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Application of AI in IS Education Through the Lens of Automate-Informate-Transformate

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Abstract

Pedagogical uses of generative artificial intelligence in Information Systems (IS) education were examined through a systematic review of papers published between 2022 and June 2025 in ISCAP outlets (i.e., *Journal of Information Systems Education*, *Information Systems Education Journal*, and ISCAP Conference proceedings). Eighteen relevant papers were identified and classified with the automate, informate, transformate framework. Fifteen papers (83%) were categorized as informate. These studies employed tools such as OpenAI's ChatGPT and Microsoft Copilot to create instructional resources, reveal insights into student work, and foster reflective learning. Three papers (17%) were categorized as automate, focusing on tasks such as auto-grading and quiz generation. No paper met the criteria for transformate, indicating that current scholarship presents generative AI as an incremental aid rather than a transformational force. The use of the automate, informate, transformate framework provides an established theoretical lens for evaluating the application of AI in IS education. The findings highlight a prevailing human-in-the-loop orientation and encourage further investigation into genuinely transformative applications in IS education.

Keywords: Artificial intelligence, Generative AI, Automate, Informate, Transformate, Microsoft Copilot, IS Pedagogy

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The authors acknowledge the use of Microsoft Copilot to generate material included in this paper. This material was properly cited using APA style recommendations as with all cited material.

1. INTRODUCTION

"Technology will never replace great teachers, but technology in the hands of a great teacher can be transformational." – George Couros on X (2014)

Since the release of OpenAI's ChatGPT in late 2022, and subsequent platforms like Google Gemini, Microsoft Copilot, Anthropic's Claude, and X's Grok, the discussion about Artificial Intelligence (AI), Generative Artificial Intelligence (GenAI) and Large Language Model (LLM) usage in education has been seemingly endless. The myriad of academic papers, books, popular press articles, professional development workshops, and webinars has skyrocketed. Topics range from cheating and plagiarism, bias, privacy, individualized learning, course development, and grading, just to name a few. Mew and Money (2024) discuss the ability to leverage ChatGPT to generate syllabi, lesson plans, quizzes, and homework assignments. A quick review of these sources reveals many specific ways in which to utilize AI in education such as content creation, grading, student feedback, data analysis, coding, chatbots, tutors, podcast, among other applications.

Given the meteoric rise of AI in higher education, information systems education notwithstanding, the present paper specifically examines Information Systems & Computing Academic Professionals (ISCAP) publications, including the Journal of Information Systems Education (JISE), Information Systems Education Journal (ISEDJ), and ISCAP conference papers, from the period of 2022 to the first half of 2025 which directly discuss the use of AI for pedagogical purposes and employs Microsoft Copilot, hereafter referred to as Copilot, and human authors to categorize and analyze the papers within the context of the automate-informate-transformate framework (e.g., Angeles, 2013; Zuboff, 1985). The goal is to identify whether AI is simply helping to automate our tasks, inform our practice, or transform our pedagogy and to begin to address the question, *how is AI being applied in IS education?*

2. AUTOMATE-INFORMATE-TRANSFORMATE FRAMEWORK

A central tenet of Zuboff (1985, 1988) is the identification of a "fundamental duality" of IT, the distinction between two types of information technology based on their impact: automating and informating. Automate refers to the use of IT to replace human actions or processes, to automate operations. It replaces human actions, particularly in manual and simple white-collar tasks, with the goal of gaining operational efficiencies, reducing costs, and increasing control and continuity. Automating can lead to deskilling of the human labor force. Informate describes IT's capacity to create information about the underlying processes and work being performed through it. This process makes events, objects, and processes visible, knowable, and shareable in new ways. Informating creates a new resource that organizations can use to learn and improve, offering a potentially more penetrating, comprehensive, and insightful grasp of the business. This capacity can serve as a catalyst for significant improvement and innovation. Informating demands new intellective skills, which are abilities needed to learn from, adapt to, and interact with IT systems. It can lead to organizations becoming "learning institutions" and textualizes work, requiring new intellectual effort.

While Zuboff's primary framework includes "automate" and "informate," some researchers have extended or related her concepts to a third dimension, "transformate". Transformate refers to using IT to restructure business models, processes, practices, assets, capabilities, and relationships to create new value, products, markets, or reposition the firm (Angeles, 2013). Shein (1992) was the first to add this next level with the label "The Vision to Transform" as a CEO mindset for using IT as a basis for completely transforming their organizations by changing its relationships with suppliers and customers, altering products, markets, and organizational structures. Ogawa (2020) defined a version of

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"transformate" naming it Digital Transformation (DX) and defined it as creating new value by changing business processes through the use of digital technology and data, and argued that the value created by DX goes beyond Zuboff's automate and informate, constituting a new type of value. Even McKinsey (2025) has a new "tranformate" label, describing the next wave of AI maturity as developing "superagency," where employees combine AI with human creativity to transform operations and unlock new value.

3. METHODOLOGY

Beginning in 2022, the launch of OpenAI's ChatGPT (Ortiz, 2023b) and subsequent release of numerous other LLMs, the authors conducted a manual search of each volume of JISE and ISEDJ as well as the proceedings of the ISCAP Information Systems and Computing Academic Professionals Conference following a purposeful sampling approach through convenience sampling techniques (Patton, 1987, 2002). Papers addressing AI prior to 2022 were not considered as these were pre-current day LLMs. The search was conducted in June 2025, so only papers published in the first half of 2025 were available at that time. Using the JISE, ISEDJ, and ISCAP Conference Proceedings websites, the authors examined the paper titles for each volume and proceedings year searching for AI-related terms such as artificial intelligence (AI), generative artificial intelligence (GenAI), large language models (LLMs), ChatGPT, Claude, Gemini, etc. After the list of papers were compiled, the authors reviewed the text of each paper to deduce its relevancy. Using Copilot, each paper was evaluated and categorized as automate, informate, or tranformate based upon the above-mentioned definitions. The prompt used for Copilot is provided in Appendix A. Additionally, each author independently reviewed and categorized each paper. This followed the directed content analysis approach (Hsieh & Shannon, 2005), whereby automate, informate, and transformate served as the coding categories.

With regards to the interrater reliability (McHugh, 2012), there was unanimous agreement (100%) for the categorization of sixteen of the eighteen papers. For the remaining papers, there was partial agreement (67%). This resulted in an overall inter-rater reliability between the authors of 96%. When including Copilot's categorization, there was unanimous agreement (100%) for thirteen of the eighteen papers. For two papers, the categorization was split equally between Copilot and one author and the other two authors (50%). In the three remaining papers, the Copilot categorization differed from the authors, who were all in agreement (75%). In sum, when including all raters, AI and human, the inter-rater reliability was 92%. Interrater reliability of 90% or higher is generally considered excellent. Overall, the authors were very satisfied with the categorization and analysis provided by Copilot as well as the level of agreement.

4. RESULTS

A total of eighteen papers published in the target outlets were published between 2022 and the first half of 2025. Of the eighteen papers, one (6%) was published in 2022, two (11%) in 2023, nine (50%) in 2024, and six (33%) in the first half of 2025. The vast majority (15, 83%) of papers are categorized as informate. Only three (17%) papers are categorized as automate and none as transformate. Details about how each paper was categorized can be found in Appendix B. Figure 1 depicts the distribution of papers by year and category.

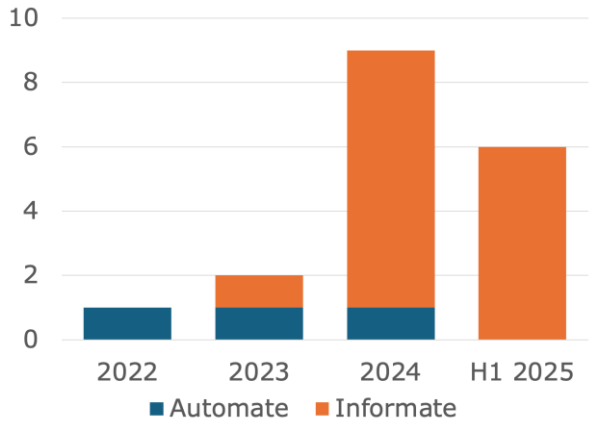

Figure 1: Distribution of Papers by Year and Category

Automate

Three (17%) out of eighteen papers were categorized as automate. To automate simply means to use IT to replace human actions or processes (Zuboff, 1985, 1988). In the case of GenAI, Rutner and Scott (2022) provide an exemplar. There was unanimous agreement between Copilot and the authors that the use of AI to grade asynchronous online discussion boards is appropriately categorized as automate. Other examples include the creation of quizzes, exams, assignments, or auto-grading code. All course elements that instructors have manually created in the past without the assistance of GenAI. The goal of automation is speed and efficiency. That is, take a time-consuming task

and reduce the time and effort needed to complete it. Copilot specifically cites, replacement of human tasks, increase in operational efficiency, reduction in cost, standardization and control, and the potential for deskilling as reasons for its categorization (Microsoft, 2025).

While there was consensus between Copilot and the authors that auto-grading discussion boards are clearly automate, the two papers applying AI to create case studies (Lang, Triantoro, & Sharp, 2024; Singh, Samborowski, & Mentzer, 2023) were not unanimous. In fact, in both instances, Copilot alone differed from the authors. While all three authors identified this application as automate, Copilot categorized this application as informate (Lang, Triantoro, & Sharp, 2024) and transformate (Singh, Samborowski, & Mentzer, 2023), respectively. Each author considered the use of AI to create case studies as replacing human action on the part of the instructor. Rather than the instructor manually spending time and effort to create the case study, they feed a prompt to AI and let it do the work. In their perspective, this should be considered automate.

Informate

Fifteen of the eighteen papers (83%) were ultimately categorized as informate. Because informate was the largest category and represented the greatest agreement between AI and human raters, it might be of interest to describe the characteristics identified by Copilot in deducing its categorization. Five papers fell into the innovation and organizational learning category. Eight papers were categorized into the improvement of academic programs area. Two papers represented educational content creation. Five papers aligned with the idea of organizations as learning institutions. Notably, all fifteen papers were included in the intellective skill category representing critical thinking, engagement, interpretation, and reflection. Ten papers were categorized by transparent and analyzable learning processes. Eight papers supported reflective learning and future pedagogical strategies. Four papers supported learning institutions, insight generation, and adaptability to technological change. Finally, one paper emphasized the process of making unstructured data knowable and actionable (Microsoft, 2025).

Transformate

Of the eighteen papers included in the study, none were ultimately categorized as transformate. Four papers were initially categorized as transformate by either Copilot or one of the authors, but upon further discussion none remained as examples for transformation in the spirit of using IT to restructure business models, processes, practices, assets, capabilities, and relationships to create new value, products, or markets, or to reposition the firm (Angeles, 2013).

Although no papers were not categorized as transformate in the final analysis, it might be helpful to consider transformate examples from another domain to facilitate ideas of how transformate might apply in IS education. Angeles (2013) applied the automate-informate-transformate framework within two recycling programs at Hewlett Packard (HP) Brazil and the city of Grand Rapids. The main finding at HP was the transformation from a "cradle-to-graveyard" to "cradle-to-cradle" model promoting environmental sustainability. For the city of Grand Rapids, the transformation involved changing the business model for refuse collection services to encourage recycling and composting.

5. DISCUSSION & CONCLUSION

There does seem to be a dichotomy between instructors and students when it comes to automating. In general, instructors are interested in using AI to help them automate the more mundane and time-consuming tasks, while at the same time they are reluctant to allow students to automate tasks for concern that critical thinking and skill building will be lost. Educators may fear that AI automation in both IS education and IS practice could lead to deskilling (Jarrahi, 2019; Nazir et al., 2024), reduced memory recall and less mental engagement. These negative consequences have been shown to be real by a study of a team at the MIT Media Lab (Kosmyna et al., 2025).

The results show that the majority of papers fall under the informate category, suggesting that many educational applications of AI focus on enhancing visibility into learning processes, supporting reflection, and developing new intellective skills. Tools like ChatGPT and Copilot are primarily used to generate content (e.g., code, questions, cases), support student understanding, and encourage critical thinking and self-assessment. This indicates that educators are leveraging AI to augment, not replace, human learning and teaching.

This aligns with constructivist and experiential learning theories, where understanding and engagement are prioritized over efficiency. Jarrahi (2019) wrote about the positive and negative potentials of AI automating and informating work. He noted that AI automation

may be a source of human cognitive complacency and de-skilling. He argued for an informate rather than fully automate strategy, a human in the loop approach, which would value the abstract thinking and judgment that humans can provide. This also prevents what Nazer et al. (2024) term the "perilous route to disaster" which describes the movement toward automating complex problems because it adversely affects the user skill and capability in changing environments. This "human in the loop" approach and advocation for informating over automating seems to have pedagogical implication as well to prevent cognitive complacency and de-skilling among students.

Transformate is still emerging. A few papers demonstrate how AI can restructure educational models, such as redefining instructor and student roles, enabling scalable, personalized learning experiences, and creating new pedagogical frameworks. These cases hint at AI's potential to transform education, but such applications are still in early stages. However, much of what is promoted as transformational is really in essence automation or information. Areas which may represent transformate include restructuring educational practices, creation of new value, repositioning the role of IS education, creation of new capabilities and relationships, and transforming the learning environment. As advances in AI technology continue, its transformating power will certainly increase.

The study is not without limitations. The first is the limited scope. The study only included ISCAP publications rather than the broader corpus of IS education literature. Second, the small number of papers categorized potentially skewing the results in terms of the use of AI for automate, informate, or transformate. Third, there may have been self-selection in the data, whereby educators are more likely to publish work about informate approaches than about automate approaches to teaching with GenAI. These limitations, however, do give rise to future research opportunities such as expanding the scope to include a broader search of IS education literature, thus increasing the number of papers and hopefully reducing self-selection bias somewhat, creating a visual framework, and examining what prior IS education literature has not yet done with the automate-informate-transformate lens.

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APPENDIX A: PROMPT USED

Given the following definitions, review the attached paper and categorize it as either automate, informate, or transformate: Automate refers to the use of IT to replace human actions or processes, to automate operations. It replaces human actions, particularly in manual and simple white-collar tasks, with the goal of gaining operational efficiencies, reducing costs, and increasing control and continuity. Automating can lead to deskilling of the human labor force. Informate describes IT's capacity to create information about the underlying processes and work being performed through it. This process makes events, objects, and processes visible, knowable, and shareable in new ways. Informating creates a new resource that organizations can use to learn and improve, offering a potentially more penetrating, comprehensive, and insightful grasp of the business. This capacity can serve as a catalyst for significant improvement and innovation. Informating demands new intellective skills, which are abilities needed to learn from, adapt to, and interact with IT systems. It can lead to organizations becoming "learning institutions" and textualizes work, requiring new intellectual effort. Transformate refers to using IT to restructure business models, processes, practices, assets, capabilities, and relationships to create new value, products, or markets, or to reposition the firm.

APPENDIX B: INDIVIDUAL PAPER CATEGORIZATION RESULTS

A=Automate, I=Informate, T=Transformate

Article	Copilot	Author 1	Author 2	Author 3	Final
Bekkering & Harrington (2025)	I	I	I	I	I
Firth & Triche (2024)	T	I	I	T	I
Frydenberg, Xu, & Xu (2025)	I	I	I	I	I
Jiang Nakatani (2025)	I	I	I	I	I
Lang & Gürpinar (2025)	I	I	I	I	I
Lang, Triantoro, & Sharp (2024)	I	A	A	A	A
Liu & Downing (2024)	I	I	I	I	I
Marquardson (2024)	I	I	I	I	I
Memmert, Tavanapour, & Bittner (2023)	T	I	I	I	I
Rutner & Scott (2022)	A	A	A	A	A
Singh, Samborowski, & Mentzer (2023)	T	A	A	A	A
Sun & Deng (2025)	I	I	I	I	I
Sundberg & Holmström (2024)	I	I	I	I	I
Triantoro, Rua, & Lang (2024)	I	I	T	I	I
Walden, Caporusso, & Atnafu (2022)	I	I	I	I	I
Yoo & Kim (2024)	I	I	I	I	I
Zhang (2025)	I	I	I	I	I
Zhong & Kim (2024)	I	I	I	I	I