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On Higher Education, the Workplace of the Future, and Generalized Large Language Models: Research Questions in a Time of Technological Change and Adaptation

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Abstract

Resistance to and gradual adoption of technological innovations is not new to educational systems and, in some ways, continues as generalized large language models become widespread and, at times, seem to threaten traditional ways of teaching and learning. As educators and students experiment with these models innovatively, educational institutions will be compelled to evolve in ways that will enhance student preparation for the future workplace. This paper will discuss the potential impacts of generative language models on the workplace of the future, implications for workforce preparation, and implications for faculty teaching with an emphasis on business and information systems management. Research questions are posed to suggest future research opportunities for scholars working in the area.

Keywords: generalized large language models; higher education; workplace of the future; information systems pedagogy

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1. Introduction

Prior to the widespread availability and use of computers and calculators, occupations that required skill in arithmetic calculation such as bookkeeping, engineering, and surveying were widespread and schools devoted significant time and resources to teaching students to quickly and accurately perform these calculations. As the adoption of computers and calculators has become widespread, teaching and learning in primary schools is focused primarily on the development of conceptual understanding of mathematics. A parallel nascent development is now occurring in the domain of language as powerful generative large language models are becoming widely available. These models are trained on vast repositories of text data and, once trained, can generate sophisticated text material in a wide variety of domains and for a wide variety of tasks. These generative language models are likely to transform the workplace and the types of jobs humans will perform in the future. For certain types of routine language generation, it may soon seem as unimaginable to assign the task to humans as it would have seemed for the past several decades to assign routine arithmetic calculation tasks to humans. A parallel transformation to the one seen earlier in the teaching of mathematics is likely in education with a transformation in the way humans are taught about language generation and the language generation tasks for which they will be prepared in schools. And just as teachers were once alarmed by the use of calculators in schools and worried that students would lose their ability to perform routine mathematical calculations, many teachers and university professors are alarmed today by the existence and the use of generative language models. Indeed, for many, the focus is more on detection and prevention of the use of generative large language models with an emphasis on pursuing academic integrity violations rather than on preparing students for the future workplace.

This paper will discuss the potential impacts of generative large language models on the workplace of the future, implications for workforce preparation, and implications for faculty teaching with an emphasis on business and information systems management.

2. From Early Conceptions of Artificial Intelligence to Generative Large Language Models: Implications for a Transformed Human-Machine Relationship

The roots of artificial intelligence lie in the work of path breaking scholars such as Herbert Simon, Allen Newell, and Marvin Minsky who sought to develop ways in which computer programs could mimic activities generally thought to be in the exclusive domain of human intelligence (Haenlein and Kaplan, 2019). Fields such as cognitive science, linguistics, logic, and computer science were applied to these developments. Early debates addressed the issue of whether the best approach would lie in systems designed to mimic general intelligence or those designed to perform specific tasks. For a time, the field of expert systems seemed promising as efforts were made to develop a deep understanding of expertise in specific fields and then apply that understanding to artificial intelligence systems designed to replicate the performance of experts in narrow domains. More recently generalized artificial intelligence such as generalized large language models have used machine learning algorithms along with very large collections of training data with the aim of replicating human understanding and generation of language (Chun and Noveck, 2025; Ooi et al., 2025). These systems have the potential to perform a wide variety of tasks and are currently of great interest to business organizations and educational institutions.

Computer vision and robotics have already transformed some aspects of jobs and the workplace in domains such as the manufacturing of goods (Brynjolfsson and McAfee, 2016). Similarly, generalized large language models hold the potential to radically transform knowledge work and the educational systems designed to prepare students for roles in the knowledge economy. In doing so, these systems hold the potential to reimagine the relationship between humans and machines in ways that Simon, Newell, and Minsky (Simon and Newell, 1964; Minsky, 1988) imagined at the beginning of the age of artificial intelligence.

3. The Workplace of the Future of Generalized Large Language Models

The workplace and ways in which business practices are designed and executed have long been influenced by new technologies and algorithms. While workers once used manual approaches and adding machines to perform straightforward calculations, the adoption of spreadsheets changed the way in which quantitative business processes were executed. Some jobs such as linotype operators (https://en.wikipedia.org/wiki/Linotype_machine) simply ceased to exist with the development of computerized tools for copy layout. More recently, organizational tasks and roles have been transformed by the use of sophisticated computer algorithms that support organizational processes and decision making

(McAfee and Brynjolfsson, 2017).

Potential effects of generalized large language models in the workplace of the future include automation of jobs focused on knowledge work, the shift to increasingly more complex tasks in some jobs, the creation of new types of jobs such as roles focused on the integration of generalized large language models into business processes and decision making, increased focus on collaboration between artificial intelligence agents and humans, and the need for employees to develop skills focused on tasks that cannot be accomplished by artificial intelligence agents. The skills needed for language-related tasks in the workplace are likely to shift significantly as routine writing tasks will increasingly be allocated to generalized large language models. Humans will likely focus on skills such as the detection and correction of errors, synthesis, prompt generation and refinement, creativity, and innovation. As prompt engineering becomes increasingly important in knowledge work, professionals in a wide variety of domains will need to understand the characteristics and limitations of generalized large language models; understand how to craft, test, and refine effective prompts; and understand how to evaluate and appropriately use the outputs of these models.

4. On Adaptation to Technological Change in Education: A Brief History of Calculator Adoption and Use

Resistance to and gradual adoption of technological innovations is not new to elementary and secondary schools, colleges, and universities (Ellington, 2003; Hembree and Dessart, 1986). The case of the electronic calculator provides a parallel to what we are seeing today during the early stages of generalized large language models. Initially, the electronic calculator was fiercely resisted in elementary and secondary schools and teachers and parents feared that calculator use would harm students' calculation skills and mathematical understanding. As calculators became more affordable, they inevitably made their way into classrooms and homes and gradually mathematics curricula and pedagogy adapted to incorporate the calculator as a tool to be used alongside the human mind. As students were freed from the need to focus on calculations, more challenging problems and strategies were introduced into schools (Ruthven, 1998). Eventually the electronic calculator became a routine aspect of mathematics curricula and classrooms and its use even spread to standardized exams. As graphing and scientific calculators became widespread, students and knowledge workers were expected to have the skills needed to formulate problems and interpret outputs generated by electronic calculators. As calculator apps have become available on cell phones, many teachers and employers would be very surprised to encounter students or employees who do not know how to appropriately use them.

A similar evolution is likely to occur with the adoption of generalized large language models in educational settings and the workplace. While some academics express alarm about their use in the classroom and it is not uncommon for academic integrity complaints to be filed against their users, over time we expect the use of generalized large language models to be widespread and for the skills and knowledge students and employees bring to language-based tasks to shift toward those requiring higher order thinking, creativity, and innovation. Routine writing tasks are likely to shift toward execution by generalized large language models over time, and students and employees will be expected to have the prompt engineering skills needed to effectively put these models to work (Phoenix and Taylor, 2024; Tababalan, 2024). Employees and organizations are likely to adapt to this transformed environment by emphasizing employee selection and training with an emphasis on technical skills such as machine learning and chatbot development as well as business process and change management skills (Babashahi et al., 2024).

5. Higher Education and Generalized Large Language Models

As with the initial availability and adoption of calculators, students and faculty have tended to view the availability of generalized large language models from different perspectives. Students embracing them as labor saving tools that can execute assignments focused on lower-order cognitive domains (Kiel and Linkov, 2025; Lubbe et al., 2025) and as tools that can generate study aids such as flashcards and study guides. At least some faculty have been alarmed by the capacity of these tools to execute academic tasks that they have created to be done solely by their students (Wong, 2024).

While we currently see significant emphasis on academic integrity issues in the academic use of generalized large language models (e.g., Eke, 2023; Plata et al., 2023; Sullivan et al., 2023; Wiredu et al., 2024), we anticipate that focus will shift to the design and adaptation of curricula and schools to address the workplace of the future in which humans will perform knowledge work in conjunction with generalized large language models (e.g., Yusuf et al., 2024).

Despite the current focus on academic integrity in the use of generalized large language models, we also see promising

efforts to better understand how faculty and students can productively, effectively, and even ethically use these tools (Chiu, 2024; Hadidi and Klein, 2025). In this spirit, we invite contributions to the *Journal of the Midwest Association for Information Systems* building on the literature seeking to enhance our understanding of the ways in which generalized large language models can be incorporated into information systems curricula and classes in order to better prepare students for the workplace of the future.

6. Ethical Consistency and Generalized Large Language Models

University faculty have long been concerned with plagiarism and academic dishonesty, especially in the context of writing assignments that ask students to think critically and generate original analysis and text. As access to written material became more freely available and as word processing software made it easier for students to copy text and represent it as their original work, technical approaches to detecting such academic integrity issues were developed and adopted by universities. These systems tended to develop a mindset among faculty and administrators in which they viewed their roles as encompassing the prevention, detection, and correction of deception in student writing. As generative large language models became available to faculty and students, this mindset has persisted among some faculty and the desire among some to prohibit the use of these tools and to detect forbidden use of generative large language models has developed. In some cases, faculty have been encouraged to adopt and publish course-level policies related to the use of these tools (e.g., Course Policies and Syllabi Statements, 2025). Simultaneously, universities have begun to encourage faculty to think creatively and broadly about the use of generative large language models as productivity tools and as tools for enhancing teaching, learning, and scholarship (e.g., Course and Assignment Re-Design, 2025). For example, a recent eight-week training course offered by the University of Michigan focused on topics such as privacy and security, content creation using generative AI, prompt literacy, and generative AI as a communication tool (The University of Michigan 8-Week AI Challenge, 2025). These competing views of learning and work may, in some cases, encourage faculty to adopt an attitude that use of generative language models is "OK for me (i.e., faculty), but not for you (i.e., students)." A more forward-looking perspective guided by the search for new ways to use generalized large language models as tools for teaching and learning is arguably a healthier approach since the workplace of the future will be one in which the use of generative large language models will be as common as the use of word processing and electronic spreadsheet tools are today.

The principle of ethical consistency offers a way forward during this time of rapid change in educational institutions and the workplace. Ethical consistency is the principle that one should use the same ethical principles to evaluate one's own behavior and actions and the behavior and actions of others (Hopkins et al., 2008). This is in contrast to the notion of ethical hypocrisy which is the notion of evaluating the behavior and actions of others differently (and generally using more demanding standards) compared to one's own behavior and actions (Foad et al., 2022). A pedagogical approach characterized by the principle of ethical consistency recognizes the challenges and opportunities of a transformed workplace both in terms of faculty teaching and scholarship as well as the workplaces students will experience during their own careers.

We invite manuscripts focused on the following research question: Given recent developments related to generalized large language models, how can we approach our scholarly work and teaching and learning in the classroom in a spirit of ethical consistency?

7. Additional Research Questions

In addition to research guided by the principle of ethical consistency, we invite manuscripts for submission to the *Journal of the Midwest Association for Information Systems* focused on the following research questions related to higher education, the workplace of the future, and generalized large language models.

1. What are the prompt engineering skills and abilities likely to be of most use in the future workplace? How can these skills and abilities best be developed in our students?

Increasingly, preparation for the workplace will require faculty to focus on the design and delivery of curricula incorporating prompt engineering (Knoth et al, 2024). Students will need to develop the ability to craft and revise effective prompts to serve as inputs to generalized large language models (Federiakin et al., 2024; Lee and Palmer, 2025). To accomplish this, students will need a deep understanding of language, knowledge of the problems and tasks to be

addressed by the generalized large language model, an understanding of the goals of the model output, and the ability to evaluate and refine outputs in an iterative fashion (Cain, 2024). Prompt engineering curricula will need to focus on the fundamentals of artificial intelligence, natural language processing, and the domain knowledge in which students will develop professional expertise. Case studies, project-based learning, community-based experiences, and internships are likely to play a role in the development of the required knowledge and skills.

2. What knowledge and skills should students be taught about the use of generalized large language models in intercultural and global contexts?

Given that students will spend much of their business careers working in global organizations and intercultural contexts and given that generalized large language models may emphasize text written in a specific language, how can students be taught to navigate these language challenges in global business environments (Dai et al., 2025; Wu et al., 2025).

3. What types of jobs are likely to disappear and what types of jobs are likely to be created due to the existence of generalized large language models? What are the implications for pedagogical design, course topics, and job placement for students?

Generalized large language models have the potential to facilitate significant redesign of jobs. In the process some jobs may disappear or become far less numerous, while other jobs may be created that do not currently exist. While scholarly work addressing this topic is in its infancy, some guidance has begun to emerge. Jobs such as language transcription may disappear entirely, while others such as customer service positions may become far less numerous and require more complex skills targeted at tackling unusually complex customer issues. Jobs focused on training generalized large language models and those focused on compliance issues associated with these models may become more numerous over time. Employees with language and cultural skills may be in demand as organizations focus on global deployment of their generalized large language models. Human resource specialists with expertise in artificial intelligence may work in new jobs focused on collaborative work design between humans and generalized large language models. As these shifts in work design and jobs occur, faculty and students will need to adapt to new pedagogical approaches, course topics, and career preparation. Preparation for managerial roles will also need to evolve so managers are prepared to provide guidance and supervision for employees using generalized large language models both informally and formally in organizations (Retkowsky et al., 2024; Shokran et al., 2025).

4. What skills related to innovation will students need for a workplace in which generalized large language models will be deployed? As routine tasks done by knowledge workers in the past are shifted to these models, how do we ensure that our students are able to compete in a transformed labor market?

The workplace of the future is likely to offer jobs that are increasingly complex, more demanding, more focused on innovation and creativity, and more focused on assessment of the outcomes of generalized large language models (Sollner et al., 2025). Pedagogy, course content, and experiential learning will need to adapt to prepare students for this workplace shift.

5. What knowledge and skills will students need to navigate data privacy and data accuracy issues as they use generalized large language models in the workplace and as personal assistants?

In order to effectively use generalized large language data models in the workplace for organizational tasks and as personal assistants, employees will need a strong understanding of data privacy and data accuracy. Students and employees will need to understand how training data, test data, input prompts, and model outputs are collected and stored and how breaches can expose data in ways that may be harmful to individuals and organizations (Das et al., 2025; Mesko and Topol, 2023). Knowledge of data accuracy frameworks (Wang and Strong, 1996) and error detection and correction (Klein et al., 1997; Klein, 2001) will also be needed. Privacy settings and encryption standards are likely to evolve over time and organizations and universities will need to update their training and curricula to help employees maintain up-to-date knowledge of these technical issues.

6 How can student outcomes and the effectiveness of degree programs be assessed and revised over time to evaluate the design and implementation of curricula infused with generative large language models, either by design or by students' informal adoption and use of the tools?

Generalized large language models have been found to perform well on at least some course assessments designed and used before the era of generalized artificial intelligence, and some faculty have expressed concerns about student use of these models on course assignments and assessments (Nikolic et al., 2023). However, as the nature of work is transformed by generalized large language models, learning outcomes and goals will inevitably evolve to focus on more complex skills and knowledge emphasizing higher order thinking skills in order to deliver career preparation needed for this transformed workplace. Course material, assignments, and assessments can then be modified in ways that acknowledge and use these models to achieve student and program level learning outcomes. Employer feedback related to student adaptability in a workplace in which generalized large language models are used can also be adapted as an indirect measure of learning outcomes (Khlaif et al., 2024; Lubbe et al., 2025; Xia et al., 2024).

8. Conclusion

Generalized large language models have the potential to transform higher education and the workplace. By embracing rather than resisting this and similar technologies, faculty can collaborate with their students and industry partners to ensure that students receive an education focused on the complex, higher-order thinking skills and abilities that will prepare them to thrive in their careers. Research focused on the questions discussed in this article, as well as related questions, holds the potential to improve our understanding of practices and strategies that can best deliver the promise of these tools to our students, organizations, and society.

9. Overview of the Contents of this Issue

This issue of the journal includes two other articles. Vlad Krotov and Pitzel Krotova in their interesting and teaching related article provide a detailed description of how they have used the Scrum methodology to manage group project in a face-to-face graduate Project Management course. They discuss the feedback they have received from their students about the effectiveness of this approach.

Ricardo de Deijn and Rajeev Bukralia in their interesting and timely article discuss the potential uses of prompt-generated synthetic datasets for snow detection. The study explores the advantages as well as disadvantages of using such datasets for this application.

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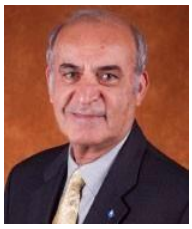

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