Domestic Product (GDP) such as US\$42 T for Asia, US\$29 T for North America, and almost US\$20 T for Europe as stated by Adanma and Ogunbiyi (2024). The new wave of Artificial Intelligence Film Festivals, starting with 4 festivals in 2020 and reaching 16 festivals by 2024, showcases steady growth and underscores the significance of AI integration in the cinema production and filmmaking landscape.

### 3.2.2 Technological integration, production economics, and resource allocation

Figure 6 illustrates the required regulatory frameworks for the submission to the Artificial Intelligence Film Festivals, which require integration of AI techniques and tools experimentally and narratively in the preproduction, production, and postproduction processes within a length of 1–10 min total duration of the movie. The unified software has been used in the technical aspects such as scripting using GPT4 for ideas and brainstorming, use of Runway ML models, Framestore UK, DNEG, and Industrial Light and Magic (ILM), NVIDIA, Synthesia, and IMAX for animations, VFX, CGI, Adobe, and CapCut for some automation in editing, Weta Digital, Deepbrain for deepfake, and Avia Technologies for sound design modulation.

The AI-film festivals can be classified into three categories: Major Festivals, Mid-Tier, and Emerging, where the film production budget ranges US\$15,000–35,000 for the submitted AI short films within 45 days of development from script to completion of an audiovisual movie, which shows a huge significant



difference in cost production, workflow, and time efficiency, while all of these factors do guarantee the produced quality to be comparable to the conventional methods of filmmaking, fame of actors, Hollywood’s big studios, and expensive technical aspects as the Artificial Intelligence Film Festivals are still at their earliest stage. The analysis shows that there are almost an average of 150 submissions in each festival, where acceptance rates range between 20 and 30%, and the awards and prizes are clustered into 4–5 categories, showing the aim of festival organizers and creative professionals to secure the competition between producers to implement the best integration of AI advances narratively and experimentally.

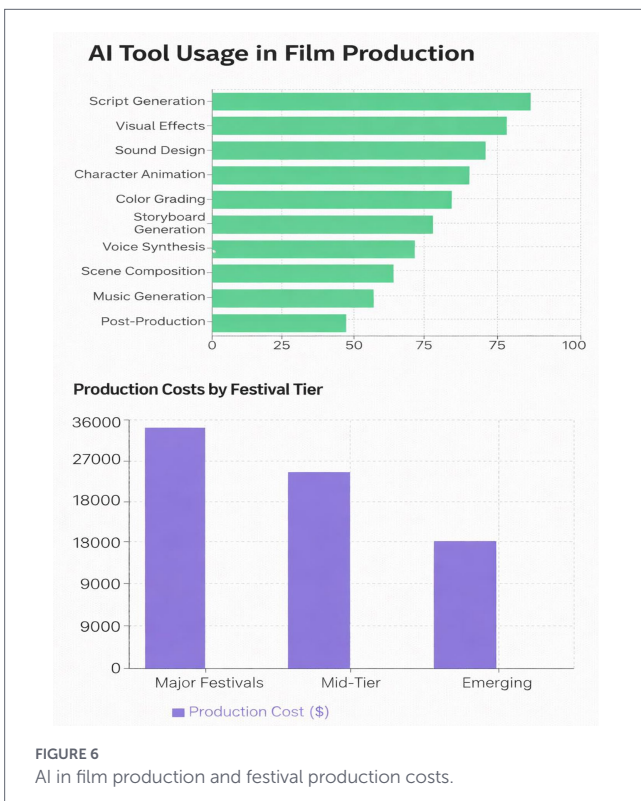
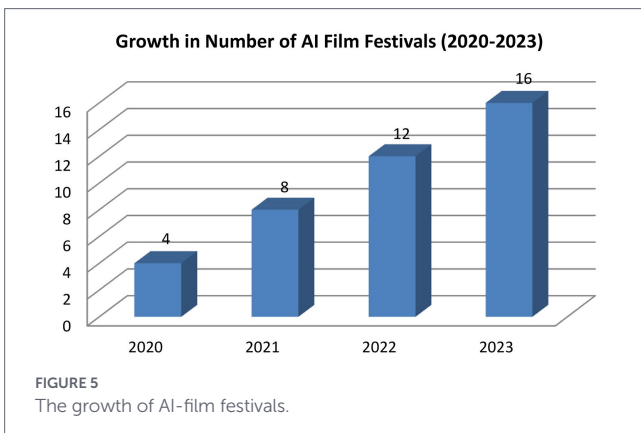
### 3.2.3 Return on investment and financial sustainability

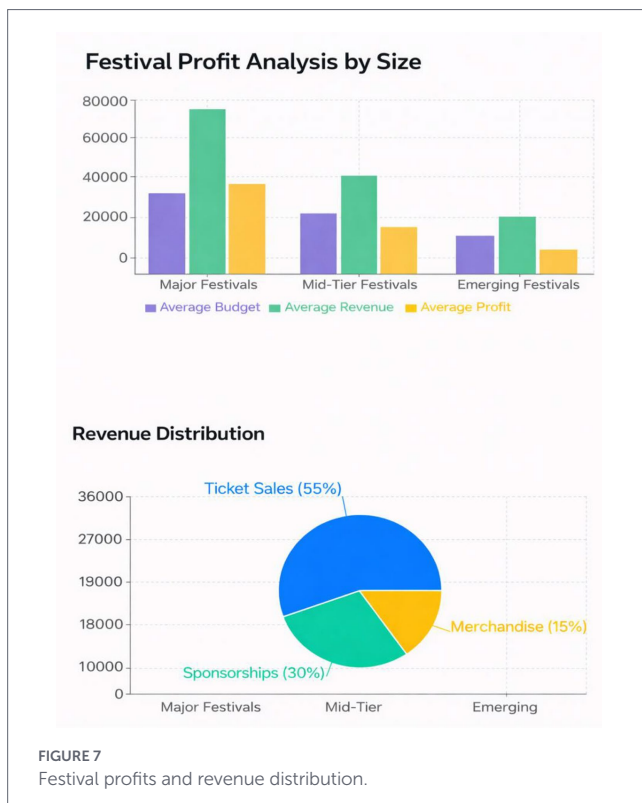
As shown in Figure 7, the analysis of the publicly available data on the websites of the selected Artificial Intelligence Film Festivals showcases a significant difference in awards systems and prizes as classified in Major, Mid-Tier, and Emerging, where the average profit of US\$40,000 in Tribeca AI and Sundance AI festivals, while US\$20,000 for Austin and Busan AI-Film Festivals, US\$15,000 for AIFF by Runway, and Dubai International AI-Film Festival, and US\$10,000 for emerging festivals, such as MetaMorph Academy Awards and the Neu Wave AIFF, offering valuable opportunities for filmmakers to compete to develop AI short-films through automation, short-term creation, reduced costs, and efforts. The economic feasibility and financial viability of the selected 16 Artificial Intelligence Film Festivals showcase a positive ROI, which has increased by approximately 20% each year for the last 4 years. The common factors in the financial success dynamics of the AI-Film Festivals were ticket sales at 50–60%, sponsorships, grants, and partnerships at almost 30%, and festival merchandising, branding, and promotions at almost 15%, demonstrating the potential economic growth and market development of the rapidly rising landscape in filmmaking production.

Exceptionally, a movie entitled “One More Pumpkin” was submitted to The Bucheon International Fantastic Film Festival (BIFAN), which was developed entirely by OpenAI’s Sora software as a 3-min short film in 5 days of production and cost almost zero, as stated by the South Korean producer, Kwon Han-Seul, in an interview (Seung-Hye, 2024), winning the grand prize of the 2nd Dubai International Film Festival in 2024 of almost US\$15,000, showcasing the AI advanced algorithms in reducing the cost of production, automating several tasks of production such as editing, lighting, futuristic environment settings, and scripting, while raising the standard ethical considerations such as ownership and copyrights, representation and bias, authenticity, and creative integrity.

### 3.3 Application of media convergence theory

Figure 8 presents the conceptual framework for applying Media Convergence Theory to the study findings. The study findings strongly exemplify Jenkins’ Media Convergence Theory through three key aspects such as technological, cultural and economic convergence in the selected 32 AI-themed films, where the quantitative data demonstrates through the evidenced evolution of movie production budgets and costs from 1927 to





2023 that merge between traditional and digital filmmaking production processes shifting from US\$20 M to over US\$180 M. The shift in distribution and communication channel dynamics impacting audience engagement leads to convergence from radio, theater, and television (20–50%) to the emergence of new streaming services, Web 2.0 and Web 3.0, and social media (85–95%).

Cultural convergence is evident in the rising wave of Artificial Intelligence Film Festivals (AIFFs), which integrate traditional festival culture with technological innovations through a range of new creative media practices, including VFX, CGI, lighting, and sound design. These festivals require organizers to use AI tools in their submission criteria for filmmakers and producers across preproduction, production, and post-production processes.

The economic evaluation of the selected 16 AI-film festivals shows the convergence in developing new business models, strategies, and revenue streams through ticket sales, sponsorships, partnerships, merchandising, promotions, AI and software companies, and media organizations. The case study of “One More Pumpkin,” a film which was created entirely by utilizing OpenAI’s Sora software, exemplifies Jenkins’ expectations that Media Convergence would lead to new forms of media production and consumption while raising several ethical considerations about balancing AI and creativity, bias, automation, intellectual property, and copyrights, emerging from the rapidly rising AI innovations integration in cinema production.

### 3.4 Suggested guidelines for producers, filmmakers, economists, and media professionals

Figure 9 summarizes the suggested guidelines emerging from the study’s findings. The technological, cultural, and economic

convergence emerged from the rapid integration of AI into filmmaking. Different production processes require nuanced calibration and balancing implementation through the utilization of AI tools in different production processes, such as scriptwriting, editing, visual effects, CGI, distribution channels, revenue streams, human creativity, and artistic vision.

The raising ethical considerations emerging from the intersection of AI and filmmaking, narratively and experimentally, demonstrate the crucial need to implement ethical practices to challenge and maintain transparency through adhering to intellectual property rights, copyright laws, and AI integration guidelines in cinema preproduction, production, and postproduction processes.

The well-planned use of AI algorithms in audience engagement and marketing analytics could help with new prediction models, optimization strategies, real-time sentiment analysis, trend analysis, revenue, and box-office performance evaluation. Consequently, there would be improvements in financial planning, resource allocation, and budget optimization.

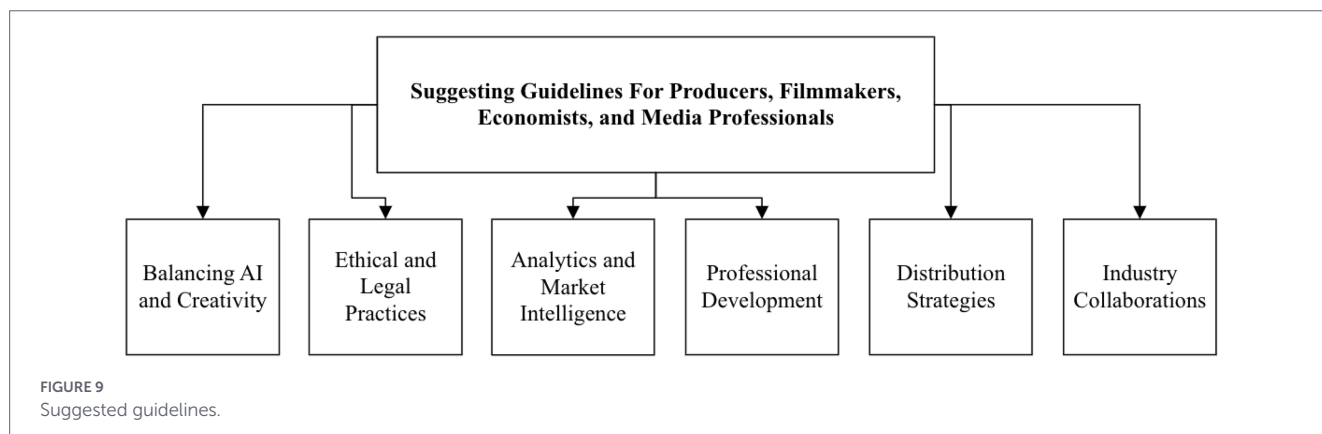
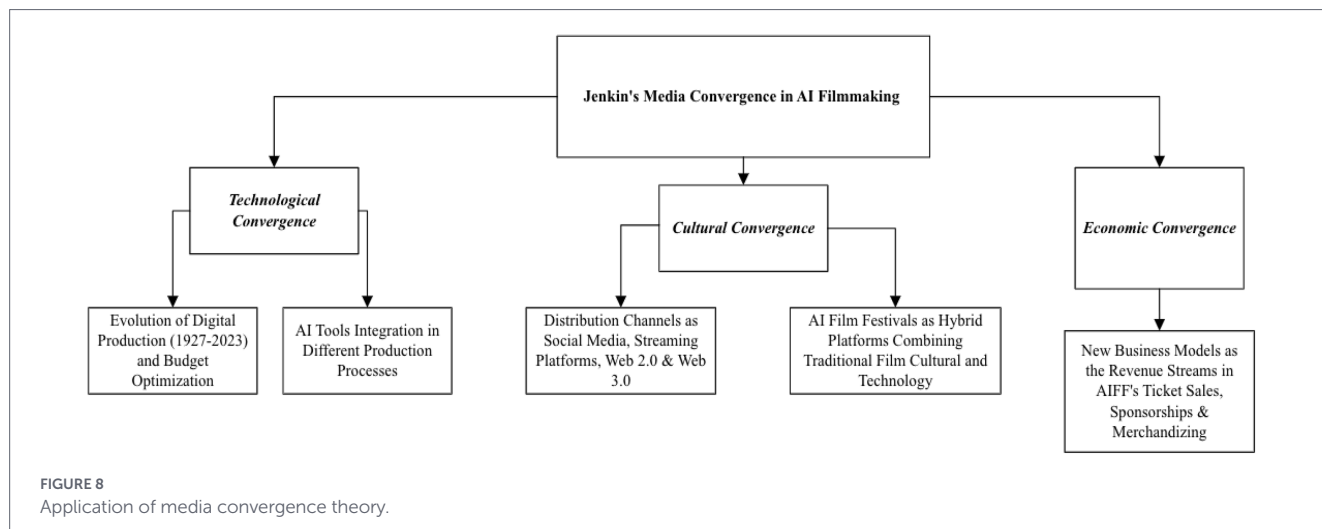
Professional development in the rapidly rising digital media landscape is paramount and vital, requiring the ability to cope with the technological advances and technical updates through specialized training programs utilizing AI techniques developed by big companies such as Runway ML, DeepBrain, NVIDIA Omniverse, and Unreal Engine, IBM (Watson Analytics, Cloud Services), Microsoft (Azure AI and Power BI), Movio (Cinema audience analysis), Cinelytic (Film performance prediction), Semrush (SEO, Market Intelligence), Brandwatch (Social listening, Consumer Intelligence), Qualtrics (Experience Management), Alteryx (Data science, Analytics automation), and DataRobot (Enterprise AI platform).

The rise of new distribution and communication channels leading to the need of adaption of hybrid methods through traditional theaters partnering with AI companies such as AMC, Regal, Cinemark, and Vue, and the streaming platforms such as Netflix, Amazon, HBO, Disney+, Apple TV+, and the AI-powered content hubs, enhancing the storytelling techniques, presenting different visual narratives formats, and audience engagement through dynamic content optimization, automated localization, predictive audience targeting, real-time performance analytics, and cross-platform distribution synchronization.

Finally, expanding the possibilities of Media Convergence technologically, culturally, and economically will be supported through industry collaborations between producers, professionals, economists, media organizations, AI and software developers, research labs, visual effects and CGI studios, TV channels, social media platforms, sponsorships, banking and funding, AI-driven analytics companies, and streaming services.

## 4 Conclusion

AI integration in cinema production and filmmaking has been rapidly rising over time, both narratively and experimentally, where the analysis of the selected 32 AI-themed films in Hollywood and Asian cinema shows economic and social insights, demonstrating that micro-budgeting movies can achieve a significant return on investments (ROI), such as M3GAN (2023) costs US\$12 M within 1405.8% and Upgrade (2018) costs US\$3 M within 466.67%, showcasing strategic financial planning and resource allocation. Also, high-budget films like Big Hero 6 (2014) achieved an ROI of



298% with profits of US\$492.8 million, and Matrix (1999) cost US\$63 M to gain a profit of US\$403.6 M with an ROI of 640.63%, confirming the strong correlation between the cost of production and box-office revenues ( $r = 0.822, p < 0.001$ ), while films such as Transcendence (2014) cost US\$100 M within 3% ROI without any notable recognition through awards and prizes, confirming the weak correlation between cost of production and awards with ( $r = 0.211, p = 0.246$ ), box-office revenue and awards with ( $r = 0.313, p = 0.082$ ) indicating that the financial success of films depends on more factors than just investments as audience engagement, quality of drama, and visual narratives which socially, AI-themed films impacting the society and culture through shaping their perceptions on technology, emotional intelligence, human-AI relationships, and the ethical considerations.

The new wave and emergence of Artificial Intelligence Film Festivals shows economic growth and cultural exchange in the last 4 years and demonstrates the rapidly rising integration of AI in filmmaking and cinema production centered in North America, Europe and Asia, representing the strong economic GDP of the continents and the presence of innovative media technologies, artificial intelligence and software companies, offering new dimensions of production, storytelling techniques, workflow and time efficiency, technical aspects, resource allocation, and budget optimization, where the average cost of production for the 150 submitted films to each festival was in the range of US\$15,000–\$35,000 and exceptionally may cost few dollars or even just zero through average production time frame

of 45 days. The selected 16 AIFF economic analysis shows that they achieve financial gains through ticket sales (55%), sponsorships (30%), branding and merchandising (15%) approximately, with annual ROI growth of 20%, showcasing a variety of possibilities in the societal and cultural exchange, narratively and experimentally through different platforms emerging for enhanced audience engagement, filmmaking visual narratives, AI innovations, and partnerships between producers and filmmakers globally. Future predictions and the expected global growth of AI's integration in cinema production reveal economic and social development, where it will rise from US\$1.4 to 14.1B, the generative AI technological software developments to rise from US\$351.1 M to 3.66B in the next 10 years by 2033, within 25.7 and 27.2% compound annual growth rate (CAGR), respectively, showcasing the possibilities of cost production reduction, new channel distribution, resource allocation, and budget optimization, impacting the societal and cultural dimensions by the ongoing developments of AI-themed films and AI-generated movies through audience engagement, perceptions, democratization, and the standard ethical considerations. AI integration in preproduction, production, and postproduction processes of filmmaking triggered both economic and social development through enhanced cost production, workflow, and time efficiency, a new stream of revenue distribution growth, and financial sustainability through festivals, platforms, and global markets, serving as a medium to address and

investigate the social, cultural, and ethical dilemmas of AI through visual narratives, recent technological advancements, and storytelling techniques in cinema production.

## 4.1 Limitations

There are several limitations of the research study that can be summarized in the dependency on publicly available data and relying on financial reports on the Web 2.0 platforms, web-scraping techniques, and industrial blogs, limiting the findings to be accurate as much as the output data from major studios and companies, which is not publicly accessible, especially for the Artificial Intelligence Film Festivals (AIFFs). The limited sample size through the selection of 32 AI-themed films in Hollywood and Asian cinema, and the selection of 16 AI-film festivals, would not capture the broader economic and technological impact evaluation, and the findings cannot be generalized. Finally, the absence of primary data from industry professionals and the lack of interviews with economists, filmmakers, producers, festival organizers, experts, and investors.

## 4.2 Future research directions

Expanding the economic analysis to evaluate streaming and AI-driven platforms through examining the new business models of independent filmmakers and digital platforms and revenue distribution models. Developing an AI-driven predictive model for financial planning success utilizing machine learning algorithms analyzing resource allocations, minimizing risks, budget optimization, AI integration, real-time audience engagement, and box-office revenues as a framework aims to collaborate between filmmakers, producers, investors, media professionals, economists, AI and software companies, and film festival organizers. Conducting longitudinal studies on film labor markets and AI through the shift in employment dynamics, job displacement, upskilling opportunities, and the expected new wave of prompt engineering opportunities utilizing technological advances and techniques. Finally, the cornerstone of the rapid rise of AI integration in cinema, narratively and experimentally, is exploring the needed ethical and legal frameworks through redefined policies and regulatory guidelines, protecting the intellectual property rights, copyright laws, and the creativity of the artistic visions.

## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

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## Author contributions

KA: Supervision, Conceptualization, Project administration, Writing – original draft, Formal analysis, Writing – review & editing. GS: Conceptualization, Methodology, Formal analysis, Writing – review & editing, Writing – original draft, Project administration. TA: Writing – review & editing, Supervision. AB: Methodology, Formal analysis, Writing – review & editing, Software.

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## Generative AI statement

The author(s) declared that Generative AI was not used in the creation of this manuscript.

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