



FUTURE UNSCRIPTED:

The Impact of Generative
Artificial Intelligence on
Entertainment Industry Jobs

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Preface

Discussions about the impact of technology on the labor market usually focus on the creation and elimination of jobs. Since at least the Industrial Revolution, technological advancements have changed how work is done roughly every generation, affecting some sectors more than others.¹ For example, in 1870, the share of Americans working in agriculture was approximately 50%. The introduction of mechanization dropped that number to 41% by 1900; by 2020, agriculture employment accounted for less than 2% of all jobs nationwide. Similarly, automation in the 1980s played a large role in the decline of U.S. manufacturing jobs. During the postwar years, employment in the manufacturing sector hovered around 30%; today it is closer to 6%.

With the emergence of generative artificial intelligence (GenAI), we come to another critical inflection point in the story of jobs and technology. The entertainment industries are in a period of significant uncertainty, where the nature of work is rapidly — and in many cases, profoundly — changing at an unprecedented rate.

The questions posed by GenAI are consequential: How is the technology being used? How will it be used moving forward? What is the impact on creative workflows and industry offerings? Will these technologies prove to be a productivity boom for creative workers? Or will they increasingly replace the need for creative workers in the process?

In a survey conducted between November 17 and December 22, 2023, 300 C-Suite leaders, senior executives, and mid-level managers across six industries in the entertainment sector were given the opportunity to provide their input. Questions centered on current and anticipated roles of GenAI, the technology's effects on tasks and responsibilities, the creation and/or replacement of job roles and titles, and the perceived benefits and challenges of GenAI implementation.

As the pace of change will only continue to accelerate in 2024, it is our goal at CVL Economics to cut through the hype and ground the conversation in data. This report, the first in a series of GenAI's impact on the entertainment industries, is a step in that direction.

¹ David Rotman, "How Technology Is Destroying Jobs," MIT Technology Review, June 12, 2013, <https://www.technologyreview.com/2013/06/12/178008/how-technology-is-destroying-jobs/>.

Executive Summary

In mid-2023, just months after OpenAI released ChatGPT, the Writers Guild of America (WGA) and Screen Actors Guild–American Federation of Television and Radio Artists (SAG-AFTRA) voted to go on strike. A point of contention for both unions lay in the impact that artificial intelligence (AI) would have on the nature of work and job security as the technology becomes more powerful and sophisticated.

Many companies were already drawing on original content produced by writers to train developing generative artificial intelligence (GenAI) programs and/or using the likenesses of actors to generate digital replicas and character designs. Without strong protections in place, striking workers could envision a world in the not-too-distant future where their roles would be replaced by GenAI technology.

Although the latest round of contract negotiations with the Alliance of Motion Picture and Television Producers (AMPTP) favored WGA and SAG-AFTRA members in the end, the uncertainty about GenAI's impact on the film and television industry — and increasingly, all entertainment industries — remains.

What *is* certain is that GenAI technology is here, and it will continue to be refined and leveraged over time. To be sure, public policy and organized labor will play critical roles in shaping the operating environment and establishing safeguards. In the short to medium term, though, the decisions about what GenAI technology will

be deployed and how it will be used will be led by industry leaders and managers. At a time when several entertainment industries are facing challenges, the desire to increase productivity, cut costs, and identify new revenue streams will be top of mind. But such decisions carry weight. Riot Games, Unity Software, Amazon MGM Studios, Pixar, and Universal Music Group all announced layoffs within the first few weeks of 2024,² and further job cuts are expected in the months ahead.³

Understanding how creative industry executives are currently thinking about GenAI integration can provide some insight into the implications for

the creative workforce. In a survey conducted between November 17 and December 22, 2023, 300 C-Suite leaders, senior executives, and middle managers across six entertainment industries were asked to share their perspectives across multiple dimensions.⁴ Whether their responses are encouraging or sobering may be a matter of opinion, but they do reflect an important reality. Creative industry leaders are largely embracing GenAI technology, and most recognize that operational benefits in the future will come at a cost to many creative workers.

² Christi Carras, Sarah Parvini, and J. Clara Chan, "Entertainment companies face tidal wave of layoffs in rocky start to new year," The Los Angeles Times, January 12, 2024, <https://www.latimes.com/entertainment-arts/business/story/2024-01-12/entertainment-layoffs-pixar-amazon-mgm-twitch-discord-umg> and Cecilia D'Anastasio, "Tencent's Riot Games Cuts 530 Jobs, Saying It Has Lost Focus," Bloomberg, January 22, 2024, <https://www.bloomberg.com/news/articles/2024-01-22/tencent-s-riot-games-to-lay-off-530-people-about-11-of-staff>.

³ Jack Kelly, "Unlike Last Year's Large-Scale Layoffs, 2024 Sees Small and Steady Job Cuts—Here's Who's Laying off." Forbes, January 19, 2024. <https://www.forbes.com/sites/jackkelly/2024/01/19/unlike-last-years-large-scale-layoffs-2024-sees-small-and-steady-job-cuts-heres-whos-laying-off/?sh=35d2a22f5f80>.

⁴ These industries are: (1) Film, Television, and Animation; (2) Music and Sound Recording; (3) Gaming; (4) Media Streaming Distribution Services, Social Networks, and Content Providers; (5) Radio and Television Broadcasting; and (6) Newspaper, Periodical, Book, and Similar Publishing.

Key Survey Findings

72%

Seventy-two percent (72%) of firms surveyed can be considered early adopters of GenAI programs.

Twenty-five percent of creative businesses already have a GenAI program in place, compared to 3.9% of businesses economy-wide. An additional 47% indicated they are in the planning or early stages of implementing at least one GenAI program.

75%

Three-fourths (75%) of survey respondents indicated GenAI tools, software, and/or models had supported the elimination, reduction, or consolidation of jobs in their business division.

At the same time, most executives and managers indicate GenAI has already led to the creation of new job titles and roles in their organization and anticipate GenAI technology will be responsible for the creation of new job opportunities. Whether these new jobs will offset inevitable job losses is not clear.

36%

Over a third of respondents (36%) who currently have or are in the early stages of developing a GenAI capability reported that GenAI had reduced the need for certain skills for daily tasks and responsibilities among their staff.

Roughly 6 in 10 early GenAI adopters reported that GenAI “increased efficiency in routine tasks” and “enhanced quality of routine or repetitive tasks in their organization.” Half reported that GenAI implementation had introduced new tasks and responsibilities, though the number and nature of these tasks and responsibilities were not specified.

57%

Over half of respondents (57%) reported employees raising concerns regarding the ethical implications of using GenAI in their work.

Asked to name their top three concerns, employees cited issues related to the dangers of current GenAI systems being “stochastic parrots” (42% of the time);⁵ a lack of transparency over GenAI decision-making processes and output (38%); and misinformation, content falsification, and deepfakes (36%).

90%

Over 90% of business leaders foresee GenAI playing a larger role in the entertainment industries, with 26% indicating it would play a significantly larger role over the next three years.

That said, only 26% of respondents felt their organization’s workforce was fully prepared for the integration of GenAI into their workflows.

47%

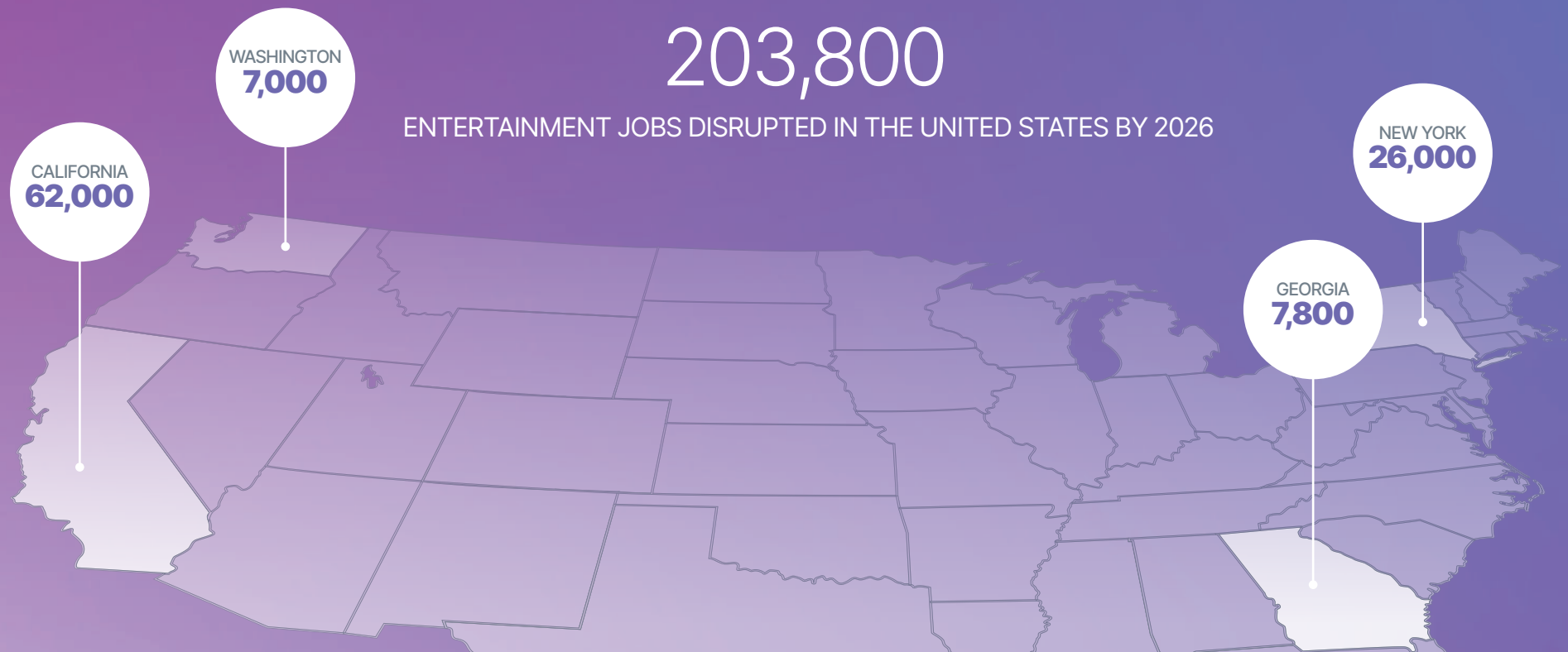
Almost half (47%) of business leaders felt that over the next three years, GenAI will be effective in generating 3D assets as well as realistic sound design for film, television, and video games.

Another 44% believed GenAI would be able to generate realistic and convincing foreign-language dubbing for film or television dialogue, and 39% believed GenAI would be generating music mixes and masters by 2026.

⁵ The term “stochastic parrot” refers to the fact that large language models may be able to generate coherent, convincing texts, but cannot discern the actual meaning of the text itself. They effectively “parrot” back information they are fed.

Potential Impacts

The introduction of GenAI potentially signifies a large-scale transition from existing techniques into new processes, which will likely rebalance the demand for labor and capital across the entertainment industries. In doing so, creative workers will be facing an era of disruption, defined by the consolidation of some job roles, the replacement of existing job roles with new ones, and the elimination of many jobs entirely.



Almost two-thirds of the 300 business leaders surveyed expect GenAI to play a role in consolidating or replacing existing job titles in their business division over the next three years. This would translate to approximately 203,800 payroll jobs being adversely affected in the United States, over half of which would be in four states: California (accounting for 28% of all displaced creative industry jobs), New York (14%), Georgia (4%), and Washington (3%).⁶

Since this figure does not include the effect on gig workers and freelancers, who are not tracked as robustly by U.S. administrative data and surveys, the actual number of displaced creative jobs is in fact likely to be much higher. Of the firms surveyed that primarily employ gig workers or freelancers, nearly 80% are early adopters of GenAI. Non-payroll workers are disproportionately vulnerable to contract work displacement compared to the population of creative workers overall. And given that the entertainment industries

on average employ a greater share of gig workers compared to other sectors, the total number of affected jobs will likely be even more significant.⁷

Just as different types of workers will face different levels of exposure to GenAI, the extent of job consolidation, replacement, or elimination will vary from one creative industry to the next. This report focuses on three entertainment industries in particular: Film, Television, and Animation; Music and Sound Recording; and Gaming.

⁶ This assessment extends previous research on occupational task exposure to GenAI. The existing literature is neutral on the potential for GenAI to substitute or complement human labor in key tasks. This report uses the term “disruption” to incorporate industry leader expectations for consolidation or replacement of certain tasks into the assessment of occupational/sectoral exposure to GenAI over the next three years.

⁷ Official U.S. administrative data sets like the Quarterly Census of Employment and Wages (QCEW) do not track gig work employment. The Current Population Survey (CPS) does include self-employed persons, yet its small sample size is not suitable for detailed analysis and lacks sufficient coverage of secondary sources of income.



Film, Television, and Animation Industry

Concentrated in California, New York, Georgia, and New Mexico, the U.S. Film, Television, and Animation industry employs almost 550,000 workers and is the largest of the creative sectors included in the survey. The potential for GenAI-induced job disruption is significantly higher given the many ways the technology is being deployed across multiple job roles.

ADOPTION

Over two-thirds (68.7%) of firms in the Film, Television, and Animation industry are early adopters of GenAI. Firms primarily engaged in post-production activities are implementing GenAI programs more than those that focus on other production stages. For the early GenAI adopters in Film, Television, and Animation, roughly 44% are implementing GenAI technology to assist in generating 3D models and 39% in generating character and environment design tasks. Thirty-seven percent are using the technology to assist in voice generation and cloning and compositing tasks.

DISRUPTION

About 21.4% of Film, Television, and Animation jobs (or approximately 118,500 jobs) are likely to have a sufficient number of tasks affected to be either consolidated, replaced, or eliminated by GenAI in the U.S. by 2026. As the state with the largest industry employment and industry concentration (or location quotient), California will be impacted the most (affecting 39,500 jobs) both in total job disruption nationwide and with respect to its own economy. New York also has a relatively high employment concentration and will see 15,100 film, television, and animation jobs affected over the next three years.

JOB ROLES

Roughly one in three Film, Television, and Animation business leaders surveyed predict job displacement over the next three years for Sound Editors and 3D Modelers. Job titles such as Sound Designer, Composer, and Graphic Designer were flagged as vulnerable by roughly 25% of respondents. Approximately one third placed Re-Recording Mixers, Broadcast Technicians, and Audio and Video Technicians in this category as well, with another 15% predicting job displacement for Storyboard Artists, Illustrators, Look/Surface/Materials Artists, and Animators by 2026.

555,000

U.S. Film, Television, and Animation Jobs (2023)

68.7%

Share of GenAI Early Adopters (2023)

118,500

U.S. Film, Television, and Animation Jobs Disrupted by GenAI (by 2026)

21.4%

Share of U.S. Film, Television, and Animation Jobs Disrupted by GenAI (by 2026)



Music and Sound Recording Industry

The Music and Sound Recording industry has weathered several technology disruptions over the past 20 years, ranging from the rise of digital downloads, the explosion of illegal file-sharing, to the emergence of music streaming services. The impact of GenAI is likely to usher in another period of transition, but the impact on the existing 21,300 jobs is projected to be smaller relative to the Film, Television, and Animation industry.

ADOPTION

The Music and Sound Recording industry has been slower at adopting GenAI programs than other entertainment industries. Only half of firms in Music and Sound Recording are early adopters of GenAI, with most adopters primarily operating in pre-production. Most early adopters implement GenAI technology to assist with voice generation and cloning (57%) and music generation and recording (52%). About half use GenAI programs to generate lyrics and about 45% and 40% of respondents use GenAI for mastering and mixing, respectively.

DISRUPTION

Since fewer firms have adopted GenAI in Music and Sound Recording, the proportion of jobs with a sufficient number of tasks impacted is much lower than in other entertainment industries. About 8.4% of industry jobs will be disrupted by 2026, which translates to about 1,800 industry jobs across the United States. Most jobs will be displaced in California (470 jobs), but Tennessee (320 jobs) has the largest industry location quotient, which means its economy will feel the effects of displacement more acutely.

JOB ROLES

Fifty-five percent (55%) of business leaders surveyed foresee Sound Designers facing the greatest degree of displacement over the next three years. A little over 40% of respondents considered Music Editors, Audio Technicians, and Sound Engineers to be vulnerable as well, and roughly 33% expect Songwriters, Composers, and Studio Engineers to experience similar impacts over the next three years.

21,300

U.S. Music and Sound Recording Jobs (2023)

53.3%

Share of GenAI Early Adopters (2023)

1,800

U.S. Music and Sound Recording Jobs Disrupted by GenAI (by 2026)

8.4%

Share of U.S. Music and Sound Recording Jobs Disrupted by GenAI (by 2026)



Gaming Industry

At 390,500 jobs, the Gaming industry has been at the forefront of technological advancement for decades now, and it currently plays an outsized role in the development and deployment of GenAI technology. Yet this does not mean the industry is immune to job disruption. Many of the same tasks that are likely to be completed by GenAI technology in the Film, Television, and Animation industry are integral to the Gaming industry as well.

ADOPTION

Out of the entertainment industries analyzed in this report, the Gaming industry has the largest share of early adopter firms. Nearly 90% of firms in the Gaming industry have adopted or are in the process of adopting GenAI programs. GenAI use is common across all stages of production (pre-production, production, and post-production), with over three-fourths of firms being early adopters of GenAI within each stage.

DISRUPTION

Despite having the highest degree of GenAI integration out of all the entertainment industries, Gaming industry leaders do not foresee GenAI consolidating or replacing jobs within the next three years to the same extent as the other entertainment industries. It is important to emphasize that Gaming is at the forefront of technological advancement, and assessing the degree to which existing workers are insulated from having their roles minimized or eliminated is difficult to predict three years out. Based on survey respondents' expectations, though, approximately 13.4% of Gaming jobs (or 52,400 jobs) will be consolidated, replaced, or eliminated by 2026. Most consolidation, replacement, or elimination will occur in California (19,400 jobs), but Washington (4,600 jobs) has the highest location quotient of gaming jobs.

JOB ROLES

Roughly one in three business leaders predict job displacement over the next three years for Software Developers, Sound Editors, Software Analysts and Testers, and Special Effects Artists. Roughly 20% reported that the job titles of 3D Artist, Game Designer, UI/UX Designer, and Video Game Tester would be vulnerable. Respondents also expected GenAI to play a larger role in tasks like generating 3D modeling (55% of respondents), generating concept art and visual development (40%), and generating sound design, voice generation, and cloning (37%). About 28% of businesses surveyed use GenAI in animation, rigging, and motion capture; 27% in lighting and texturing; and 22% in storyboarding.

390,500

U.S. Gaming Industry Jobs
(2023)

86.7%

Share of GenAI
Early Adopters
(2023)

52,400

U.S. Gaming Jobs
Disrupted by GenAI
(by 2026)

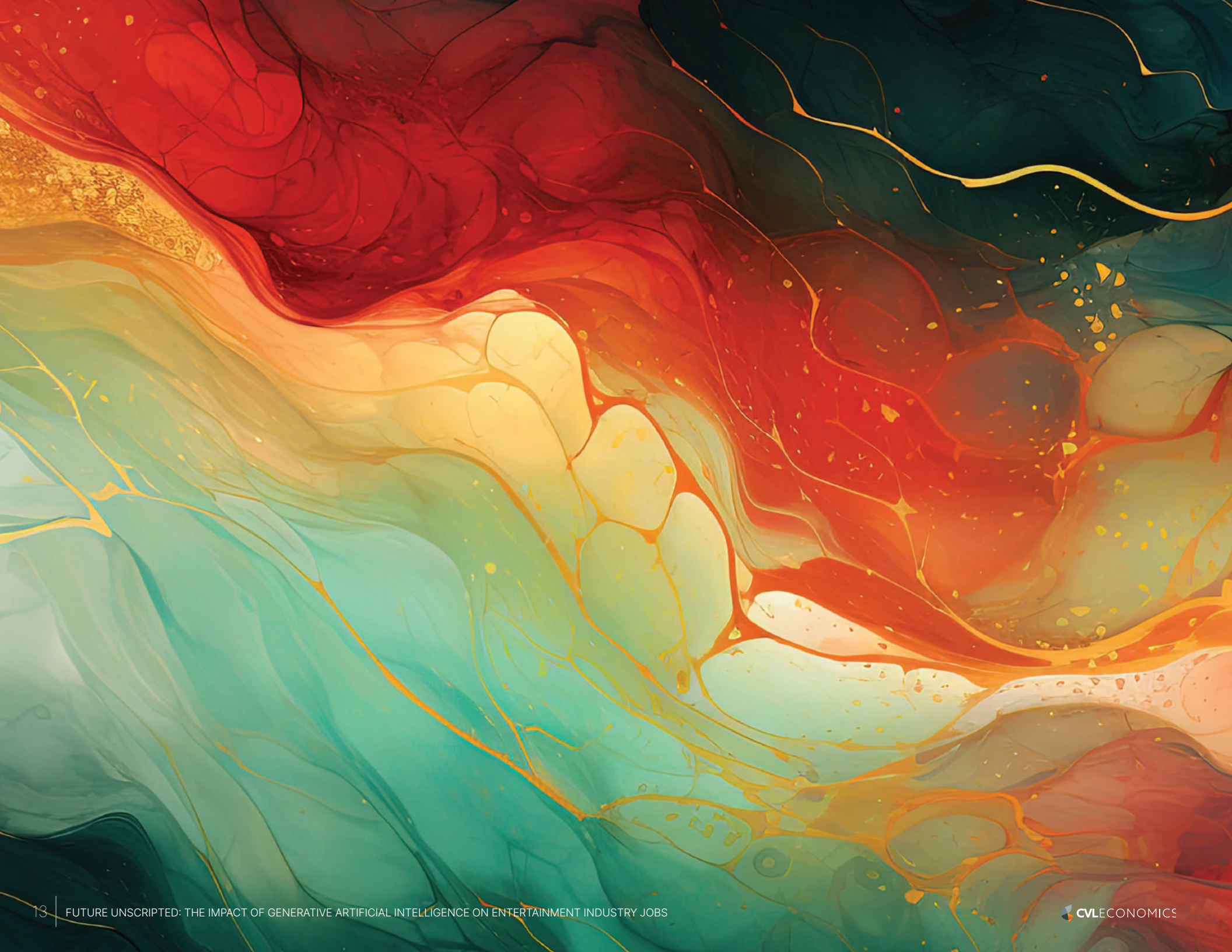
13.4%

Share of U.S. Gaming Jobs
Disrupted by GenAI
(by 2026)

Looking Ahead

The actual net impact on jobs in the wake of GenAI will not be known for some time. But aside from the displacement we can expect to see over the next few years, there are longer-term considerations to keep in mind.

The jobs most susceptible to consolidation, replacement, or elimination will be concentrated among entry-level positions. These have rarely been glamorous or high paying jobs, but they have offered entry points into entertainment industries and serve as the primary pipeline to mid- and senior-level positions. Fewer entry points today will mean fewer qualified workers to fill Level 3 vacancies over the next 10 to 20 years. Moreover, the elimination of entry-level jobs in favor of GenAI technologies will not only limit early career workers' exposure to key processes but will also affect their ability to build professional networks and develop domain knowledge. Additionally, a contraction in the number of junior positions has implications for the overall diversity of the creative industry workforce. Such changes will disproportionately affect those from less affluent backgrounds and underrepresented communities who have traditionally used these roles as a means towards economic and career mobility. Limiting opportunity is likely not the intent of the industry leaders surveyed, but without a measured and intentional approach to GenAI integration, this may very well be the future that is generated.



Introduction

The entertainment industries have had to navigate choppy waters since the onset of the Covid-19 pandemic, but 2023 was especially turbulent.

On the one hand, it was a year of major box office successes, epitomized by the cultural phenomenon of “Barbenheimer” and AAA game releases such as *The Legend of Zelda: Tears of the Kingdom*, *Marvel’s Spider-Man 2*, and *Super Mario Bros. Wonder*. On the other hand, it was also a year in which layoffs cut deep across gaming companies,⁸ music streaming services,⁹ radio networks,¹⁰ and mass media companies.¹¹ The halt in production for the better part of the year meant new film and television commissioning in the U.S. fell to levels actually *lower* than during the pandemic-induced shutdown in Hollywood. With the decline of the linear television sector, creative workers are fighting for protections as industry heads are struggling to find a viable business model in a new media landscape. As one former media executive told *Deadline* in July of 2023:

“None of these businesses are going to look like what linear used to look like. None of these businesses are going to deliver the types of revenue that syndication used to deliver to directors and actors. The difficult question for Hollywood right now is whether the leadership that’s in place, the guys who are really competent in managing studios and linear networks and theme parks, are the right people to solve that problem. I think that the uncomfortable truth that’s emerging from this standoff between the Screen Actors Guild, the Writers Guild and the studios is that they may not be.”¹²

⁸ Ash Parrish, “2023’s Great Games Were Overshadowed by a Dark Cloud of Layoffs.” *The Verge*, December 30, 2023, <https://www.theverge.com/24009039/video-game-layoffs-2023>.

⁹ Adam Satariano, “Spotify to Cut 1,500 Jobs after Spending Spree,” *The New York Times*, December 4, 2023, <https://www.nytimes.com/2023/12/04/business/spotify-layoffs.html>.

¹⁰ McKenna Oxenden, “NPR Cuts 10% of Staff and Halts Production of 4 Podcasts,” *The New York Times*, March 25, 2023, <https://www.nytimes.com/2023/03/25/us/npr-layoffs-podcasts.html>.

¹¹ Todd Spangler, “Layoffs Hit Condé Nast and Vox Media,” *Variety Daily*, November 30, 2023, <https://variety.com/2023/digital/news/layoffs-conde-nast-vox-media-1235815307/>.

¹² Katie Campione, “Inside the Battle for A New Streaming Residuals Model: Data, Transparency & ‘A Fight for Power,’” *Deadline*, July 27, 2023, <https://deadline.com/2023/07/hollywood-strikes-streaming-residuals-fight-actors-writers-1235448649/>.

From the perspective of studio executives — and, indeed, business leaders across the entertainment industries — the emergence of generative artificial intelligence (GenAI) provides opportunities to improve productivity, cut costs, and generate content. How this rapidly evolving technology is employed, though, has the potential to redefine the economic landscape, with seismic implications for creative workers. GenAI is both a subset and evolution of what has been referred to as simply “artificial intelligence” (AI) for years. Whereas traditional AI is rules-based and functions along pre-established algorithms, GenAI leverages machine learning to identify patterns among immense data sets to generate “new” content. In addition to appearing in standalone programs, GenAI technologies are being integrated into preexisting consumer-facing and enterprise-level products (such as Firefly in Adobe Photoshop and Stable Diffusion in Houdini), reflecting a trend towards more sophisticated use cases that blurs the lines between human creativity and content generation (Table 1).

GenAI’s expansive capabilities are fueled by the vast trove of content available on the internet and other digital platforms, coupled with significant advancements in machine learning, neural networks, and computational power. Not surprisingly, creative workers are concerned on a number of fronts, including copyright infringement, plagiarism, deepfakes, and the loss of intellectual property. Although GenAI-generated content cannot be copyrighted,¹³ what kind of content GenAI technologies can legally draw from has not been defined. A group of writers that includes Pulitzer Prize-winning author Michael Chabon, for example, filed a lawsuit last September against OpenAI for allowing its ChatGPT technology to use their works without permission.¹⁴ In a similar case, Getty Images accused Stability AI of illegally scraping millions of licensed images from its library to populate DALL-E datasets.¹⁵ Some companies are attempting to place guardrails around what source content can be used and how content generated by GenAI is used, but such measures have yet to be proven

effective. Adobe Stock recently came under fire for allowing photorealistic GenAI-generated deepfakes supposedly depicting events in Gaza, Ukraine, and Maui to appear alongside legitimate photographs; industry attempts to regulate the situation have so far been circumvented.¹⁶ With respect to plagiarism, many creatives are taking matters into their own hands by using tools like Nightshade to corrupt GenAI training data.¹⁷

These cases point to the ways that GenAI is being regarded more as a substitute for, rather than an amplifier of, the creative worker skill set. In the years it takes to develop a robust regulatory environment, uses of GenAI will continue to spread throughout the entertainment industries and become further integrated into production workflows. This will undoubtedly have an impact on the size and composition of the creative workforce. This study aims to measure that impact.

¹³ Kate Knibbs, “Why This Award-Winning Piece of AI Art Can’t Be Copyrighted,” *Wired*, September 6, 2023, <https://www.wired.com/story/ai-art-copyright-matthew-allen/>.

¹⁴ Blake Brittain, “More writers sue OpenAI for copyright infringement over AI training,” *Reuters*, September 11, 2023, <https://www.reuters.com/technology/more-writers-sue-openai-copyright-infringement-over-ai-training-2023-09-11/>.

¹⁵ Gil Appel, Juliana Neelbauer, and David A. Schweidel, “Generative AI Has an Intellectual Property Problem,” *Harvard Business Review*, April 7, 2023, <https://hbr.org/2023/04/generative-ai-has-an-intellectual-property-problem>.

¹⁶ Will Oremus and Pranshu Verma, “These look like prizewinning photos. They’re AI fakes,” *The Washington Post*, November 23, 2023, <https://www.washingtonpost.com/technology/2023/11/23/stock-photos-ai-images-controversy/>. That said, several pieces of proposed Federal legislation are attempting to address this issue. The “AI Labeling Act” would require disclosures for AI-generated image, audio and text content; the “DEEPFAKES Accountability Act” would establish civil and criminal penalties for failing to disclose generation and dissemination of deepfake content; and a related bill, the “Nurture Originals, Foster Art, and Keep Entertainment Safe (NO FAKES),” would protect artists from unauthorized reproduction of their “voice and visual likeness.”

¹⁷ Melissa Heikkilä, “This New Data Poisoning Tool Lets Artists Fight Back against Generative AI.” *MIT Technology Review*, October 23, 2023, <https://www.technologyreview.com/2023/10/23/1082189/data-poisoning-artists-fight-generative-ai/>.

Table 1: GenAI Typologies

	TEXT	AUDIO	VISUAL
DESCRIPTION	Text-oriented GenAI programs help generate, alter, contextualize, or summarize information using text-to-text and text-to-speech prompts. They can be used for administrative purposes (such as generating a summary of a script or generating routine emails) as well as for creative endeavors (like generating a storyboard or storylines). In addition, these technologies are often employed to answer complex or technical questions.	Audio GenAI programs, platforms, and technologies facilitate the manipulation of existing sounds and the development of new ones. Typical use cases include the generation of a new song or melody (text-to-audio) or voice generation for musical, dubbing, or narrative applications (audio-to-audio or text-to-audio). Applications such as Deep Composer, for example, allow users to generate melodies within seconds via a series of prompts.	Visual-based GenAI programs allow users to generate or modify images. Outputs can be “new” works generated from existing assets (text-to-image), alterations or enhancements (image-to-image), or transformations from one medium to another (image-to-video). These technologies make it possible, for example, to upload landscape photos to virtual production screens in seconds or speed up rotoscoping in post-production.
SAMPLE TECHNOLOGY	<ul style="list-style-type: none"> • ChatGPT • Azure AI • Bard AI • Chatsonic • Storyboard.ai 	<ul style="list-style-type: none"> • Deep Composer • AudioCraft • Stable Diffusion • Jukebox • Dance Diffusion 	<ul style="list-style-type: none"> • DeepDream • PhotoSonic • DALL-E 3 • Midjourney • Big Sleep
SAMPLE TASK APPLICATIONS	<ul style="list-style-type: none"> • Script Writing • Storyboarding • Task Organization • Task Management • Tools Programming 	<ul style="list-style-type: none"> • Sound Editing • Sound Design • Voice Generation • Voice Cloning • Audio Translation 	<ul style="list-style-type: none"> • 3D Modeling • Storyboarding • Animation • Concept Art • Visual Effects
PROMPT TYPES	<ul style="list-style-type: none"> • Text-to-Text • Text-to-Speech 	<ul style="list-style-type: none"> • Text-to-Audio • Audio-to-Audio • Speech-to-Audio 	<ul style="list-style-type: none"> • Text-to-Image • Image-to-Image • Image-to-Text
INDUSTRY USAGE*	68.7%	38.0%	76.7%

* Share of businesses in the six entertainment industries surveyed.
Source: CVL Economics Survey (N=300)

TECHNOLOGY INNOVATION AND LABOR MARKETS

Three recent reports provide some high-level insights into how some of these technologies are already having an impact economy-wide: LinkedIn's "Preparing the Workforce for Generative AI: Insights and Implications,"¹⁸ Indeed's "AI at Work Report: How GenAI Will Impact Jobs and the Skills Needed to Perform Them,"¹⁹ and "GPTs are GPTs: An Early Look at the Labor Market Impact Potential of Large Language Models" from researchers at OpenAI, OpenResearch, and the University of Pennsylvania.²⁰

According to Indeed's report, Software Development, Media & Communications, and Arts & Entertainment are among the top 20 sectors economy-wide facing exposure to GenAI. OpenAI's analysis addresses industry exposure to language model-based AI technologies specifically. It includes Publishing, Broadcasting, Motion Picture and Sound Recording, and Performing Arts among their top 25, underscoring the broad impact GenAI will have across the entertainment sector. LinkedIn's research offers a more nuanced view by differentiating between augmentation and disruption. The Technology, Information and Media sector — which encompasses the Software and Entertainment industries — ranks highest in total GenAI exposure, suggesting that GenAI is likely to play a significant role both in assisting and potentially displacing traditional roles. Entertainment Providers also appear on the list, with a sizable percentage of the industry experiencing both augmentation and disruption.

These reports reveal a consistent narrative: the television, film, gaming, media, and other entertainment industries all currently face significant GenAI exposure. This trend is particularly noteworthy given that these sectors have not previously ranked highly on automation exposure indices. The nature of creative tasks within these industries has been, until now, largely resistant to the types of automation affecting other sectors. However, with the advent of GenAI, the criteria for job exposure and impact are changing. Tasks that are not necessarily rote or routine are now within the reach of automation due to the capabilities of GenAI technology to generate novel and complex outputs.

¹⁸ Karin Kimbrough and Mar Carpanelli, "Preparing the Workforce for Generative AI: Insights and Implications," LinkedIn Economic Graph, August 23, 2023, <https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/PDF/preparing-the-workforce-for-generative-ai.pdf>.

¹⁹ Annina Hering, "Indeed's AI at Work Report: How GenAI Will Impact Jobs and the Skills Needed to Perform Them," Indeed Hiring Lab, September 21, 2023, <https://www.hiringlab.org/2023/09/21/indeed-ai-at-work-report/>.

²⁰ Tyna Eloundou, Sam Manning, Pamela Mishkin, and Daniel Rock, "GPTs are GPTs: An early look at the labor market impact potential of large language models," OpenAI, March 17, 2023, <https://openai.com/research/gpts-are-gpts.poisoning-artists-fight-generative-ai/>.

Table 2: Sectors, Industries, and Occupations Facing Greatest Exposure to GenAI

GenAI already touches nearly every corner of the economy. Highlighted entries include entertainment occupations and/or industries.

(1) Occupational Groups Facing Highest Exposure to GenAI

1	Software Development
2	IT Operations & Helpdesk
3	Information Design & Documentation
4	Mathematics
5	Legal
6	Accounting
7	Human Resources
8	Media & Communications
9	Marketing
10	Banking & Finance
11	Logistic Support
12	Industrial Engineering
13	Project Management
14	Administrative
15	Scientific Research & Development
16	Arts & Entertainment
17	Civil Engineering
18	Architecture
19	Electrical Engineering
20	Education & Instruction

Source: Indeed Hiring Lab

(2) Industries Facing Highest Exposure to Large Language Models

1	Data Processing Hosting and Related Services
2	Other Information Services
3	Publishing Industries (Except Internet)
4	Insurance Carriers and Related Activities
5	Credit Intermediation and Related Activities
6	Securities Commodity Contracts and Other Financial Investments
7	Professional, Scientific, and Technical Services
8	Lessors of Nonfinancial Intangible Assets (Except Copyrighted Works)
9	Broadcasting (Except Internet)
10	Monetary Authorities - Central Bank
11	Funds Trusts and Other Financial Vehicles
12	Management of Companies and Enterprises
13	Wholesale Electronic Markets and Agents and Brokers
14	Telecommunications
15	Electronics and Appliance Stores
16	Nonstore Retailers
17	Religious, Grantmaking, Civic, Professional and Similar Organizations
18	Computer and Electronic Product Manufacturing
19	Motion Picture and Sound Recording Industries
20	Merchant Wholesalers Durable Goods
21	Real Estate
22	Federal, State, and Local Government *
23	Performing Arts Spectator Sports and Related Industries
24	Health and Personal Care Stores
25	Merchant Wholesalers Nondurable Goods

Source: OpenAI

(3) Share of Sectors Augmented and Disrupted by Exposure to GenAI

	Augmented	Disrupted	Total Impact	
1	Technology, Information and Media	41%	36%	77%
2	Accommodation and Food Services	54%	18%	72%
3	Wholesale	26%	46%	72%
4	Financial Services	21%	50%	71%
5	Professional Services	31%	38%	69%
6	Manufacturing	28%	36%	64%
7	Retail	23%	40%	63%
8	Administrative and Support Services	29%	33%	62%
9	Utilities	25%	37%	62%
10	Oil, Gas, and Mining	21%	33%	54%
11	Transportation, Logistics, Supply Chain and Storage	20%	33%	53%
12	Entertainment Providers	19%	31%	50%
13	Farming, Ranching, Forestry	18%	32%	50%
14	Education	33%	16%	49%
15	Consumer Services	23%	24%	47%
16	Government Administration	21%	23%	44%
17	Construction	15%	25%	40%
18	Hospitals and Health Care	18%	17%	35%
19	Real Estate and Equipment Rental Services	10%	19%	29%

Source: LinkedIn Economic Graph Research Institute



THE CREATIVE WORKFORCE

Approximately 29% of work in the arts, design, entertainment, and media sector is characterized by self-employment or some similar type of arrangement. This share is significantly higher than the average across 22 major occupational groups, where self-employment accounts for about 7%. This high incidence of non-standard employment forms is a critical aspect when evaluating the influence of GenAI on job dynamics in these fields.²¹ As GenAI tools become adopted at a wider scale and integrated into workflows, creative industry jobs may become more precarious (that is, more work is contracted out to freelancers or the amount of existing freelance work declines) before the industry fully transitions to newer production methods. Given that freelance, self-employed, and non-standard employment forms are more common in creative occupations, change may not be systematically understood or visible beyond anecdotal data.



The vulnerability of self-employed and gig workers has historically been mitigated by the strong presence of organized labor in the entertainment industries. Compared to a 6% unionization rate across the entire U.S. economy, 8% of jobs in the arts, design, and entertainment sector fall under union representation. In certain industries, organized labor plays an outsized role.²² Unionization rates in the Broadcasting industry were around 11% at last count, with the Motion Picture and Sound Recording Industries coming in even higher at 17%.

This partially accounts for the success that the entertainment industries have had when navigating the intersection of art and technology. Collective bargaining agreements specify the responsibilities and rights of both employers and employees regarding the adoption of new technology. The objective is to ensure that there is a balanced approach, where the interests of the workforce are weighed against the operational and strategic goals of the organization. Collective bargaining has also been instrumental in the development of mitigation strategies. These

strategies are aimed at facilitating the introduction of new technology in the workplace and may include the implementation of employee training programs for new systems, clauses to address job displacement risks, and adjustments in workload. The goal of these strategies is to reduce job displacement and support a smoother transition for all parties involved in the face of technological changes.

²¹ The evolving nature of the labor market for creative workers, particularly with the rise of non-traditional employment forms, poses significant challenges in accurately tracking job disruptions and losses. Traditional metrics, such as those highlighted in the monthly jobs report from the Bureau of Labor Statistics (BLS), are critical for understanding industry employment trends and the unemployment rate. However, the methodologies of these reports have limitations in the context of today's workforce dynamics. The monthly jobs report comprises two key surveys: the Current Employment Survey (CES) and the Current Population Survey (CPS). The CES, encompassing about 160,000 U.S. firms across approximately 400,000 worksites, offers substantial coverage but notably excludes self-employed individuals. On the other hand, while the CPS, which surveys around 60,000 households, does include self-employed persons, it lacks the detailed industrial and geographic insights provided by the CES.

²² U.S. Bureau of Labor Statistics

THE ENTERTAINMENT INDUSTRIES

Several articles, studies, and surveys in the past year have reflected the fears of marginalization and jobs losses among creative workers. What has been less clearly articulated are the perspectives of industry management and how they are thinking about the future of GenAI. In a survey of 300 business leaders across six entertainment industries, over 90% of respondents believed GenAI will play a larger role in the entertainment industries over the next three years, with 26% indicating it would play a significantly larger role. How this role ultimately manifests in these firms has yet to be seen. In the most positive light, GenAI may cut costs, boost output, and open up new forms of expression. It may also, however, automate a large share of workers — both the creative and non-creative minds needed to sustain the development and growth of these industries over the long term — out of their jobs.

Most firms are not waiting to see how this plays out. Among all firms surveyed, 72% can be considered “early adopters” of GenAI technology. Twenty-five percent (25%) of creative businesses reported already having a formal GenAI program in place — compared to 3.9% of businesses economy-wide²³ — and another 47% percent indicated they are in either the planning or early implementation stages of developing such a program (Figure 1). Such high adoption rates should not be surprising. More often than not, the adoption of new technology is tied to self-preservation, and early adopters reported they are investing in GenAI to stay competitive. Many studios are forming specialized departments focused on creating cutting-edge tools that integrate computer vision, machine learning, and foundational models. This integration, in turn, will impact areas once far removed from VFX, ranging from script development and storyboarding to editing and sound engineering (Figure 2).

²³ This aligns with the most recent Business Trends and Outlook Survey (BTOS) conducted by U.S. Census Bureau which found 26.1% of Motion Picture and Sound Recording Industry (NACIS 512) respondents indicated their business had used artificial intelligence in the production of goods and/or services in the previous two weeks (12/04/2023 to 12/17/2023).

²⁴ The term “stochastic parrot” refers to the fact that large language models may be able to generate coherent, convincing texts, but cannot discern the actual meaning of the text itself. They effectively “parrot” back information they are fed.

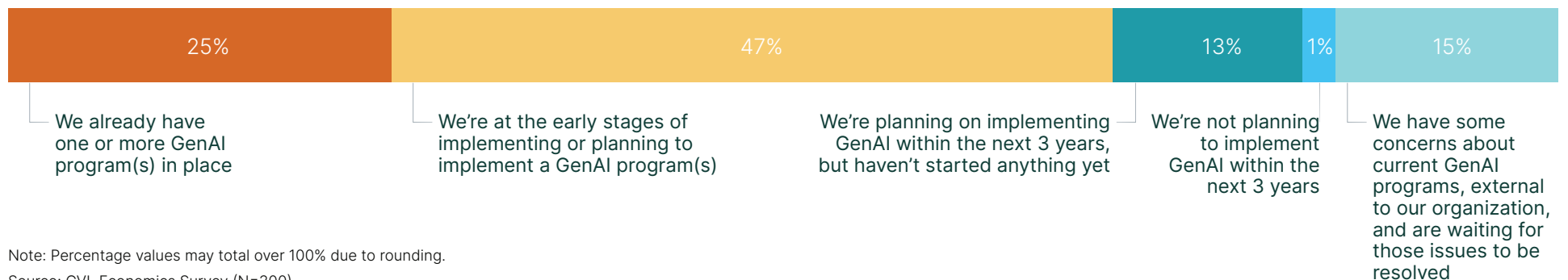


On the other end of the spectrum, 15% of survey respondents said their organizations had concerns about the use of GenAI and would not pursue related technologies until these concerns were addressed. By and large, these issues centered on not only what kind of content was being generated but how that content was being generated (Figure 3). Asked to name their top three concerns,

employees cited issues related to the dangers of current GenAI systems being “stochastic parrots” (42% of the time);²⁴ a lack of transparency over GenAI decision-making processes and output (38%); and misinformation, content falsification, and deepfakes (36%).

Figure 1: GenAI's Expanding Footprint in the Entertainment Industries

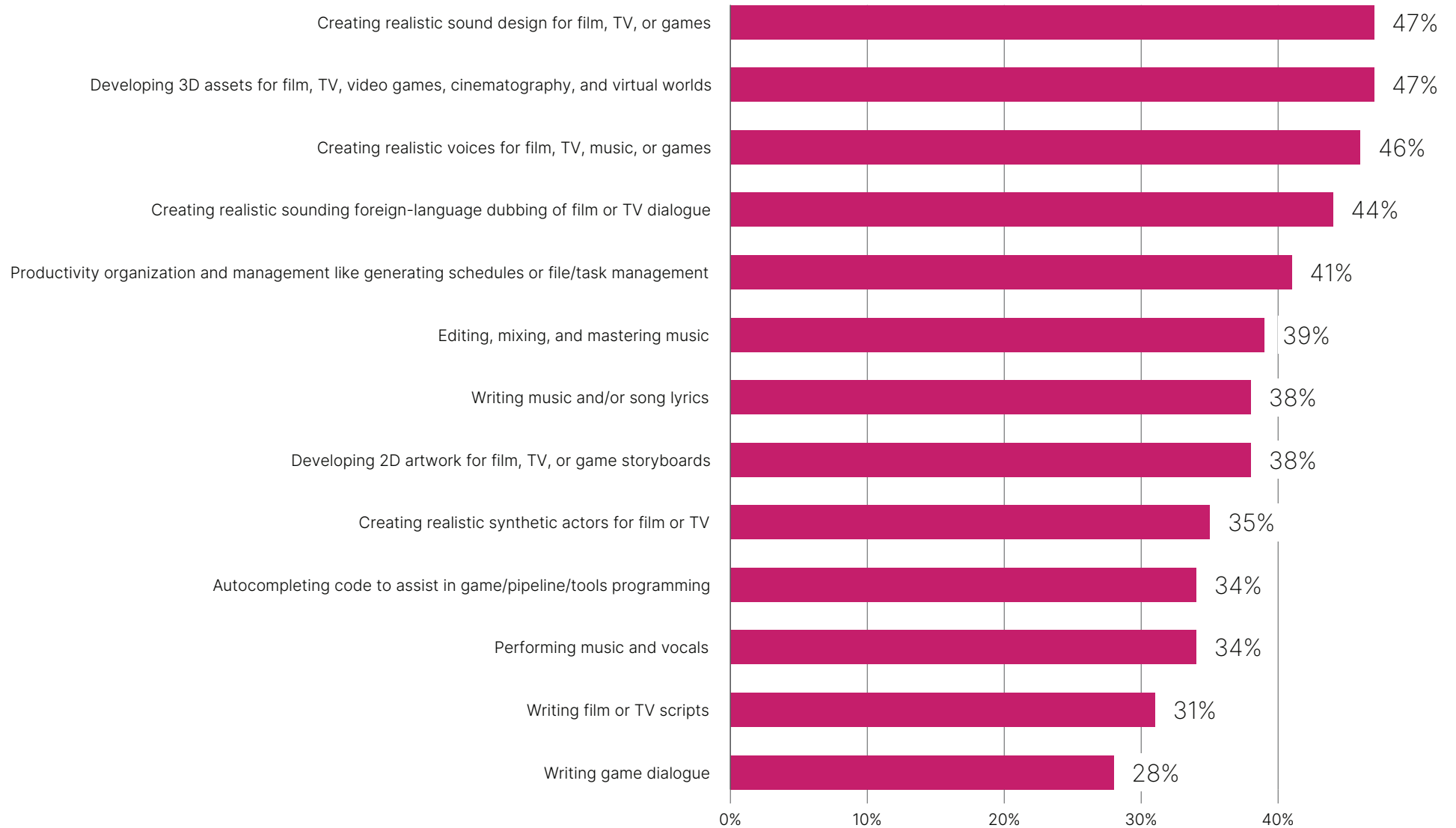
Share of survey respondents who agreed with the following statements:



Note: Percentage values may total over 100% due to rounding.
Source: CVL Economics Survey (N=300)

Figure 2: Adoption of GenAI in the Entertainment Industries

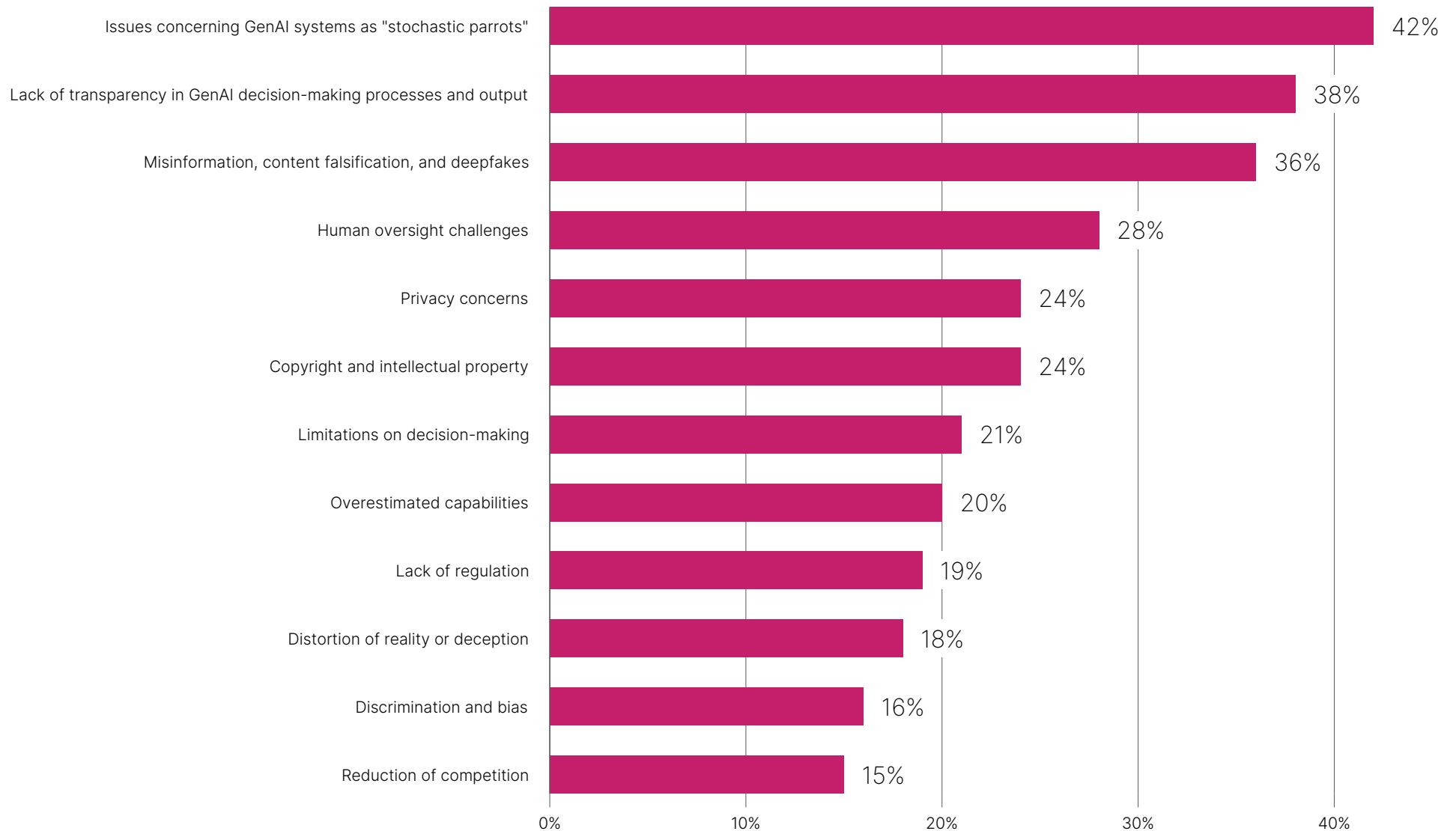
How creative firms expect to use GenAI over the next 3 years



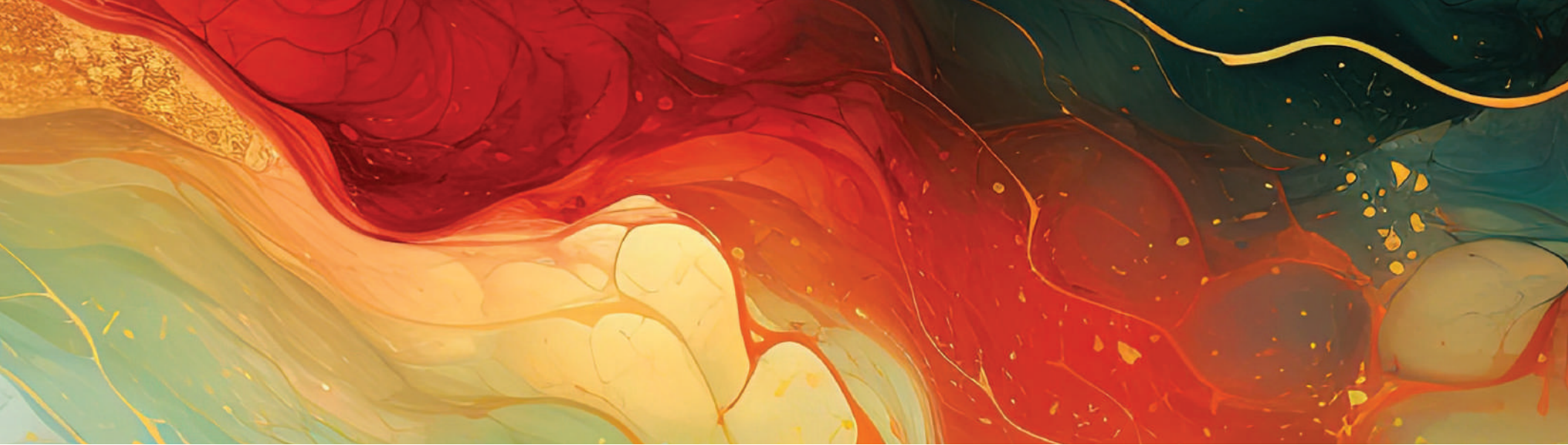
Source: CVL Economics Survey (N=300)

Figure 3: Ethical Concerns Raised by Entertainment Industry Employees

Share of times each issue ranked among the top three employee concerns in each firm



Source: CVL Economics Survey (n=170)



AI Integration and Job Demand

The extent to which creative jobs will be affected by GenAI adoption varies and is difficult to measure in isolation of broader macroeconomic trends, government policies, and changes in consumer preferences. That said, the entertainment industries have been adopting earlier forms of AI technology for years, and the pace of AI integration into creative job roles is increasing at a rapid clip; between 2020 and 2022, for example, the number of job postings that listed the ability to use artificial intelligence tools as a desired skill increased by 122%.²⁵

²⁵ Lightcast.



Mapping these trends onto job demand across a range of creative occupations provides some insight into the role GenAI technology may play going forward (Figure 4). Software Engineers and Video Game Designers experienced high rates of AI integration into their workflows in recent years, while also enjoying high labor demand. These types of jobs would be expected to attract workers who can both develop and utilize GenAI technology, and increasing AI integration would only increase demand for their skill sets.

A high level of AI integration, however, does not necessarily imply high employment growth across the board, and in some cases it can even be associated with declining demand for certain creative roles. For instance, while AI integration

increased 117% in graphic design roles, demand for actual Graphic Designers fell by 3%. While this decline may be correlated to other factors, rapid AI adoption in sectors that once outsourced graphic design services may minimize the need for human talent as AI generated content becomes an adequate substitute.²⁶ The same holds true across several occupations ranging from Production Artists to Audio/Visual Specialists to even Composers.

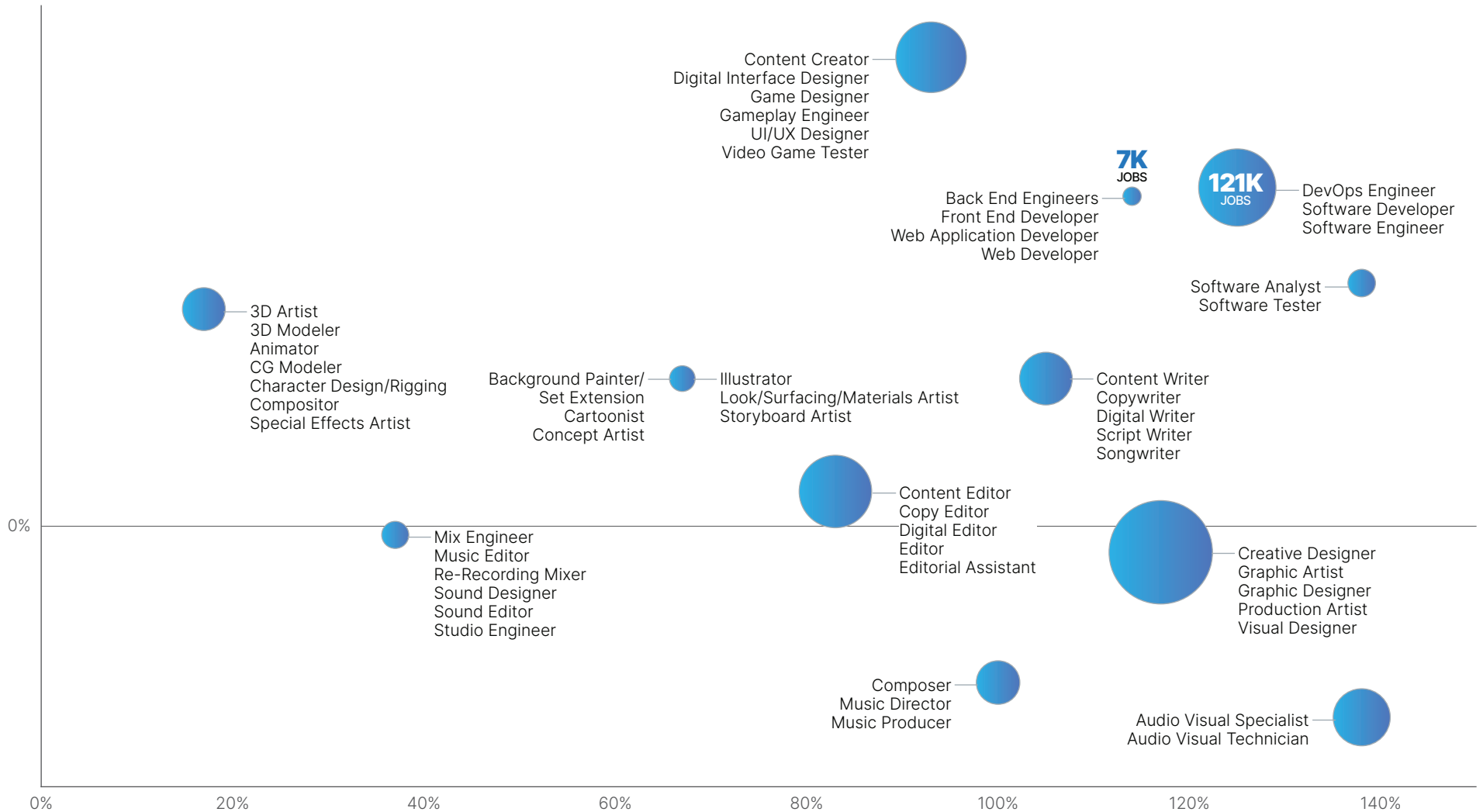
In other cases, the relationship between the two factors may mask emerging realities. By way of example, AI technologies have been less likely to be needed in recent years in both 3D Modeler and Sound Designer roles. These findings suggest that the former (where job growth increased by 25% between 2017 and 2022) would be more insulated

from the disruptive effects of GenAI adoption compared to the latter (where job growth declined by 3%). Yet based on the survey results, both roles may be increasingly vulnerable over the next three years. Taking the long view, it is not even clear that job roles that are seemingly benefiting from AI integration now will also benefit later. The same people developing and utilizing GenAI technology next year may very well program themselves out of a job a few years down the road. The same may hold true for high-tech roles in other sectors. In this sense, what may be viewed as a “creative worker” issue may actually be a more insidious problem winding its way throughout the entire economy.

²⁶ U.S. Bureau of Labor Statistics Job Outlook: Graphic Designers. Available at: <https://www.bls.gov/ooh/arts-and-design/graphic-designers.htm#tab-6>.

Figure 4: AI Integration and Job Demand in Entertainment Industries

Mapping the vulnerability and augmentation of select jobs onto demand for AI skill sets prior to 2023
 Circle size indicates relative number of jobs for each collection of job roles.



Note: Job Demand is measured by the 5-year (2017–2022) job growth for each occupation cluster. AI Integration is measured as the increase in job postings that list artificial intelligence as a desired skill between 2020 and 2022. Job role lists are illustrative and not meant to be exhaustive.

Source: CVL Economics; Lightcast

The use of GenAI, both in form and frequency, can vary drastically from role to role. Some workers may be just becoming acquainted with technologies like ChatGPT and use them for a small share of their day-to-day tasks, whereas programs like DALL-E may become the norm for others who need photorealistic imagery to perform their job. It is this second case that many find most concerning, where GenAI may play a large enough role to “displace” an existing job by either consolidating specific roles, replacing existing job roles with new ones, or even eliminating certain jobs entirely. The impact will not be inconsequential. Based on survey respondents’ GenAI implementation plans, it is estimated nearly 203,800 payroll jobs will be affected by GenAI across the entertainment industries nationwide by 2026.

States with a high concentration of jobs in the entertainment industries, such as California, New York, Georgia, and Washington, will be most affected by GenAI-related job disruption (Figure 5). California — the global hub for entertainment — has the highest concentration of creative industry employment, accounting for 28.1% of U.S. creative industry jobs. California will see about 62,000 creative industry jobs affected by 2026. New York, which also has a large entertainment industry presence, accounts for 14% of the total U.S. creative industry workforce; by 2026, a sufficient number of tasks will have been impacted to cause the consolidation, replacement, or elimination of 26,000 jobs. Georgia and Washington — states with growing media and gaming hubs — each account for almost 4% of total U.S. creative industry jobs and will see 7,800 and 7,000 creative industry jobs disrupted by GenAI, respectively.

203,800

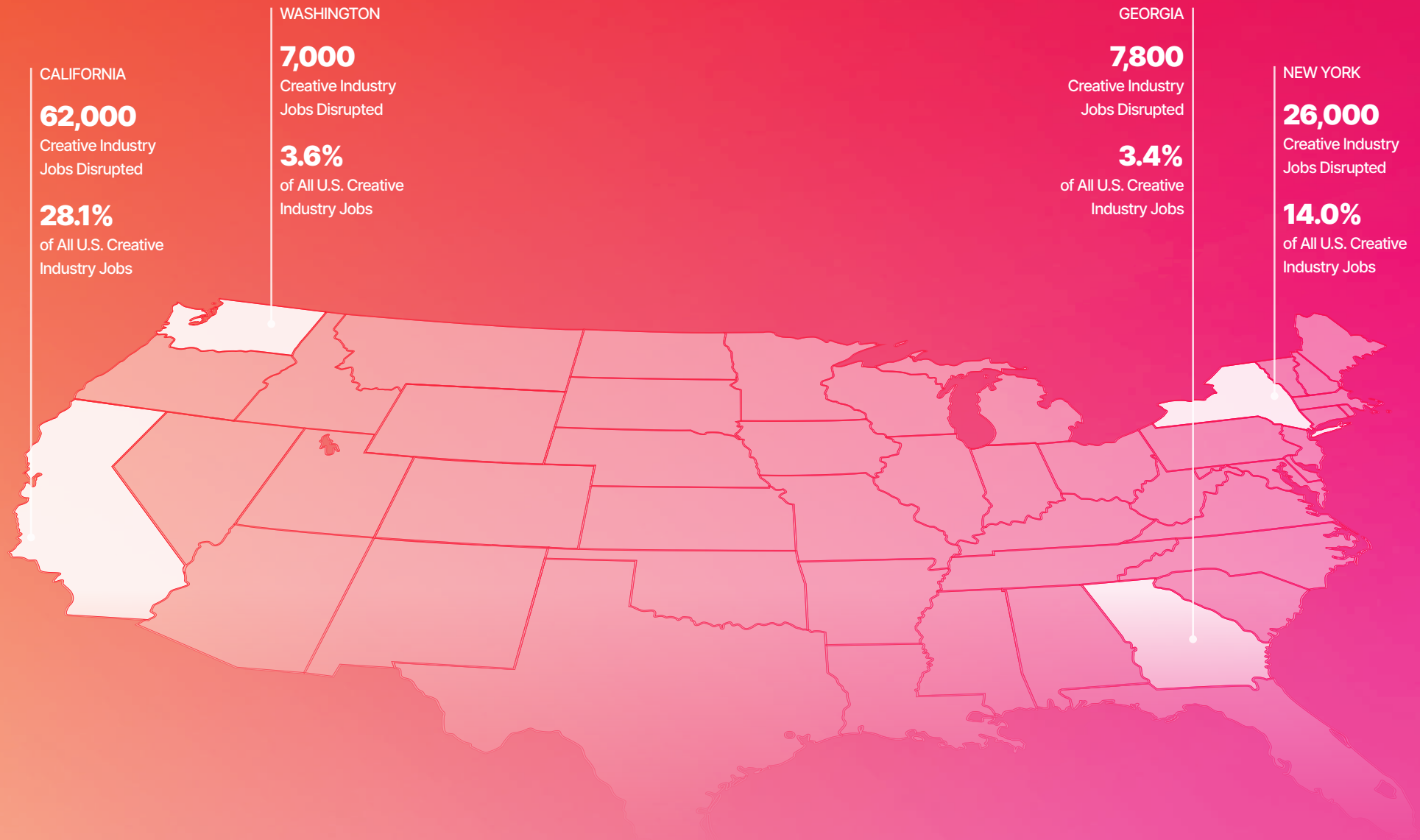
U.S. Entertainment Jobs
Disrupted by 2026

16.1%

Share of U.S. Entertainment Jobs
Disrupted by 2026

Figure 5: Job Disruption in the Entertainment Industries

Impact on jobs in U.S. states with largest creative industry employment by 2026



Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages; O*NET; Lightcast; CVL Economics Survey (N=300)

A key question to ask, then, is which jobs (or specific occupations) are most vulnerable to displacement? The answer lies in examining a given occupation's specific tasks and responsibilities and assessing which ones, to some degree, can be assigned to GenAI technologies. If GenAI will be completing tasks such as 3D modeling, voice generation, storyboarding, and writing at an increasing scale, then it would be reasonable to expect that jobs built around these kinds of tasks will be vulnerable to displacement by GenAI. Although the business leaders surveyed conceded there would inevitably be some job losses, 94% saw the introduction of GenAI leading to new job roles or titles within their organizations.

This yields a follow-up question: will the number of jobs displaced be offset by the number of jobs created? This is difficult to answer at this stage. About half of the early adopters surveyed reported that the adoption of a GenAI program introduced new tasks and responsibilities, some of which required some upskilling or retraining among existing employees. Whether these new tasks and responsibilities translate to expanded job roles, lead to worker turnover, or cause a contraction of the workforce will take time to sort out. This is especially true for the entertainment industries, where many jobs have been largely immune to automation. Now, with GenAI programs growing more versatile and accessible, the ability to generate novel and complex outputs is testing the limits of that immunity.

SHARE OF EARLY ADOPTERS WHO SAID GENAI HAS:

59%

Increased efficiency in routine tasks

51%

Introduced new tasks and responsibilities

49%

Required employee upskilling or retraining

43%

Reduced time spent on repetitive tasks

Source: CVL Economics Survey (n=214)

Desired Skills in the Entertainment Industries

As the use of GenAI technology becomes more pervasive, the value of certain job skills is expected to change.

Demand for machine learning skills is expected to grow as businesses expand use of GenAI in their operations. Creativity and domain knowledge, which is derived from experience rather than data sets, are especially high-valued. In fact, more survey respondents (45%) viewed creativity capabilities as more desirable than machine learning skill sets (42%), with domain knowledge (38%) ranking closely behind. As job requirements and skill demands evolve, businesses must adopt more strategic talent management approaches. Over 85% of survey

respondents expected their employees would either need some new skills or a completely new set of skills in the next three years to work with GenAI.

Ensuring that uniquely human capabilities like creativity and domain knowledge are also prioritized will need to be factored into the size and composition of a firm's creative workforce. To some degree, such a sentiment resonates at the management level. An overwhelming majority (91%) of industry leaders surveyed for this study believe consumers can

discern between products created by humans and those generated by AI. Indeed, the question of "authenticity" can affect perceived value. Eighty-four (84%) percent of respondents said it was important to emphasize and promote the "human-made" aspects of artistic products rather than the "AI-generated" components. While consumers may feel confident today about their ability to make such a distinction, however, the increasing sophistication of GenAI is likely to blur the lines sooner than most realize.

SHARE OF SURVEY RESPONDENTS WHO SAID THE INCREASING PREVALENCE OF GENAI MAKES THE FOLLOWING SKILLS AND/OR CAPABILITIES MOST VALUABLE:

45%

Creativity

42%

Machine Learning

38%

Domain Knowledge

Source: CVL Economics Survey (N=300)





Film, Television, and Animation Industry²⁷

From scriptwriting to acting, many tasks and roles across the Film, Television, and Animation industry have the potential to be completed by GenAI technology, and early adopters account for almost 70% of firms in the industry. Almost half (47%) of all survey respondents expect GenAI will be most effective in developing 3D assets for film, television, gaming, and virtual worlds.

Visual effects (VFX) studios, for instance, are increasingly becoming more involved from the project's inception, which allows them to employ new technologies, enhance creativity, and mitigate risks earlier in the production cycle. With GenAI technology at hand, the industry is being pushed to reexamine and revamp core processes, workflows, talent needs, and digital asset management.

This growing capability and expanding footprint raise the stakes for the industry's workforce. The recent Disney+ release of Marvel's *Secret Invasion*, for example, featured an opening sequence that was heavily generated by artificial intelligence. The public backlash against what was believed to be a work that featured no human input prompted Method Studios, a VFX studio/vendor who used GenAI to help create the opening credits, to issue a statement that the process in fact included contributions by Art Directors, Animators, and Artists.²⁸ Still, as one observer notes, "What isn't good is when artists get

completely removed from the creative process entirely, and the opening of *Secret Invasion* feels very much like it's heralding that potential future."²⁹

In the United States, the Film, Television, and Animation industry job count totals 555,000 across 39,500 establishments.³⁰ Nearly 120,000 payroll jobs are likely to be disrupted by GenAI by 2026, which accounts for over 21% of all Film, Television, and Animation jobs. States that have a high concentration of industry activity will be most impacted by GenAI (Figure 6). California, which has the highest concentration of industry jobs (a location quotient of 2.81) will see about 39,500 jobs displaced by 2026, accounting for 33.3% of all industry jobs that will be either consolidated, replaced, or eliminated. New York will see about 15,100 (or 12.8%) industry jobs affected. Georgia, which has an exponentially growing industry, will see about 6,100 industry jobs displaced by GenAI by 2026.

39,500

Total Establishments
(2022)

555,000

Industry Employment
(2023)

68.7%

Share of GenAI Early Adopters
(2023)

118,500

Industry Jobs Disrupted by GenAI
(by 2026)

21.4%

Share of Industry Jobs Disrupted
by GenAI (by 2026)

Source: Bureau of Labor Statistics Quarterly
Census of Employment and Wages;
Lightcast; CVL Economics Survey (n=150)

²⁷ The "Film, Television, and Animation" industry analysis in this section includes responses from "Radio and Broadcasting" industry survey participants.

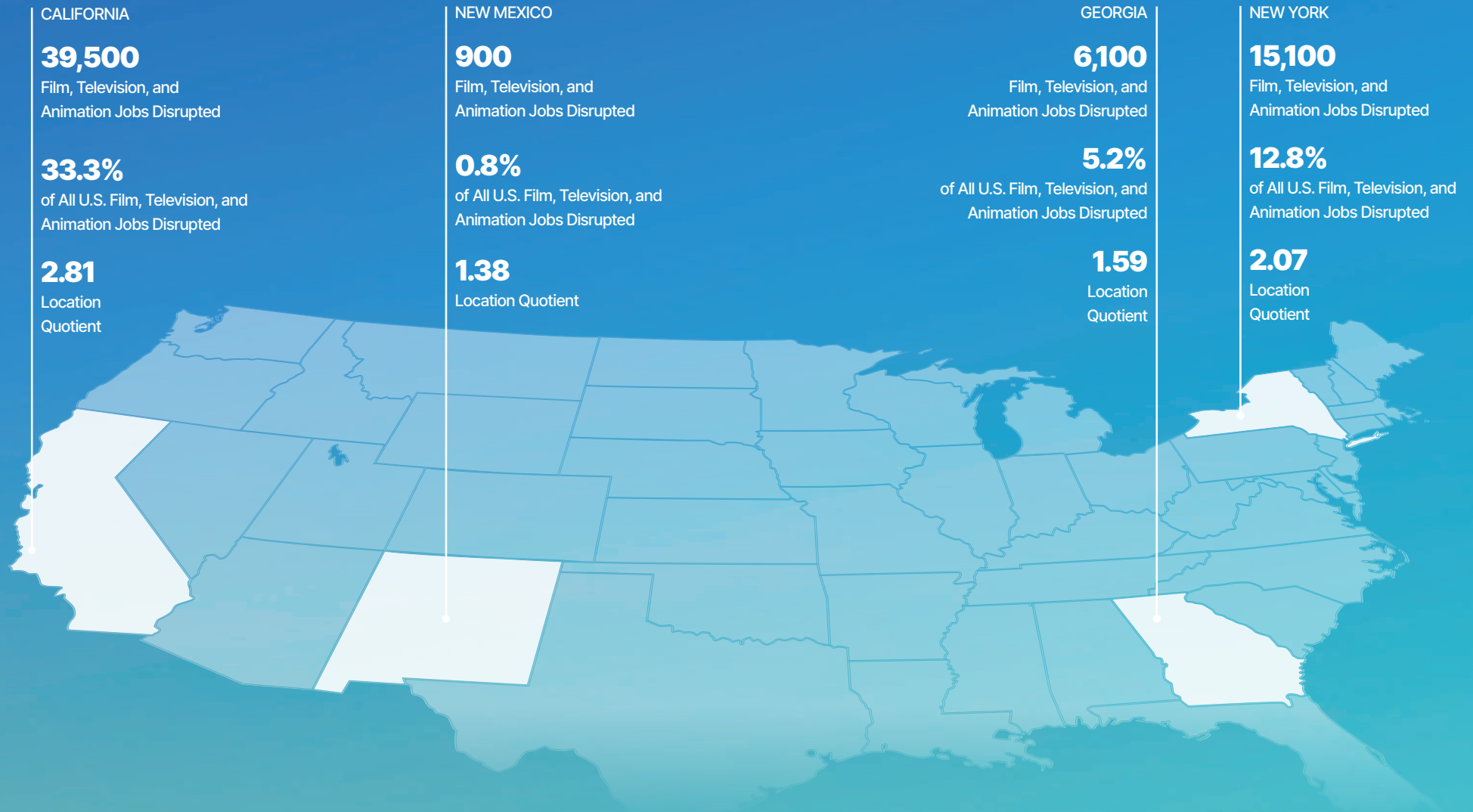
²⁸ Carolyn Giardina, "'Secret Invasion' Opening Using AI Cost 'No Artists' Jobs," Says Studio That Made It (Exclusive)", Hollywood Reporter, June 21, 2023 <https://www.hollywoodreporter.com/tv/tv-news/secret-invasion-ai-opening-1235521299/>.

²⁹ Charles Pulliam-Moore, "Unfortunately, Secret Invasion's AI credits are exactly what we should expect from Marvel," The Verge, June 27, 2023, <https://www.theverge.com/2023/6/27/23770133/secret-invasion-ai-credits-marvel>.

³⁰ An "establishment" is a physical location of a business, which differs from a "firm." A firm is a single entity that may have one or more establishments, each with its own distinct address.

Figure 6: Job Disruption in the Film, Television, and Animation Industry

Impact on jobs in U.S. states with largest Film, Television, and Animation employment concentration by 2026



Note: Location Quotient measures a region's industry employment concentration relative to the United States as a whole. A Location Quotient greater than 1 indicates industry employment accounts for a larger share of the regional economy than it does nationwide.

Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages; O*NET; Lightcast; CVL Economics Survey (n=150)

When thinking about the types of Film, Television, and Animation tasks and responsibilities — and by extension, jobs — that face higher exposure to GenAI integration, the production cycle can provide a useful lens. Eighty percent (80%) of early adopters of GenAI in the industry are currently using or are planning to use GenAI technology in post-production processes (Figure 7), which focuses on editing and adding visual effects to finalize content. The GenAI program TrueSync, for example, can manipulate the movement of actor’s lips to accommodate dubbing in different languages.³¹ Not only was the use of this type of technology a sticking point during the negotiations between SAG-AFTRA and AMPTP, but its proliferation is also likely to suppress demand for multilingual voice actors in emerging fields like entertainment localization.³²

Similar displacement will also occur in other stages, with about 70% of early adopters engaged in the production phase and another 60% engaged in pre-preproduction. In the movie *Here*, starring Tom Hanks and Robin Wright (to be released in 2024), software developed by Metaphysic was used to “de-age” the actors, whereas, previously, hair and makeup artists or younger actors may have been employed to approximate the same ends.³³ Similarly, GenAI is now often used in pre-production to help create images that can speed up pre-visualization, character design,

and storyboarding processes, minimizing the need for the holistic skill sets offered by concept artists, illustrators, and animators.³⁴

Among early adopters in Film, Television, and Animation, roughly 44% are implementing GenAI technology to assist in generating 3D models and 39% in generating character and environment design tasks. Thirty-seven percent (37%) are using the technology to assist in voice generation and cloning and compositing tasks. Overall, jobs associated with these types of tasks will be most affected by GenAI, such as 3D Modelers, Sound Editors, and Concept Artists (Table 3).

Roughly one in three business leaders across Film, Television and Animation predict job displacement over the next three years for Sound Editors and 3D Modelers. Job titles including Sound Design, Compositors, and Graphic Designer were flagged as vulnerable to displacement by roughly one in four respondents. One in three saw Re-Recording Mixers, Broadcast Technicians, Audio and Video Technicians as vulnerable. Fifteen percent (15%) of respondents predicted jobs for Storyboard Artists, Illustrators, Look/Surface/Materials Artists, and Animators were at risk for consolidation, replacement, or elimination by 2026.

TOP GENAI PROGRAMS USED IN THE FILM, TELEVISION, AND ANIMATION INDUSTRY:

Azure AI

ChatGPT
(OpenAI)

Imagen
(Google)

StarryAI

Deep Dream

Source: CVL Economics
Survey (n=150)

³¹ Cate Lawrence, “Generative AI is bringing the biggest disruption to filmmaking in 100 years,” Tech.eu, January 23, 2023, <https://tech.eu/2023/01/23/flawless-brings/>.

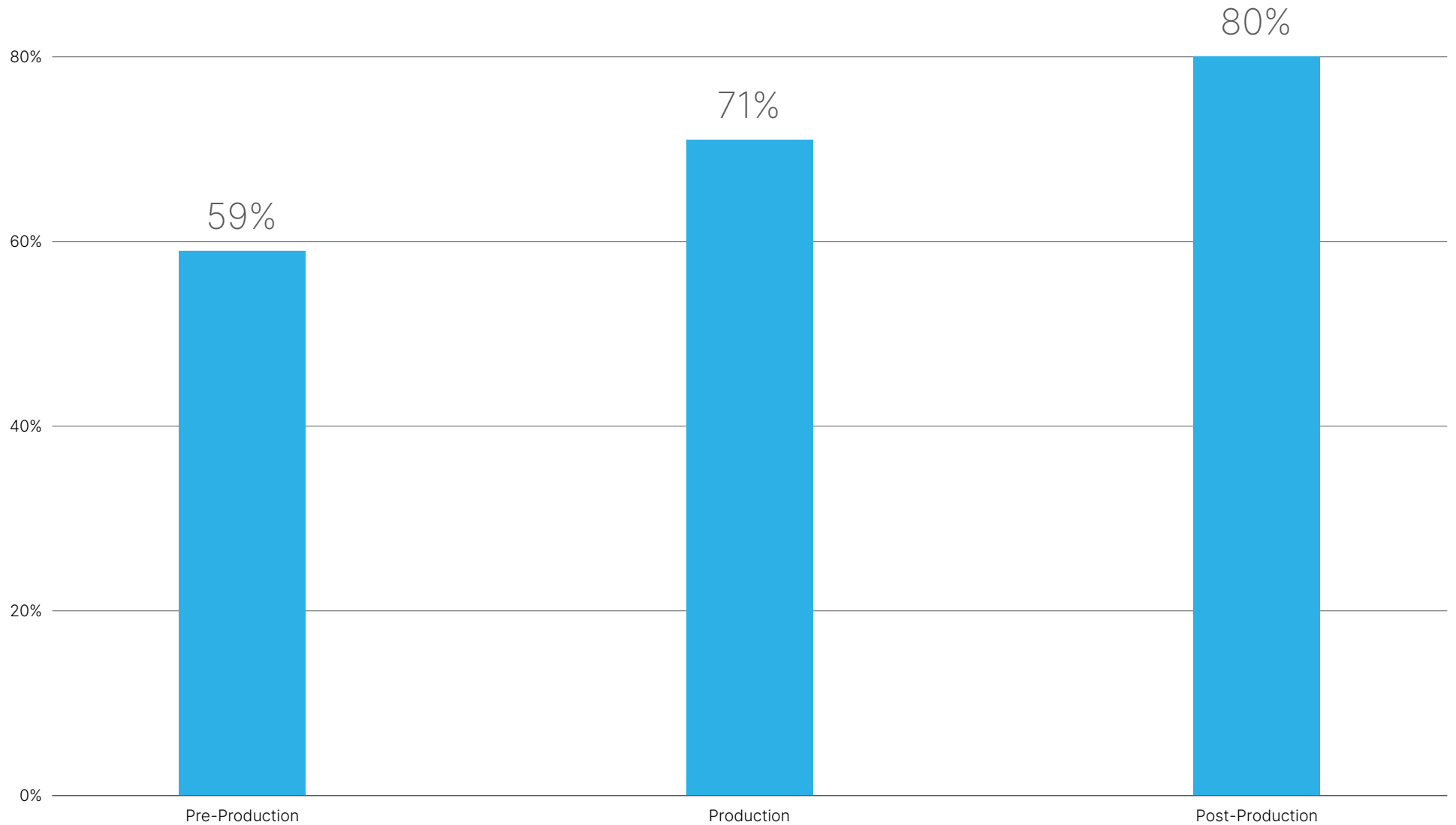
³² Andreas Wiseman, “The Future Of Film Dubbing? ‘Fall’ AI Firm Flawless Partners With XYZ & Tea Shop To Acquire & “Visually Translate” Foreign Language Movies — Cannes Market,” Deadline, May 19, 2023, <https://deadline.com/2023/05/ai-fall-dubbing-flawless-xyz-tea-shop-buy-movies-cannes-1235373298/>.

³³ Diana Lodderhose, “Technologies Like AI & Unreal Engine Are Having A Big Impact On The Entertainment Business, But Where Will It Go From Here?,” Deadline, May 21, 2023, <https://deadline.com/2023/05/ai-unreal-engine-technology-disruptors-1235364383/>.

³⁴ Nate Bek, “This generative AI startup wants to help content creators in the storyboarding process,” GeekWire, April 13, 2023, <https://www.geekwire.com/2023/this-generative-ai-startup-wants-to-help-content-creators-in-the-storyboarding-process/>

Figure 7: GenAI Use in Film, Television, and Animation Industry

Share of Film, Television, and Animation industry firms using GenAI in each phase of the production cycle



Source: CVL Economics Survey (n=150)

Table 3: GenAI Impact on Film, Television, and Animation Industry Tasks*Share of survey respondents who reported GenAI would impact the following tasks:*

TASK		SAMPLE JOBS
<u>3D Modeling</u>	44%	3D Modeler, CG Modeler, Design Engineer, Product Design Manager, Video Designer, Motion Graphic Artist
<u>Character and Environment Design</u>	39%	Illustrator, Concept Artist, Environment Artist, Character Artist, Cartoonist
<u>Voice Generation and Cloning</u>	37%	Sound Designer, Sound Editor, Mix Engineer, Music Editor
<u>Compositing</u>	37%	Compositor, Nuke Compositor, Motion Designer, FX Technical Director
<u>Sound Design</u>	34%	Sound Editor, Sound Designer, Re-recording Mixer
<u>Tools Programming</u>	29%	Digital Interface Designer, Broadcast Technician, Software Engineer, Technical Project Manager, Technical Artist
<u>Script Writing</u>	29%	Script Writer, Associate Producer, Production Assistant
<u>Animation and Rigging</u>	27%	Special Effects Artist, Animator, Graphic Designer, Technical Animator, Rigging Manager, Entertainment Technician
<u>Concept Art/Visual Development</u>	26%	Storyboard Artist, Concept Artist, Creative Director, Graphic Designer
<u>Light/Texture Generation</u>	25%	Texture Artist, Look/Surfacing/Materials Artist, Background Painter, Environment Artist, Modeler, Lighting Technician

Source: 2023 CVL Economics Survey (n=150); Lightcast



Music and Sound Recording Industry

The integration of GenAI in Music and Sound Recording has sparked ethical concerns around the loss of authenticity and creativity in music and sound production. With the capability to recreate melodies and replicate musicians' voices convincingly and quickly, it is becoming easier than ever to generate a music track without any direct human involvement.³⁵ This also means it has become easier to violate existing copyright laws and generate deepfakes by using artists' voices or work without their permission.



For instance, in April 2023, hip hop fans embraced *Heart on My Sleeve*, a track attributed to Drake featuring the Weeknd. Millions of streams hit before it was confirmed that the whole song was generated by GenAI. Fears of copyright infringement led to the song being removed from most streaming services, but the precedent had been set. Even Spotify, which was among the platforms that pulled *Heart on My Sleeve*, has refused to commit to a ban on all AI-generated content.³⁶

There are 5,000 establishments and 21,300 employees in Music and Sound Recording nationwide. About half (53%) of industry firms are early adopters of GenAI programs. Compared to other entertainment industries like Gaming and Film, Television, and Animation, firms in Music and

Sound Recording have been slower to adopt GenAI programs. About 37% of business leaders surveyed are planning to implement GenAI within the next three years but haven't yet begun the program development process.

Nearly 1,800 payroll jobs will be affected in this industry across the U.S. by 2026. At about 450 jobs, California will feel the greatest job disruption over the same time horizon (Table 8), but Tennessee, which has the largest industry employment concentration relative to its own economy, will feel the impact more. It is only appropriate then that Tennessee is the first state in the nation to pursue legislation protecting musicians from the abuse of GenAI technologies.³⁷

5,000

Total Establishments
(2022)

21,300

Industry Employment
(2023)

53.3%

Share of GenAI Early Adopters
(2023)

1,800

Industry Jobs Disrupted by GenAI
(by 2026)

8.4%

Share of Industry Jobs Disrupted
by GenAI (by 2026)

Source: Bureau of Labor Statistics Quarterly
Census of Employment and Wages;
Lightcast; CVL Economics Survey (n=60)

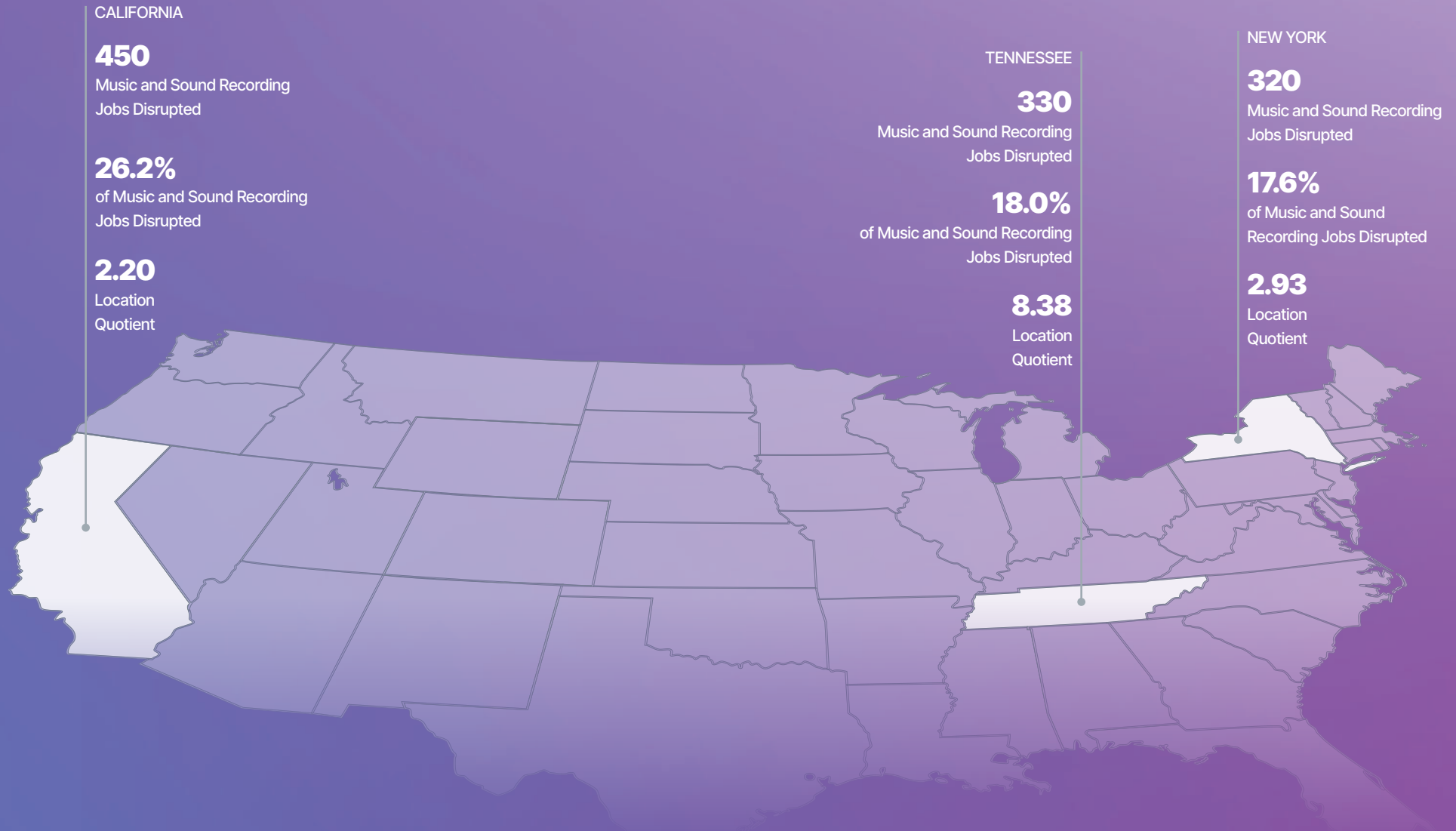
³⁵ Emilia David, "TikTok can generate AI songs, but it probably shouldn't," The Verge, January 19, 2024, <https://www.theverge.com/2024/1/18/24043432/tiktok-generative-ai-music-viral-bloom>.

³⁶ Zoe Kleinman, "Spotify will not ban AI-made music, says boss," BBC, September 25, 2023, <https://www.bbc.com/news/technology-66882414>.

³⁷ Audrey Gibbs and Vivian Jones, "Gov. Bill Lee proposes 'ELVIS Act' to protect musicians, songwriters from misused AI," The Tennessean, January 10, 2024, <https://www.tennessean.com/story/entertainment/music/2024/01/10/ai-music-gov-bill-lee-bill-protect-artists-artificial-intelligence/72163690007/>

Figure 8: Job Disruption in the Music and Sound Recording Industry

Impact on jobs in U.S. states with largest Music and Sound Recording employment concentration by 2026



Note: Location Quotient measures a region's industry employment concentration relative to the United States as a whole. A Location Quotient greater than 1 indicates industry employment accounts for a larger share of the regional economy than it does nationwide.

Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages; O*NET; Lightcast; CVL Economics Survey (n=60)

Approximately 63% of Music and Sound Recording early adopters use GenAI technology for pre-production processes (Figure 9). GenAI is used to help generate lyrics and melodies, realistic voices, and instrumental arrangements. Programs like AIVA, which has been available since 2016, generate songs by analyzing patterns among an extensive database of compositions.³⁸ More recent offerings, like the Stanford Institute for Human-Centered Artificial Intelligence's Anticipatory Music Transformer, allow users to input their own song components into a program to generate accompaniments and variations.³⁹ Viewed in a favorable light, such GenAI programs can be tools that augment creativity. At the same time, the democratization of composition makes it easier for non-musicians to develop works that can be featured in commercials, video games, and other applications where songwriters or composers would otherwise be commissioned.

Just over half of early adopters (54%) reported using GenAI technology in production processes, and only one third said they were deployed during post-production. One of the more famous examples in the past year involved the November 2023 release of *Now and Then*, dubbed "the last Beatles song." Wingnut Films' machine-learning AI technology MAL (the same audio technology used in Peter

Jackson's 2021 Beatles documentary series) was used to isolate and enhance John Lennon's voice from a forty-year-old cassette recording.⁴⁰ In this case, MAL allowed engineers to complete a task that would not have been possible otherwise. By the same token, though, it is not difficult to foresee how similar technologies can invert the sound engineer's role from a principal to supporting one.

Most early adopters in Music and Sound Recording deploy GenAI technology to assist with voice generation and cloning (57%) and music generation and recording (52%). About half use GenAI programs for lyrics generation and about 45% and 40% of respondents use GenAI for mastering and mixing, respectively. Jobs associated with these tasks will be most affected by GenAI, such as Sound Designers, Sound Engineers, Music Editors, Lyricists, and Composers (Table 4). Business leaders in Music and Sound Recording foresee Sound Designers being the job most likely to be consolidated, replaced, or eliminated, with 55% foreseeing GenAI-related displacement in that occupation over the next three years. A little over 40% of business leaders see Music Editors, Audio Technicians, and Sound Engineers being vulnerable. One in three also foresee potential displacement for Songwriters, Composers, and Studio Engineers by 2026.

TOP GENAI PROGRAMS USED IN THE MUSIC AND SOUND RECORDING INDUSTRY:

Azure AI

Deep Dream

ChatGPT
(OpenAI)

Stable Diffusion

Photosonic

Source: CVL Economics
Survey (n=60)

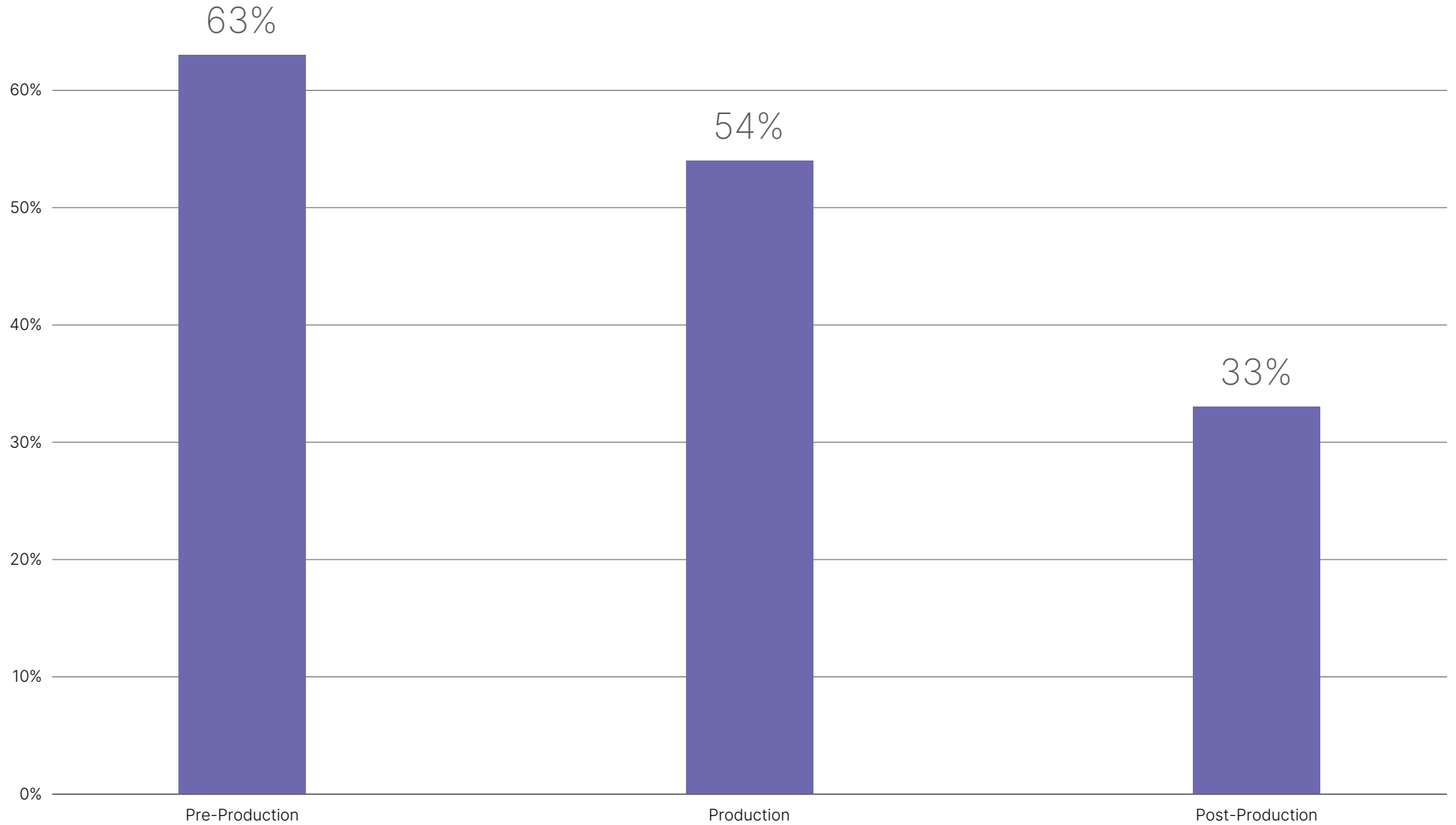
³⁸ David Henkin, "Orchestrating the Future — AI in the Music Industry," *Forbes*, December 5, 2023, <https://www.forbes.com/sites/davidhenkin/2023/12/05/orchestrating-the-future-ai-in-the-music-industry/?sh=34f116dd4f64>.

³⁹ See John Thickstun, David Hall, Chris Donahue, Percy Liang, "Anticipatory Music Transformer," arXiv, June 14, 2023, <https://doi.org/10.48550/arXiv.2306.08620>.

⁴⁰ Joe Coscarelli, "The Beatles' 'Now and Then,' Billed as 'Last Song,' Due Nov. 2." *The New York Times*, October 26, 2023, <https://www.nytimes.com/2023/10/26/arts/music/beatles-final-song-now-and-then.html>

Figure 9: GenAI Use in Music and Sound Recording Industry

Share of Music and Sound Recording industry firms using GenAI in each phase of the production cycle



Source: CVL Economics Survey (n=60)

Table 4: GenAI Impact on Music and Sound Recording Industry Tasks

Share of survey respondents who reported GenAI would impact the following tasks:

TASK		SAMPLE JOBS
Voice Generation and Cloning	57%	Sound Designer, Composer, Sound Engineer
Music Generation and Recording	52%	Sound Engineer, Studio Engineer, Music Editor, Audio Technician
Lyrics Composition	50%	Lyricist, Songwriter
Mastering	45%	Sound Editor, Music Producer
Mixing	40%	Mix Engineer, Composer
Tools Programming	27%	Software Engineer, Software Developer

Source: 2023 CVL Economics Survey (n=60); Lightcast



Gaming Industry⁴¹

The Gaming industry relies heavily, more so than the other entertainment industries, on GenAI to carry out tasks like generating storyboards, character designs, renders, and animations. In fact, by some estimates GenAI may contribute to more than half of the game development process in the next five to ten years.⁴² Even today there are cases where GenAI has been the dominant driver in bringing a game to market, such as Scriptic's Dark Mode, an "interactive horror anthology" developed in partnership with OpenAI and using DALL-E 2. As Scriptic's founder Nihal Tharoor noted, the goal of the project was to use "generative AI as a total solution for media production."⁴³

In another sign of game development moving away from dedicated creative talent, gaming startup Auxuman partnered with LG and Orbit to give consumers the ability to generate full-featured online multiplayer games from the comfort of their own homes. In response to specific prompts to select the type of game, locations, and character styles, a GenAI app generates a “metaverse” for them.⁴⁴ In the words of Auxuman’s Chief Executive Officer Negar Shaghagi, “Most of what we do is research and development on how we can use AI to simplify game creation.”

Auxuman’s initial foray into GenAI involved ways of giving non-playable characters (NPCs) in video games a seemingly greater degree of agency. Whereas NPCs in conventional games are categorized as being one-dimensional and with a limited number of pre-determined responses to player inputs, GenAI has opened up new possibilities. Ghostwriter, a text-based GenAI program, is being deployed to increase the ways that NPCs can respond with realistic dialogue based on the player’s input — even enabling the characters’ mood and tone of speech to change.⁴⁵ Although this expands opportunities from the player’s perspective, opportunities for creative content developers and writers may decrease as a result.

Gaming is among the fastest growing U.S. industries overall and home to 24,500 establishments and 390,500 employees. Among the entertainment industries, Gaming had the highest share of firms that were early adopters of GenAI. Nearly 90% of firms have implemented or are in the process of implementing GenAI programs. These technologies will create new opportunities for job creation in Gaming but will also lead to job consolidation, replacement, and elimination for certain roles. Over 52,400 payroll jobs are expected to be affected by GenAI in the United States by 2026. With an estimated 19,400 jobs disrupted, California will account for nearly 40% of all jobs likely to have a sufficient number of tasks impacted by GenAI to be either consolidated or replaced nationwide over the next three years (Figure 9). Washington — where Gaming has grown significantly in recent years and the industry location quotient is 4.84 — will feel the effects of job displacement more pointedly by comparison; the state is expected to see over 4,600 gaming industry jobs disrupted by 2026.

24,500

Total Establishments
(2022)

390,500

Industry Employment
(2023)

86.7%

Share of GenAI Early Adopters
(2023)

52,400

Industry Jobs Disrupted by GenAI
(by 2026)

13.4%

Share of Industry Jobs Disrupted
by GenAI (by 2026)

Source: Bureau of Labor Statistics Quarterly
Census of Employment and Wages;
Lightcast; CVL Economics Survey (n=60)

⁴¹ The “Gaming” industry analysis in this section includes responses from “Media Streaming Distribution Services, Social Networks, and Content Providers” survey participants.

⁴² Anders Christofferson, Andre James, Tom Rowland, and Imogen Rey, “How Will Generative AI Change the Video Game Industry?” Bain & Company Brief, September 14, 2023, <https://www.bain.com/insights/how-will-generative-ai-change-the-video-game-industry/>.

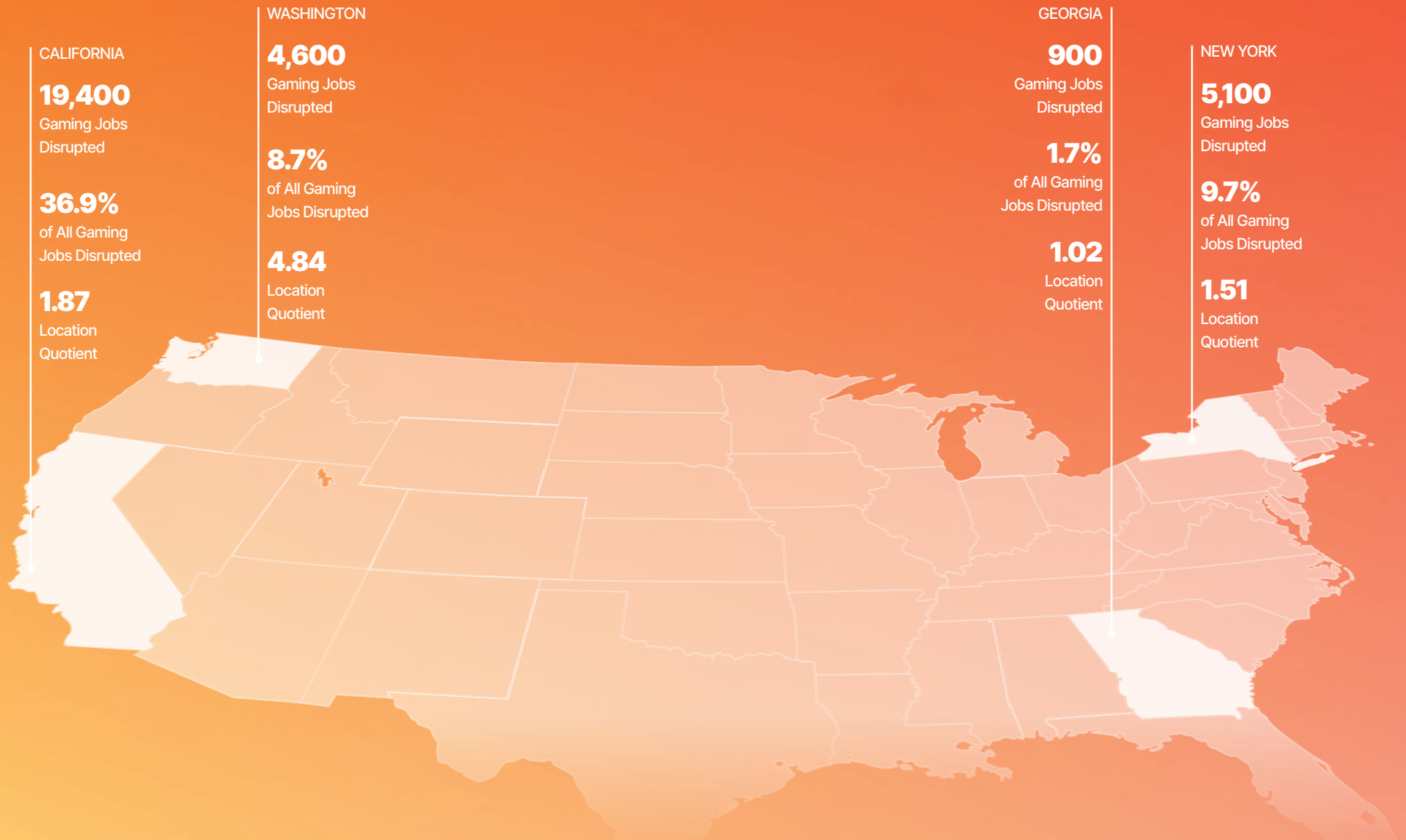
⁴³ Dean Takahashi, “ElectricNoir debuts Dark Mode as an AI-generated horror game,” Venture Beat, January 18, 2023, <https://venturebeat.com/games/electricnoir-debuts-dark-mode-as-an-ai-generated-horror-game/>.

⁴⁴ Dean Takahashi, “Auxuman lets gamers generate multiplayer games on LG TVs using simple text input,” Venture Beat, January 31, 2023, <https://venturebeat.com/ai/auxuman-brings-generative-ai-multiplayer-games-to-lg-tvs/>

⁴⁵ Rebecca Cairns, “Video games are in for quite a trip: How generative AI could radically reshape gaming,” CNN, October 23, 2023, <https://www.cnn.com/world/generative-ai-video-games-spc-intl-hnk/index.html>.

Figure 10: Job Disruption in the Gaming Industry

Impact on jobs in U.S. states with largest Gaming employment concentration by 2026



Note: Location Quotient measures a region's industry employment concentration relative to the United States as a whole. A Location Quotient greater than 1 indicates industry employment accounts for a larger share of the regional economy than it does nationwide.

Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages; O*NET; Lightcast; CVL Economics Survey (n=60)

The vast majority of Gaming firms surveyed have implemented GenAI across the entire production cycle, and nearly 95% of firms use this technology for post-production processes (Figure 11). About 28% of firms use GenAI to generate animation, rigging, and motion capture, 27% to generate lighting and texturing, and 22% to generate storyboards (Table 5). Jobs associated with these tasks include CG Modelers, Concept Artists, Sound Designers and Editors, Special Effects Artists, Animators, and Motion Capture Specialists.

Business leaders expect GenAI to play a larger role going forward in tasks like generating 3D models (55% of respondents); generating concept art and visual development (40%); and generating sound design, and voice generation and cloning (37%). Roughly one in three surveyed predicted job displacement over the next three years for Software Developers, Sound Editors, Software Analysts and Testers, and Special Effects Artists. Roughly 20% reported that the job titles of 3D Artist, Game Designer, UI/UX Designer, and Video Game Tester would be vulnerable.

TOP GENAI PROGRAMS USED IN THE GAMING INDUSTRY:

ChatGPT
(OpenAI)

Imagen
(Google)

AzureAI

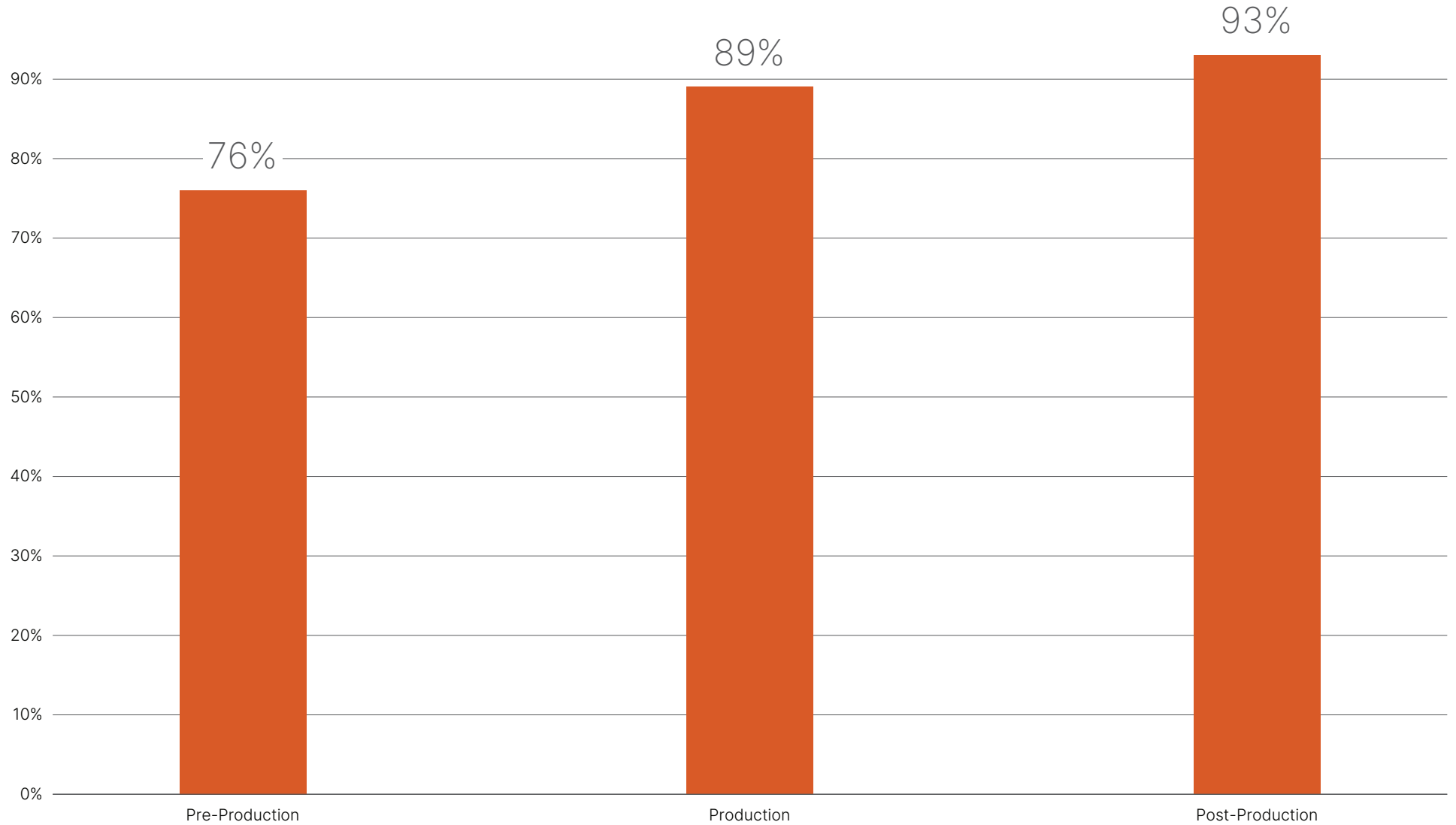
Stable Diffusion

Jukebox MuseNet

Source: CVL Economics
Survey (n=60)

Figure 11: GenAI Use in Gaming Industry

Share of Gaming Industry firms using GenAI in each phase of the production cycle



Source: CVL Economics Survey (n=60)

Table 5: GenAI Impact on Gaming Industry Tasks

Share of survey respondents who reported GenAI would impact the following tasks:

TASK		SAMPLE JOBS
<u>3D Modeling</u>	55%	3D Modeler, CG Modeler, Design Engineer, Product Design Manager, Video Designer, Motion Graphic Artist
<u>Concept Art / Visual Development</u>	40%	Concept Artist, Creative Director, Graphic Designer, Technical Artist, Color Designer, Layout Artist, Texture Artist
<u>Character and Environment Design</u>	37%	Illustrator, Concept Artist, Environment Artist, Character Artist, Cartoonist
<u>Sound Design</u>	37%	Sound Editor, Sound Designer, Re-recording Mixer
<u>Voice Generation and Cloning</u>	37%	Sound Designer, Sound Editor, Mix Engineer, Music Editor
<u>Tools Programming</u>	37%	Digital Interface Designer, Broadcast Technician, Software Engineer, Technical Project Manager, Technical Artist

Source: 2023 CVL Economics Survey (n=60); Lightcast



Conclusion

The past two years have been a period of significant advancements in large language models and GenAI visual applications such as Midjourney, Stable Diffusion, and DALL-E, and these trends are expected to continue for years to come.⁴⁶

GenAI technology is not only reshaping workflows across the entertainment industries, but the future of consumer products as well. As demand for VFX in film and television continues to grow, new capabilities and methods will influence the types of stories that are told and the way they are presented. For video game development, new levels of interactivity between player and characters and across virtual worlds will elevate the user experience. GenAI programs that help with songwriting and instrumental arrangements can help musicians expand their horizons. The possibilities are seemingly endless.

At the same time, these advancements have a real human impact. Around 204,000 jobs are poised to undergo significant disruption over the next three years due to the implementation of GenAI programs. Even though this doesn't necessarily translate to 204,000 job losses, nearly every aspect of the entertainment workforce will be affected. On top of the impact on the nature of creative work for existing employees, freelancers, and contractors, the integration of GenAI technology has cascading effects. A large number of displaced jobs will likely be entry- and mid-level positions, which will

narrow career development opportunities, work against broader DEIA goals, and hurt professional and economic mobility. Aspiring workers from less affluent and underrepresented backgrounds have historically leveraged these entry-level roles as a pathway into the entertainment industries and to higher-paying positions. More broadly, the elimination of these types of positions means the loss of critical learning and networking opportunities.



As the WGA and SAG-AFTRA strikes revealed, perspectives between industry management and creative workers do not often align, especially regarding the role of GenAI. Where industry management sees growth opportunities, creative workers see an existential risk to their livelihoods. Whether job losses will be offset by job gains has yet to be determined and may ultimately be irrelevant for many current workers in the entertainment industries. For them, putting protections into place now is a more pressing concern.

The future is not yet written, and it needn't be generated by AI. It is important to remember that GenAI output is constrained by its inputs. If the responsibility to generate content shifts away from humans to machines, which can currently only formulate output based on previously created content, the availability and uniqueness of new content brought into the world will become more limited. It is critical that those in leadership positions, especially in entertainment industries, keep this top of mind and ideate on ways that new technologies can expand human creativity, not replace it.⁴⁷

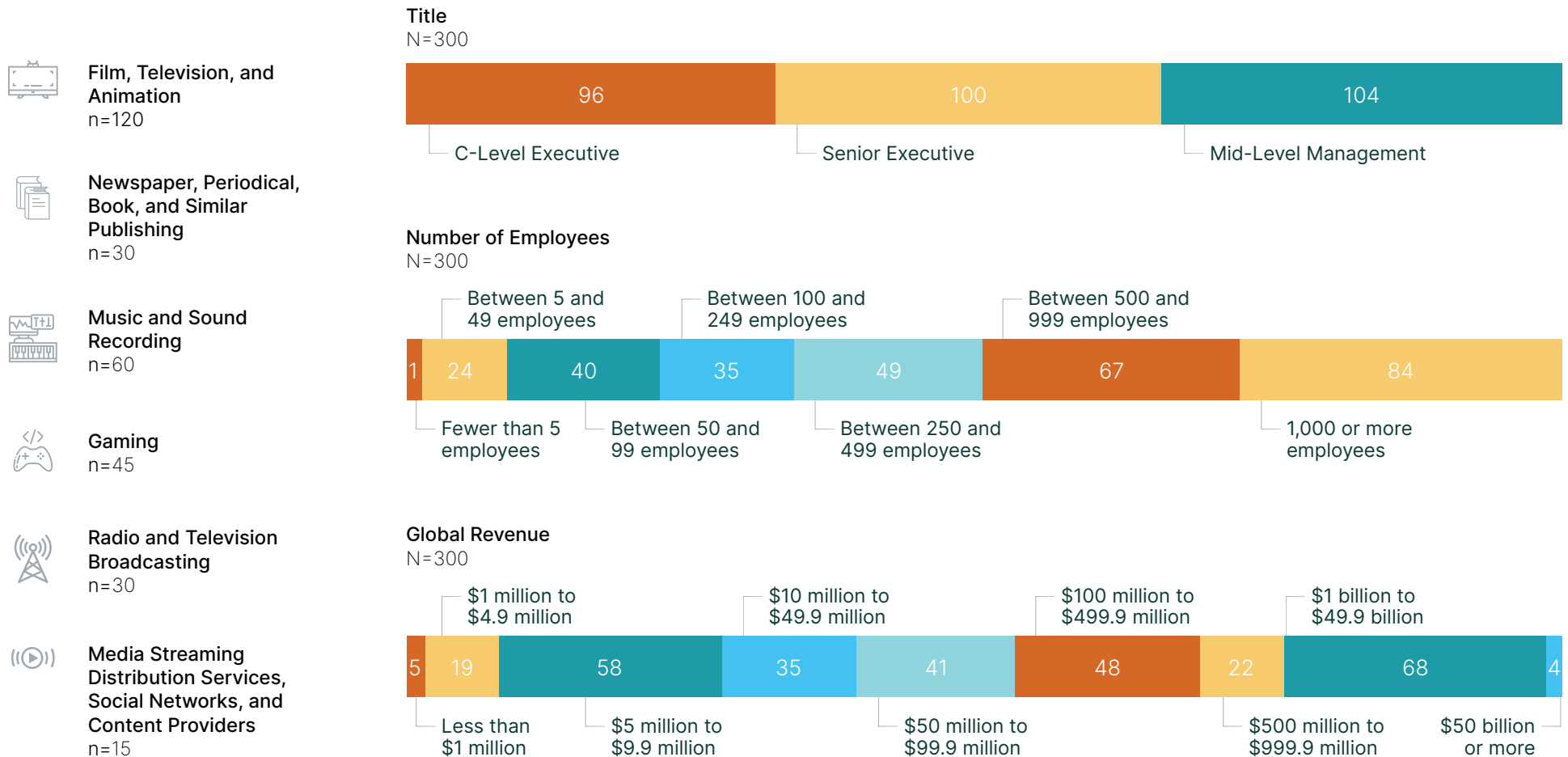
⁴⁶ Projections suggest that while high-quality language training data may reach its limits by the early to mid-2020s, image data is expected to sustain advancements well into the 2040s. See Pablo Villalobos, Jaime Sevilla, Lennart Heim, Tamay Besiroglu, Marius Hobbhahn, and Anson Ho, "Will We Run out of Data? An Analysis of the Limits of Scaling Datasets in Machine Learning," arXiv, October 25, 2022, <https://doi.org/10.48550/arXiv.2211.04325>.

⁴⁷ Jason Farago, "AI Can Make Art That Feels Human. Whose Fault Is That?" The New York Times, December 28, 2023, <https://www.nytimes.com/2023/12/28/arts/design/artists-artificial-intelligence.html>.

Appendix: Methodology

INDUSTRY SURVEY

Between November 17 and December 22, 2023, CVL Economics surveyed 300 leaders (C-Level Executives, Senior Executives, Mid-Level Management) across six U.S. entertainment industries. The survey focused on understanding the impact of Generative AI (GenAI), particularly in such industries as Film, Television, and Animation, and Music and Sound Recording. Key areas of inquiry included the current and anticipated roles of GenAI, its effects on tasks and responsibilities, the creation and/or replacement of job roles and titles, ethical concerns, and perceived benefits and challenges of GenAI implementation. Additionally, the survey focused on specialized industry and occupation skills and tasks; this is in contrast to similar work that relies on “cross functional” skill and task taxonomies that are industry and occupation agnostic.



JOB DISRUPTION ESTIMATES

The survey targeted business leaders, soliciting their input regarding the influence of GenAI tools, software, or models on specific job titles and specific job tasks within their business divisions over the next three years. Each industry respondent was asked about a set of tasks (a subset of which were industry specific) for which they had implemented or were in the process of implementing GenAI to address. In addition to job tasks, the response options were designed to capture varying degrees of impact, including:

1. Anticipation of job title consolidation due to GenAI tools.
2. Expectation of job title replacement by GenAI tools.
3. No expected consolidation or replacement of job titles by GenAI tools.

Respondents were then asked to provide estimates on the percentage of jobs they expect to be consolidated or replaced. They were also prompted to identify specific occupational roles within their industry and business division that they believe would be most affected. The responses allowed us to calculate a “displacement score” for each of the six industries surveyed, as well as for selected occupations within those industries. This score is a quantitative representation of the expected impact of GenAI on job roles. To enhance the robustness of our analysis, these displacement scores were supplemented with various external datasets. These included industry employment statistics (classified by the North American Industry Classification System, or NAICS), occupational employment data, growth projections, and skill requirements (classified by the Standard Occupational Classification System, or SOC, and O*NET). Additionally, job posting data sourced from Lightcast provided contemporary insights into labor market trends.

SCOPE AND LIMITATIONS

It is important to note that our job displacement estimates focus exclusively on existing (incumbent) jobs. Given the nascent nature of GenAI technology and its evolving capabilities, there is a significant degree of uncertainty around its adoption timeline and future potential. Consequently, our analysis does not extend to estimating or modeling new occupations that might emerge directly from the adoption of AI in the entertainment industries or because of broader labor demand introduced by GenAI technology.

FUTURE UNSCRIPTED:

The Impact of Generative Artificial Intelligence on Entertainment Industry Jobs

January 2024

PREPARED BY:



CVL ECONOMICS

CVL Economics is an economic consulting firm that takes a data-driven, human-centric approach to equitable development and sustainable growth, with a focus on the creative economy. Founded in 2021, CVL Economics partners with communities, municipalities, organizations, and institutions to address today's most complex challenges and foster bold action. Coupling our robust economic models with innovative research methodologies, we provide decisionmakers with the actionable insights needed to effect change, expand opportunity, and improve economic well-being.

<https://www.cvleconomics.com/>

COMMISSIONED BY:



CONCEPT ART ASSOCIATION

Concept Art Association is an organization committed to elevating and raising the profile of concept artists, their art and their involvement in the entertainment industries.

<https://www.conceptartassociation.com/>



THE ANIMATION GUILD

The Animation Guild, also known as Local 839 of the International Alliance of Theatrical Stage Employees (IATSE), was founded in 1952. As a labor union, it represents more than 5,000 artists, technicians and writers in the animation industry, advocating for workers to improve wages and conditions.

<https://animationguild.org/>



THE HUMAN ARTISTRY CAMPAIGN

The Human Artistry Campaign was launched at SXSW 2023 for open dialogue and guidance from the united creative community in the AI debate. The growing alliance supports seven core principles for keeping human creativity at the center of technological innovation.

<https://www.humanartistrycampaign.com/>



THE NATIONAL CARTOONISTS SOCIETY FOUNDATION

The National Cartoonists Society Foundation is the charitable arm of the National Cartoonists Society, the world's largest and most prestigious organization of professional cartoonists.

<https://cartoonistfoundation.org/>

