The Potential Role of AI In Transforming Digital Prepress and Workflows for Print Production

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Abstract

This study examines the role of artificial intelligence in refining ideation processes and digital prepress workflows. It highlights AI's potential to boost creativity and efficiency within digital operations and better understand how AI's automation capabilities can streamline project workflows, leading to more effective responses to digital design challenges and problem-solving scenarios. The presentation will also cover practical AI applications that can be seamlessly incorporated into existing practices to enhance the quality of outputs and shorten the time-to-market. Further, this discussion will contribute to the broader dialogue on AI's role in educational innovation, providing attendees with implementable AI strategies for their digital media and design teaching frameworks.

Historical Innovations and Societal Disruptions

Technological innovation has repeatedly disrupted societies, causing displacement and unrest. The Luddite movement in early 19th-century England illustrates this, as skilled textile workers protested the innovations of mechanized looms that threatened their livelihoods, not technology itself. Their machine-breaking was a response to job loss and devalued skills [10]. The British government responded harshly, criminalizing machine-breaking and deploying troops to suppress the Luddites. Despite this, the movement highlights an enduring struggle between technological progress and workers' welfare. Industrialization shifted production from homes to factories, eroding traditional community bonds and workers' autonomy [10].

Similar unrest continued throughout the 19th and 20th centuries. The 1830 Swing Riots saw English farmworkers rebel against threshing machines, while Romantic thinkers lamented the impact of industry on human dignity and nature, reflecting wider societal fears of technology [12], [13]. In the U.S., early 20th-century

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farmers resisted mechanized equipment, fearing the loss of traditional rural life [13]. Later, in the 1970s and 1980s, neo-Luddites criticized computers, automation, and nuclear power, raising concerns about environmental and social impacts overlooked in the pursuit of progress [11]. Protests evolved with new technologies. In the 1990s, anti-GMO activists destroyed experimental crops out of concern for environmental risks and corporate control. Recently, the rise of AI and automation has reignited fears about job loss and ethical challenges, especially in vulnerable industries [1]. Throughout these events, the same concerns emerge over job insecurity, loss of traditional practices, social upheaval, and the perception that technology serves the interests of a few [1]. The ongoing challenge is to manage technological change so that it benefits rather than displaces society. The history of the Luddites and similar movements shows that progress is always a social choice, requiring a balance between innovation and community well-being.

Academia Embraces AI

According to Bridges and Blue (2024), the increasing acceptance of artificial intelligence (AI) has prompted educators in several disciplines to explore effective teaching practices for the inclusion of AI [2]. AI can support educators in making informed decisions and increasing teaching effectiveness; however, it should not replace educators [9]. Many assessments are being developed for the classroom, both formative and summative, to evaluate the methods' success. One assessment that utilizes both formative and summative evaluation to assess technological innovations is Action Research, a form of investigation designed for teachers to attempt to solve problems and improve classroom professional practices [6]. It embraces systematic observations and data collection, developing more effective classroom strategies that provide a framework that guides teachers to understand why, when, and how students become better learners [6], [8].

This research paper began by focusing on the potential role of artificial intelligence (AI) adoption in transforming digital prepress and workflows for the print production classroom. Bridges and Blue's action research encouraged that to better prepare students for successful careers in graphic communications, Educational institutions should follow these steps: continually update curricula to include essential soft skills and technological tools; assess and replace obsolete tools; develop modules to enhance communication, teamwork, and problem-solving; integrate the latest software and digital tools; strengthen partnerships with industry professionals for real-world insights; and engage in ongoing research to stay current with industry changes and technological advancements [2], [4].

Industry's Interest in AI is Growing

In a 2024 podcast presentation for Printing-United-Alliance, by Chief Executive, Andy Paparozzi delivered, "The AI /Big Data Revolution," covering content to an online audience, defining and clarifying artificial intelligence's future influence on the future of graphics and print industries [7]. According to the presenter, much of the content in this presentation was based on the book: *Your Roadmap to Fuel Innovation and Amplify Profits* by Harrison Painter, 2023 [5]. However, the presenter did provide some interesting survey data from 124 participants at the 2024 mid-year Printed United -Alliance trade show, demonstrating that interest in artificial intelligence (AI) is growing by comparing data from 2023 and 2024 [7].

According to participants who survived, sitting on the sidelines regarding AI is unaffordable because it will change our business fundamentally and isn't going away [7]. It was strongly felt that organizations must actively learn about and use AI; otherwise, the competition will benefit [7]. The big winners in industry will be those who master AI at every company level. AI will play a significant role in shaping the sector, enabling those who embrace it to operate more efficiently and to seize new growth opportunities [7].

Survey Findings

Data for 124 participants in the midyear 2024 PRINTING United Alliance State of the Industry Survey. AI use includes applications embedded in equipment and software purchases from an OEM [7].

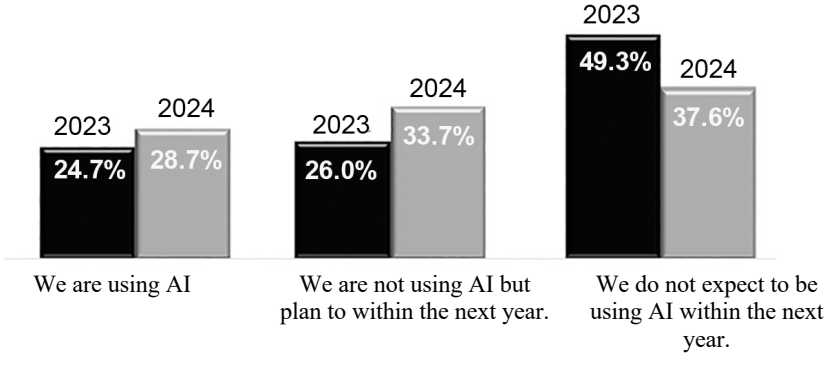

Figure 1. Question: Which is true for your company?

Data from 124 participants in the midyear 2024 PRINTING United Alliance State of the Industry Survey [7].

Currently Using AI		Using or Planning to Within One Year	
Function	**%**	**Function**	**%**
Content creation	29.0	Operations	50.8
Marketing	16.1	Content creation	49.2
Sales	15.3	Sales	42.7
Cybersecurity	13.7	Marketing	40.3
Operations	12.9	Customer analytics	40.3
Customer analytics	12.9	Cybersecurity	38.7
Market analytics	12.9	Market analytics	38.7
Hiring	8.1	Hiring	31.5
Employee development	6.5	Evaluate company performance	31.5
Evaluate company performance	5.6	Customer service	28.2
Customer service	2.4	Employee development	25.8
Risk management	2.4	Risk management	23.4

Figure 2. Question: How are you currently using AI?
And how do you plan to use it within the next year?

Findings

The data from the 2024 PRINTING United Alliance State of the Industry Survey (124 participants) reveals significant differences between current AI adoption and near-term plans across various business functions. Currently, AI is most used for content creation (29.0%), followed by marketing (16.1%) and sales (15.3%). Other areas, such as cybersecurity, operations, customer analytics, and market analytics, each see usage rates of 12.9–13.7%. Functions like hiring, employee development, evaluating company performance, customer service, and risk management have notably lower adoption rates, with the lowest being customer service and risk management (2.4%).

Though plans for AI adoption within the next year are unclear, the numbers rise sharply across nearly every function. Operations lead with 50.8% of respondents indicating they are currently using or planning to use AI in the next year. Content creation follows closely (49.2%), then sales (42.7%), marketing (40.3%), customer analytics (40.3%), and cybersecurity (38.7%). Similarly, significant increases are seen for market analytics (38.7%), hiring (31.5%), evaluating company performance (31.5%), customer service (28.2%), employee development (25.8%), and risk management (23.4%). While current AI adoption in the printing industry concentrates on content creation and customer-facing functions, widespread intent exists to expand usage into nearly all business areas in the coming year. The most significant anticipated growth is in operations, where current use is relatively low but future adoption is high. This suggests a broadening recognition of AI's value across departments and a likely acceleration in industry-wide transformation over the next 12 months.

Conclusion

The time that AI can do tasks doubles every seven months. The best current models—such as Claude 3.7 Sonnet—can perform tasks that take even a human expert hour to complete, but AI can only reliably complete functions up to a few minutes long. If this trend continues, AI systems could potentially be capable of tackling projects that currently take humans weeks or even months by the end of the decade. The statement that "the time that AI can do tasks doubles every seven months" captures the spirit of exponential acceleration observed in AI research and deployment across manufacturing and printing. While the exact figure may vary, there is strong evidence that AI's capability, as measured in terms of tasks it can automate, problems it can solve, or value it can deliver, has been doubling at a remarkable pace, fundamentally reshaping industries at a speed few technologies have matched in history.

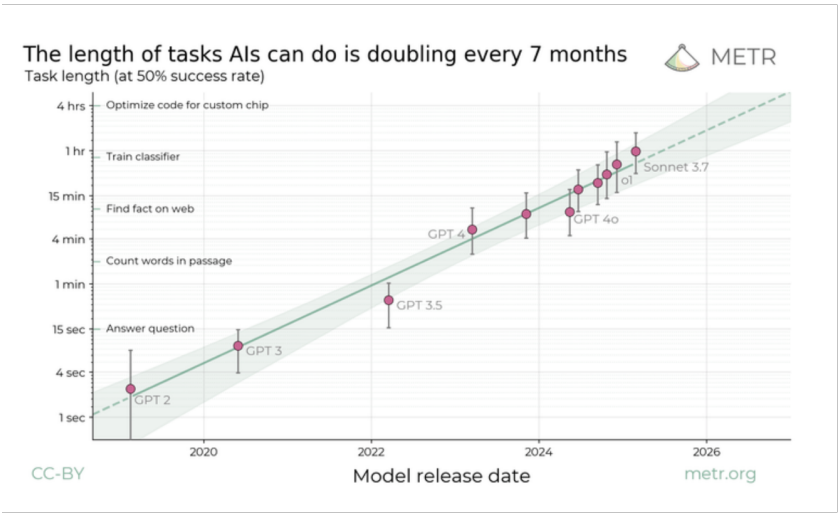

Figure 3: Conclusion - Measuring AI's Ability to Complete Long Tasks

This study demonstrates that artificial intelligence is rapidly becoming essential in digital prepress, design workflows, and educational practice within the graphic communications industry. Historical analysis shows that while technological innovation often leads to disruption and resistance, as seen in movements like the Luddites, effective adaptation and integration can ultimately drive progress and benefit society. Today, AI's adoption in education and industry reflects a growing recognition of its power to enhance creativity, streamline workflows, and improve operational efficiency. Academic research and industry surveys indicate that AI is expanding beyond content creation and marketing into core operational functions, customer analytics, and employee development. Survey data from the 2024 PRINTING United Alliance shows that while current AI adoption is focused on a few key areas, there is strong intent to implement AI across nearly every business function within the next year, signaling an accelerating transformation. For educators, this underscores the importance of continually updating curricula to include emerging technologies, fostering soft skills, and building partnerships with industry. For businesses, embracing AI is no longer optional but a strategic essential for maintaining competitiveness and driving innovation. As AI becomes increasingly embedded in education and industry, a thoughtful approach—balancing innovation with community needs and ethical considerations—will realize its benefits broadly and sustainably.

References

1 Amies, Nick, "A Growing Movement Is Advocating the Rejection of Our Digital Society." The Brussels Times, 31 Dec. 2022, www.brusselstimes.com/343996/a-growing-movement-is-advocating-the-rejection-of-our-digital-society. Accessed 22 May 2025.

2 Bridges, A., and Blue, C., "Action Research: Optimizing Ideation and Digital Prepress Workflows With AI Integration." Presented at INTED2024 in March 2024.

3 Calhoun, Emily F. "How to Use Action Research in the Self-Renewing School." Alexandria, Va.: Association for Supervision and Curriculum Development, 1994.

4 Contreras, Applications and Simulators In Teaching. Analysis of Two Training Experiences and Reflections for the Artificial Intelligence (AI) in Educational Contexts," (AIED), ICERI 2023 Proceedings, pp. 6801-6805.d

5 Painter, H., "Your Roadmap to Fuel Innovation and Amplify Profits," 2023. Published by Harrison Painter Media, Noblesville, IN 46060.

6 Parsons, Rick D., and Kimberlee S. Brown. "Teacher as Reflective Practitioner and Action Researcher." Belmont, Calif.: Wadsworth/Thomson Learning, 2002.

7 Paparozzi, Andy, Chief Economist, "The AI/Big Data Revolution," online podcast, October 16, 2024, Chief, Print United Alliance.

8 Saima Naz, Sufiana Khatoon Malik, "An Analysis of College Teachers' Awareness about Conducting Action Research for Effective Teaching." International Journal of Secondary Education. Vol. 2, No. 1, 2014, pp. 7-10. doi: 10.11648/j.ijsedu.20140201.12

9 Shohel and Mortby, "Artificial Intelligence (AI) in Education in the College Contexts: Challenges and Opportunities," ICERI 2023 Proceedings, pp. 9636-9646.

10 Wikipedia contributors. "Luddite." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 11 May. 2025.

11 Wikipedia contributors. "Neo-Luddism." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 11 May. 2025.

12 Wikipedia contributors. "Swing Riots." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 11 May. 2025.

13 Wikipedia contributors. "Technophobia." Wikipedia, The Free Encyclopedia. Wikipedia, The Free Encyclopedia, 23 Apr. 2025.

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