Knowledge Workers' Attitudes Towards Generative Artificial Intelligence and their Influence on Digital Self-Efficacy

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ABSTRACT

This quantitative cross-sectional study targeted Chinese industrial knowledge workers to explore the predictive relationship between generative artificial intelligence (GenAI) attitudes, creative problem-solving, and digital self-efficacy. Questionnaire survey was adopted, with a final valid sample of 394 respondents. Attitudes toward GenAI, constructed as a higher-order factor covering three dimensions (Benefits of AI, reverse-scored Risks of AI, and Use of AI), together with two reflective latent variables—creative problem-solving and digital self-efficacy—were measured via validated scales. Descriptive statistics and Spearman rank-order correlation analysis were applied for data processing.

Descriptive results showed the composite mean score of Benefits of AI was 3.75, reverse-scored Risks of AI reached 3.79, and Use of AI scored 3.79. The average value of creative problem-solving was 3.77, while digital self-efficacy had a mean of 3.78. At the item level, participants generally agreed with statements describing AI benefits and practical usage, and reported strong self-confidence across all digital self-efficacy items. Meanwhile, respondents mostly disagreed with the original negatively framed items about AI potential hazards. Spearman correlation test further demonstrated significant positive correlations between GenAI attitudes, creative problem-solving, and digital self-efficacy.

This research supplements empirical evidence focusing on Chinese knowledge workers, and provides practical references for enterprises to develop targeted AI literacy training and boost employees' digital competence.

Keywords: AI attitudes; creative problem-solving; digital self-efficacy; generative artificial intelligence; knowledge workers

INTRODUCTION

China has rapidly become a leading global environment for Generative AI (GenAI), due in large part to high levels of government support, an extensive digital infrastructure, and a growing number of Chinese businesses adopting Emerging Technologies (ETs) at rapid rates. According to Chinese sources, in 2023, the market value of core AI industries in China exceeded CNY 500 billion, and the "Generative AI" category was designated an engine of growth in both the "New Assistance Plan" regarding the development of a New Generation of Artificial Intelligence, as well as through other digitalization initiatives and the development of Digital Society and Digital Economy (CAICT 2023; MIIT 2022). In 2024, a report from the AI Index stated that China remains one of the top nations in the world in the field of research and the production of large language models for AI application in industries, as well as in the Developing AI Systems with Large Language Models (e.g. Deep Learning) at a very fast rate. In practice, Chinese organizations and professionals commonly use Baidu ERNIE Bot, Alibaba Tongyi Qianwen, and Tencent Hunyuan for text generation tasks such as report writing, data summarization, coding assistance, and business communication. These tools are deeply integrated into domestic digital ecosystems, including office platforms, cloud services, and enterprise management systems, making them particularly accessible to knowledge workers.Therefore, the growing prominence, acceptance and use of GenAI technology also will enable those in the workplace

within China to fully investigate the manner in which GenAI technology is changing thinking patterns and actions for professionals.

Organizations are increasingly adopting the use of generative artificial intelligence (GenAI) for tasks that require a great deal of knowledge such as writing reports, carrying out data analyses, writing computer programs, communicating with customers, and generating creative content. Surveys of companies in China show that 60 per cent of companies with a minimum revenue of RMB 10 billion or more have either tested the use of GenAi in their operations or are currently testing it; however, most of this growth is in China's Finance, IT, Manufacturing and Professional services sectors (McKinsey China, 2023; iResearch, 2023). Knowledge workers, as examined in this study, are defined as professionals whose work relies on analytical reasoning, problem identification, and creative judgment to generate solutions and decisions in organizational settings. As GenAI becomes embedded in daily work practices, understanding its cognitive implications for knowledge workers is essential to ensuring that productivity gains are accompanied by sustained expertise, creativity, and professional competence.

Generative Artificial Intelligence (GenAI) use is determined in part by an individual's attitude towards GenAI. In this study, attitudes toward GenAI are conceptualized as an individual's beliefs, feelings, and behavioral intentions regarding the usefulness, risks, and application of GenAI in their professional work (Grassini, 2023.; Stein et al., 2024.).Attitudes are critical because they influence whether and how individuals cognitively engage with AI tools rather than passively rely on them (Zawacki-Richter et al., 2023.; Liu & Chen, 2024.). Therefore, attitudes towards GenAI may act as a primary factor in determining future cognitive and behavioral outcomes related to GenAI.

This research is primarily focused on text generation or language generation AI, which are tools most typically used for report writing, email composition/writing, data analysis, and professional documentation generation, and are thus mainly focused on knowledge workers. Additionally, China has a significant reliance on written communications, such as policy documents and report writing, as part of their everyday working lives. Image-generation (e.g., through graphics) and video-generation (e.g., through videos) tools may be developing quickly, but this research has emphasized the assessment and development of text-generation tools because they are more closely associated with creative problem-solving, decision-making, and cognitive engagement within this type of workplace environment.

A different key concept in this paper discusses Creative Problem Solving (CPS). Creative problem-solving is defined here as the cognitive ability to generate novel and effective solutions through processes of problem definition, idea generation, evaluation, and execution within work-related contexts (Doshi et al., 2024). This perspective emphasizes that creativity in AI-mediated work depends not only on the technology itself but on how individuals cognitively interact with and regulate AI-generated inputs.

Digital self-efficacy (DSE) represents the third core construct of this study. Digital self-efficacy is defined as an individual's confidence in their ability to effectively use digital and AI-based technologies to perform work tasks, solve problems, and adapt to technology-enhanced environments (Ulfert-Blank et al., 2022; Wu, 2023). In the context of GenAI, DSE reflects knowledge workers' perceived capability to control, evaluate, and meaningfully apply AI tools rather than merely consume AI outputs (Getenet et al., 2024). This study conceptualizes digital self-efficacy as a key outcome variable that reflects successful cognitive engagement with GenAI in professional settings.

While research on GenAI is progressing rapidly, there remain gaps that need to be filled. To begin, existing research has primarily focused on the student and general user populations of GenAI, whereas knowledge workers in China, where the rate of AI adoption is staggering, have received little empirical attention. Moreover, prior studies have limited themselves to looking at the attitudes, creative capabilities, and self-efficacies of individuals regarding GenAI in isolation. Addressing these gaps, this study aims to examine how GenAI can function not only as an efficiency tool but also as a catalyst for creative engagement and digital confidence among knowledge workers navigating AI-enhanced work environments.

Study Objectives

General Objective

Generally, the study aims to examine the influence of knowledge workers' attitudes toward generative artificial intelligence on their digital self-efficacy.

Specific Objectives

Specifically, the study aims to achieve the following objectives:

1. **To describe the respondents' attitudes toward GenAI, in terms of:**

   1.1. Benefits of AI

   1.2. Risks of AI

   1.3. Use of AI

2. To describe the respondents' level of creative problem-solving.

3. To describe the respondents' level of digital self-efficacy.

4. To test the significant relationship of the respondents' attitudes toward GenAI, on creative problem-solving.

5. To test the significant relationship of the respondents' creative problem-solving on their digital self-efficacy.

6. To test the significant relationship of the respondents' attitudes toward GenAI, on their digital self-efficacy.

Null Hypotheses

Ho1. There is no significant influence of the respondents' attitudes toward Generative AI, on the creative problem-solving.

Ho2. There is no significant influence of the respondents' creative problem-solving on their digital self-efficacy.

Ho. There is no significant influence of the respondents' attitudes toward Generative AI, on their digital self-efficacy.

THEORETICAL FRAMEWORK

This research is based on Social Cognitive Theory (SCT) as proposed by Bandura (1997), which explains human functioning as the result of reciprocal interactions among personal factors, behavior, and the environment. SCT provides a suitable foundation for understanding how knowledge workers cognitively engage with Generative Artificial Intelligence (GenAI), as AI-mediated work environments represent a dynamic context in which beliefs, cognitive processes, and actions continuously influence one another. In this context (digital and mediated by artificial intelligence), digital self-efficacy and technology-related attitudes are considered personal beliefs that affect how a person processes information, reasons and solves complex problems (Grassini, 2023; Stein et al., 2024).

The construct of attitudes towards GenAI is the foundation of this framework; attitudes are a person's thought processes (cognitive evaluations), emotions and behaviors about GenAI technologies (i.e., Schepman & Rodway, 2020). In this study, attitudes toward GenAI are understood as internal judgments regarding the perceived usefulness, risks, and appropriateness of GenAI for professional tasks. These attitudes influence how individuals interpret AI-mediated environments, determine their willingness to cognitively engage with AI-generated information, and regulate their effort and persistence when working with AI tools. As such, attitudes toward GenAI serve as a foundational cognitive filter through which individuals decide whether GenAI is approached as a supportive cognitive resource or a disruptive external influence (Gerlich, 2023; Naiseh et al., 2025).

Digital Self-Efficacy (DSE) is a primary means by which attitudes influence behavior from the perspective of SCT. DSE is defined as the extent to which individuals think they are capable of completing work tasks utilizing digital technology (Ulfert-Blank et al., 2022). SCT posits that self-efficacy beliefs influence motivation, persistence, and cognitive effort; thus, DSE represents an outcome of sustained cognitive engagement rather than mere exposure to technology (Getenet et al., 2024; Wu, 2023). In this framework, digital self-efficacy emerges as a result of how individuals cognitively interact with GenAI through problem-solving and reflective engagement.

The fifth component of the model is Creative Problem Solving (CPS). It is an indicator of how much a worker can invent new approaches or provide innovative responses to unexpected issues, as well as how creative and effective he or she is in doing so. In AI-mediated contexts, CPS represents the cognitive space in which individuals integrate their own reasoning with AI-generated inputs. From a theoretical standpoint, CPS functions as a form of self-regulated cognition, allowing individuals to monitor, adapt, and refine their thinking while interacting with external cognitive tools such as GenAI (Doshi et al., 2024).

Overall, the framework established in this study indicates that attitudes toward generative A.I. affect the self-efficacy of knowledge workers related to the use of electronic tools, as well as their ability to think critically and solve complex problems by way of connecting the various routes that a worker takes to accomplish tasks. When workers have a positive attitude about A.I., they seem to have greater confidence in their ability to utilize electronic technology, have a propensity for analytical thinking, and generate creative, quality work product. On the other hand, negative feelings about generative A.I. can adversely affect the self-efficacy and analytical engagement of workers and impact creativity in those workplace settings. Ultimately, the framework presented in this paper demonstrates the connection between attitudes about A.I. and the metacognitive components of the SCT and how human interaction with A.I. can either enhance or diminish the use of higher-level cognitive thinking that takes place in knowledge-oriented environments.

Conceptual Framework

In relation to Ho1, the model tests whether there is no significant relationship between respondents' attitudes toward GenAI and their creative problem-solving. This path examines whether dispositions toward AI are associated with differences in how knowledge workers engage in planning, ideation, and solution evaluation. Rather than presuming a positive effect, the null hypothesis frames this influence as one that may or may not exist, allowing the data to determine whether attitudes toward AI are meaningfully linked to creative engagement in AI-supported tasks.

With respect to Ho2, the model tests whether there is no significant influence between creative problem-solving and digital self-efficacy. This path evaluates whether repeated engagement in creative problem-solving is associated with respondents' confidence in their ability to use digital and AI technologies effectively. The null hypothesis formulation allows the study to determine empirically whether creative engagement functions as a source of mastery experience that contributes to stronger digital self-efficacy, or whether no such influence can be established in the present sample.

In relation to Ho, the model tests whether there is no significant influence between attitudes toward GenAI and digital self-efficacy. This direct path examines whether workers' beliefs, trust, and perceived usefulness

of GenAI are associated with their perceived competence in using digital tools. By framing this as a null hypothesis, the study does not assume that favorable attitudes necessarily lead to higher self-efficacy, but instead evaluates whether such an association is supported by empirical evidence.

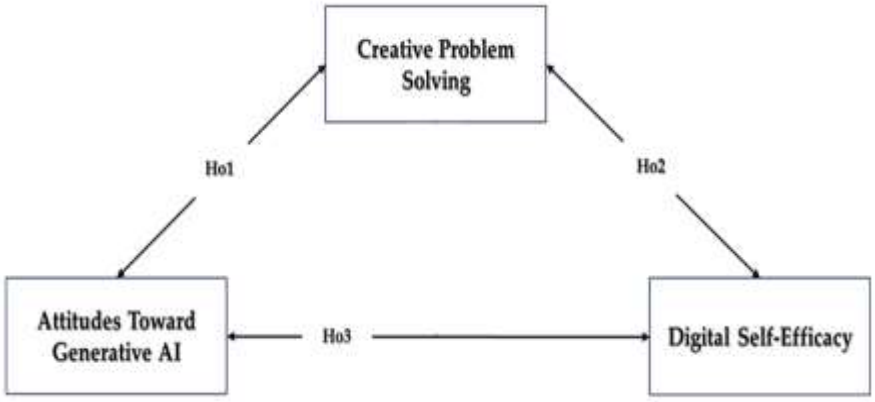

Figure 1. Paradigm of the Study

REVIEW OF RELATED LITERATURE

Gen AI of Knowledge Workers in China

The growth of Generative Artificial Intelligence (GenAI) in China has been very fast since 2023 and has been assisted by its large domestic model ecosystem as well as its strong commercialization initiatives within all major industries. In 2024, SAS and Coleman Parkes Research conducted a global survey involving 1,600 decision-makers from various industries, where 83% of all respondents from China reported using GenAI, significantly higher than both globally at 54% and in the United States at 65%. The industries that embraced GenAI technology most were banking, insurance, healthcare, telecommunications, manufacturing, retail, and energy (industries employing many knowledge workers) (Reuters, 2024). At the innovation level, China is the world leader in patenting GenAI technologies. According to WIPO's patent landscape report, there were over 38,000 patent families for GenAI filed in China by inventors between 2014-2023, suggesting strong momentum in upstream R&D efforts, which supports the continued downstream use of this technology within the workplace (WIPO, 2024). Taken collectively, these trends indicate that not only will GenAI be widely adopted in China in the near future; China is also developing its legal and business environments along with a robust model ecosystem to support continued utilization.

In the workplace, Chinese workers are using GenAI to match the demands of the high-frequency knowledge process groups, the drafted, the summarized, the translated, the code-supporting workers, the customer-contact workers and the imagination-creating workers, most of whom are doing so using either domestic or enterprise-level platforms, rather than through international (global) platforms. Research on the industry has identified a large number of rapidly-growing developers of foundational models in China, including companies such as Baidu, Alibaba, Tencent and other start-ups, that are providing solutions for enterprise applications, and many enterprises are testing the deployment of multiple solutions for multiple use cases rather than selecting a single vendor. Evidence of enterprise adoption has been seen in numerous metrics published by vendors. For example, Alibaba Cloud reported that it exceeded 90,000 adoptions in the first year of its Qwen models. This reflects the level of experimentation and integration occurring within many organizations (Alibaba Cloud, 2024). GenAI is also becoming integrated into daily production workflows in many firms, including software development. As an example, one report noted that more than 50% of Tencent programmers have used Tencent Cloud's AI coding assistant, which is built on Tencent's foundational model, suggesting that GenAI can become routine for many knowledge workers when combined with high-value, task-specific tooling (CIO, 2024).

The ability of rapid diffusion to have uniformly beneficial cognitive impacts on knowledge workers is debatable; to illustrate this point, researchers and policy-makers continue to explore how these emergent technologies will transform the ways that organizations operate and the means by which they deliver value (Triolo & Schaefer, 2024). Studies of the existing GenAI ecosystem in China indicate that some enterprises are still looking to understand how to extract meaningful and sustainable business value from this technology while at the same time balancing the need for establishing vendor lock-in with the benefit of improved productivity and enhanced cognitive functioning. In addition, given that GenAI can serve as both a tool to help with enhanced productivity and as a cognitive "shortcut", it raises questions around the ability of workers to sustain the quality of their independent reasoning and generate novel ideas, while also maintaining confidence in their own capacity as digital thought leaders, particularly as organizations continue to integrate such technology into their operations. As such, there is a pressing need for empirical research to determine not only whether knowledge workers are employing GenAI, but also how their engagement with GenAI affects their overall digital self-efficacy (Triolo & Schaefer, 2024).

Attitudes Toward Generative Artificial Intelligence

Benefits of AI

Attitudes toward artificial intelligence (AI) are generally defined as multidimensional in nature, consisting of cognitive beliefs, emotional responses, and behavioral intentions toward AI technology. Early measures such as the General Attitudes Toward Artificial Intelligence Scale (GAAIS) identified clusters of positive emotions, including optimism and perceived usefulness, which represent core benefits of AI in users' perceptions. Similarly, the AI Attitude Scale (AIAS-4) provides a stable representation of individuals' overall positive evaluations of AI products (Grassini, 2023). Studies in higher education further demonstrate that positive emotional states such as curiosity and excitement are strongly associated with acceptance and use of AI technologies (Katsantonis, 2024; Acosta-Enriquez et al., 2024).

As generative artificial intelligence (GenAI) proliferates in educational settings, a growing body of literature highlights perceived benefits such as improved learning support, feedback provision, and future career advantages. Attitudes toward ChatGPT often include evaluations of its usefulness, its potential to support learning, and its value for academic productivity (Hussain et al., 2024). Large-scale surveys across multiple universities confirm that students believe GenAI can enhance learning and benefit future career opportunities (Zawacki-Richter et al., 2023). In professional contexts, employees who perceive AI as augmenting their capabilities rather than replacing them tend to hold more positive attitudes and demonstrate greater openness to digital transformation and upskilling (Jussupow et al., 2023; Margherita, 2022).

Risks of AI

Alongside perceived benefits, attitudes toward AI are shaped by concerns about risk, fear, and ethical implications. The GAAIS and related scales identify negative emotions such as fear and risk perception as central components of AI attitudes. Research shows that individuals with higher perceptions of algorithmic opacity, unfairness, and potential harm tend to express skepticism or outright rejection of AI technologies (Castelo et al., 2022; Sankaran et al., 2022). In educational settings, students frequently report concerns about academic integrity, accuracy of AI outputs, and the ethical consequences of GenAI use (Hussain et al., 2024; Sallam, 2023).

Institutional framing also plays a significant role in shaping perceived risks. When universities emphasize AI primarily as a threat to academic integrity, students demonstrate greater fear, avoidance behaviors, and reluctance to adopt GenAI tools (Sallam, 2023; Tlili et al., 2024). In organizational environments, fears related to deskilling, job displacement, and algorithmic control contribute to resistance to AI adoption and lower confidence in AI-driven systems (Meijerink et al., 2021; Jussupow et al., 2023). These risk-related perceptions highlight that negative attitudes toward AI often stem from uncertainty, lack of transparency, and concerns about loss of control.

Use of AI

The use of AI and GenAI is strongly influenced by the interplay of perceived benefits and risks, as well as by personal and contextual factors. Studies consistently show that perceived usefulness and ease of use are key determinants of individuals' willingness to adopt and use GenAI technologies (Zawacki-Richter et al., 2023; Sallam, 2023). Students with higher digital literacy and prior experience with AI tools report more favorable attitudes and a greater willingness to integrate GenAI into their study practices (Almahasees et al., 2023). Conversely, lack of digital competence and uncertainty about how AI functions lead to confusion, anxiety, and reduced use (Popenici & Kerr, 2021).

Empirical evidence indicates that attitudes toward GenAI directly shape patterns of use, learning habits, and cognitive outcomes. Students with encouraging attitudes toward ChatGPT are more likely to incorporate it into their study routines, use it for idea development and feedback, and report higher efficiency and confidence (Tlili et al., 2024). In contrast, those with unfavorable or ambivalent attitudes tend to limit or avoid GenAI use due to concerns about accuracy, ethics, and potential penalties (Almahasees et al., 2023; Sallam, 2023). In professional contexts, favorable attitudes toward AI predict greater acceptance of AI-driven systems, stronger readiness for AI-enabled workflows, and higher engagement in digital upskilling, whereas unfavorable attitudes are associated with resistance, frustration, and reduced confidence (Jussupow et al., 2023; Meijerink et al., 2021).

Creative Problem-Solving

Creative problem-solving (CPS) is often viewed as an integrated multi-faceted thought process that includes creativity and utility to develop solutions to new or complex problems (Nazzal et al., 2020). Recently developed CPS models show that there are a series of cycles that occur when trying to generate solutions; i.e., the stages of framing the problem, generating ideas about how to solve the problem, evaluating and implementing a solution. All stages of the CPS process require flexible thought, reflective judgment, and awareness of context (Cromwell, 2023). Recent research also has begun to characterize the way people use metacognitive regulation during the CPS process to help plan, monitor and evaluate what they think as they produce and refine ideas. The MCPS (Metacognition in Creative Problem-Solving Scale) quantifies this aspect of CPS by identifying four key elements of metacognitive regulation – planning, monitoring, regulation and evaluating. These four key elements provide support for individuals who want to enhance their ability to perform adaptively and effectively within their creative performance (Urban & Urban, 2023).

GenAI has transformed the creative process through its dual role as a facilitator of creativity and a possible stumbling block. Research indicates that GenAI supports the creative process by providing users with a framework for generating ideas, speeding up the drafting process and broadening conceptual search space; these enhancements tend to be greatest for users who have a low baseline level of creativity (Doshi et al., 2024). One possible outcome of using GenAI tools too often, however, could be that this reliance will cause users' ideas to become more similar to one another, thereby reducing the potential for generating original, unique concepts. The continued development of creativity is contingent upon the user's ability to critically evaluate and reflect on the ideas provided by the GenAI. Evidence suggests that this critical evaluation should take place during the entire process of creativity and that it should include the generation of a wide range of prompts as well as reflection on the general principles that guide the generation of ideas. When GenAI is used intentionally and with this reflection, GenAI has the potential to encourage divergent thinking; conversely, when GenAI is used without reflection, users will likely experience a decrease in originality and will be less inclined to consider new possibilities through further investigation (McKay et al., 2024).

According to research conducted by Dumitru and Halpern (2023), cognitive foundations and digital self-efficacy (DSE), are critical precursors of creative problem-solving (CPS) in artificial intelligence (AI) augmented environments. CT allows an individual to assess AI-generated options and to eliminate unnecessary options from consideration. DSE has an influence on the confidence that a person has when using digital tools while performing creative tasks. Higher levels of DSE increase a person's ability to iterate

and modify their ideas based on what they have learned through digital mediated CPS. Research conducted by Ibrahim and Aldawsari (2023) and Wu (2023) supports these assertions. The organizational context also influences CPS by placing limitations, such as time constraints, limited resources, or organizational norms on the creative problem-solving process (Damadzic et al. 2022). Research shows that CPS, CT, DSE, and AI are interrelated, metacognitively driven processes.

Digital Self-Efficacy (DSE)

According to Bandura (1997), Digital Self-Efficacy is based on the principle of self-efficacy theory that states an individual's belief in his/her ability to perform a task impacts that individual's level of effort and cognitive engagement in performing that task, especially when the individual faces difficulties or issues. In today's Digital Age, Digital Self- Efficacy (DSE) refers to an individual's confidence in being able to effectively use digital technologies (e.g., navigating digital platforms, managing digital information and solving digital technology-related problems) in all aspects of life (personal, academic and professional) as cited by Ulfert-Blank et al. (2022). Within AI- and GenAI-mediated environments, Digital Self-Efficacy expands beyond just the basic digital operation skills needed to utilize digital tools to focus on the individual's perceived ability to interact with intelligent machines and systems, critically analyze and evaluate output generated by artificial intelligence and to integrate that output into their work and life processes, in addition to having a level of agency over their own life and ability to make informed decisions within digitally-saturated environments. (Paredes-Aguirre et al., 2024). Therefore, having a high level of Digital Self-Efficacy denotes having not only a degree of comfort in utilizing digital tools but also an overall sense of agency in technologically-enhanced environments, particularly environments that make extensive use of artificial intelligence.

Work related to the measurement of Digital Self-Efficacy (DSE) has increased in volume in recent years with the emergence of increasingly more rigorous measures exhibiting superior psychometric performance. According to review papers published on this topic and through digital self-efficacy scale development studies, DSE has often been conceptualized as a multi-faceted construct with the main dimensions being: Information and Data Literacy, Communication and Collaboration; Digital Content Creation, Safety and Security; as well as Problem Solving Ability (Ulfert-Blank et al., 2022). Recent research validating the Spanish Translation of the Digital Self-Efficacy Scale tested within both workplace and Spanish-speaking populations demonstrate a high level of reliability and a considered structure (i.e. unidimensional/higher order) with robust associations being demonstrated between DSE and digital competences, Task Technology Fit (the connection between technology and the situation for the individual performing that task) and Behavioral Engagement with Technology (Paredes-Aguirre et al., 2024). Empirical studies consistently demonstrate DSE to be a strong predictor of both more frequent and higher complexity of digital tools being used, higher levels of engagement online and improved learning and/or workplace performance, therefore establishing DSE as a decisive predictor of successful participation in the digital economy (Ibrahim & Aldawsari, 2023; Wu, 2023).

DSE is now being investigated through emerging research connecting it with people's perspective on AI/GenAI. People with positive attitudes towards AI will report a larger DSE, experiment with AI tools, and be willing to integrate these tools into complex tasks, seeing AI as a tool to help them meet their needs or complement other work they are already doing (Getenet et al., 2024). On the other hand, people who perceive AI as a threat, as nontransparent, or as something with excessive risk, tend to report lower DSE. People with negative views of AI will also feel less confident managing the work they do with AI—even if they already have lower-level digital skills (Naiseh & Shukla, 2025). Studies conducted in both higher education and in training/use of technology in a professional environment have found that programs specifically structured for the development of AI literacy and scaffolded opportunities to gain experience using GenAI have resulted in improved attitudes towards AI as well as improvements in DSE, leading to increased meaningful engagement in technology in universities (Getenet et al., 2024; Ibrahim & Aldawsari, 2023).

Digital skills empowerment (DSE), based on research conducted to elaborate how DSE provides a cognitive connection between attitude and contextual support and higher level outcomes such as complex reasoning

and problems solving. DSE has been supported to facilitate the pathway between digital capabilities and student engagement (e.g., cognitive engagement, social presence) in an online/blended learning context (Wu, 2023; Ibrahim & Aldawsari, 2023). DSE, the concept focuses on the relationship between workers' perceptions of efficacy in regards to AI-mediated environments and their preferences to experiment with advanced functionalities of AI-generated outputs, to use advanced functions of digital tools creatively when addressing novel, ill-structured problem sets and developing adaptive expertise in rapidly changing business environments (Ulfert-Blank et al., 2022; Paredes-Aguirre et al., 2024).

Influence of Attitudes Towards GenAI to Creative Problem-solving

The attitudes of people toward GenAI evolve as time passes and people's changing perceptions of GenAI are determined by several factors such as how people feel about using GenAI, how useful they think GenAI will be to them, and how ready they will be to use it (Pellegrini et al., in press). Empirical studies of people's attitudes toward GenAI have shown that people's mental evaluations (cognitive evaluations) and emotional evaluations (affective evaluations) will both influence their behavior: when a user considers a GenAI useful, and has a positive association with using that tool, that user will likely utilize the GenAI more often, and thus explore the capabilities of that tool, as opposed to use it infrequently or avoid using it altogether. Structural equation modeling of ChatGPT's user attitude shows that cognitive evaluations influence a user's affective evaluation, and these evaluations together predict how ready the user will be to use the tool (Acosta-Enriquez et al., 2024). In creative tasks, this is important because solving complex problems creatively often requires users to engage continuously, experiment, and refine; when users view GenAI as useful and positive, they are more likely to engage in these behaviors than when users view GenAI negatively or as unhelpful.

Recent studies indicate that viewing AI positively in creative and design-oriented environments is related to the level of enhancement perceived in how it can help individuals fulfill their creativity and autonomy when working on their assigned projects, as well as the overall effect it has on creative performance. For instance, a study examining the student experience when using AI tools for design-related assignments found that individuals with positive views of AI were able to recognize AI as a useful and efficient tool for supporting their creative process (flexibility, speed) as well as helping them generate new ideas. Conversely, individuals with negative or neutral opinions about AI viewed the use of these tools as decreasing or limiting their potential for learning and benefit from the tasks performed with support from AI (Saez-Velasco et al., 2025). While this research is focused on educational design environments, the underlying principles explored through the study correspond closely with the way GenAI can be utilized in creating knowledge-based work. When people view GenAI as a positive resource, they will utilize it more effectively to assist them during all stages of the problem-solving process, and therefore create better products.

Attitudes toward Artificial Intelligence (AI) is more than just having the right attitude. Trust in AI is another significant element of technology acceptance as well. In a study based on the Technology Acceptance Model (TAM), researchers found that attitude and trust in AI were strongly related to creative outcomes (Khoso et al., 2026). What this study also showed was that when a user has positive acceptance of AI as well as Trust in AI, the user's intention to use AI is stronger and thus has greater potential for creativity for learning using AI supported learning opportunities. The creative problem-solving influence's with GenAI is not overwhelmingly positive due to the dual nature of GenAI whereby the way in which GenAI is utilized will be a constraining factor and an enhancing factor with respect to creative thinking. An empirical study has shown that individuals' access to GenAI was found to provide higher ratings of creativity and a greater level of writing quality for people who were lower than average performers on a given writing task, while at the same time this has also caused the production of a narrower range of creative thinking (Doshi & Hauser, 2024). Other research has examined how GenAI relates to creative problem-solving and has indicated there may be advantages to divergent thinking as well as a potential negative impact on confidence in creative problem solving due to an unexamined and overly reliant use of GenAI (Habib et al., 2024).

From this, there emerges a tension between the concepts of enabling users versus homogenizing users: finding a balance between the two, wherein a positive attitude would allow for experimentation and a more diverse range of ideas (allowing for creative problem-solving), whereas a very positive or absolutely unexamined attitude would lead to users relying too heavily on a single application of creativity and being less original and more repetitive, causing individuals to not explore options that have not been suggested by GenAI. There is little data available that has examined this influence with knowledge workers in real work situations, and what influence individuals' attitudes toward GenAI may have on how they will utilize GenAI within their creative problem-solving processes (i.e. using GenAI as a brainstorming partner versus as a replacement for the solutions they develop), and the impact that this will have on their professional performance and development of their capabilities.

Influence of Creative Problem Solving to Digital Self-efficacy

Using a social-cognitive perspective, Creative Problem Solving (CPS) is thought to create a strong link to Digital Self-Efficacy (DSE) through the experiential learning aspect of CPS, when individuals complete successfully complex (i.e. technology-mediated) digital tasks, their successful navigation creates mastery experiences thereby increasing their self-confidence about digital tasks that they will complete in the future. Current research into DSE defines this as confidence within the context of competence with digital systems across many competence areas to include explicitly the ability to solve problems digitally (Ulfert-Blank et al., 2022). Furthermore, the Digital Self-Efficacy Scale that Paredes-Aguirre and his colleagues adapted and validated also captures DSE in regards to 'real-world' digital competencies (i.e. information management or problem-solving with digital tools). Thus, according to this scale, individuals who actively engage in solving complex problems using technology-rich environments will report greater DSE (Paredes-Aguirre et al., 2024). Hence, from this perspective, CPS is conceived of as an acquired ability and as habitual behaviors that repetitively reinforce the acquisition of confidence in digital performance.

Several recent empirical studies suggest that using CPS can enhance one's belief in their ability to do a task using technology or digital tools. The results from an experimental study on ill-defined creative problem-solving demonstrate that individuals who utilized ChatGPT to help them complete the task generated a better quality, more original solution than those who did not use AI assistance (Urban et al., 2024). Participants indicated higher levels of perceived self-efficacy when completing their ill-defined problem-solving tasks using ChatGPT versus not using AI technology. The results did not only identify task-level self-efficacy ratings but are also consistent with other research that highlights the relationship between completing an ill-defined problem-solving task supported by a digital tool and developing self-efficacy for performing future digital tools used in similar problem-solving tasks in the workplace (self-efficacy development in the workplace), as these findings are closely aligned with how Technology-Based Creative Problem-Solving (TB-CPS) teaches individuals how to develop and utilize self-efficacy when completing TB-CPS tasks within their respective work environments.

As such, structural modeling studies that examined TB-CPS in technology-rich environments provide further insight as to how having greater self-efficacy toward using technology directly relates to the degree to which individuals engage in technology-enhanced CBT-based problem-solving, which can be a critical factor to ultimately generating creativity-based results (Mangubat et al., 2025). The studies above indicate a reciprocal effect of relationship between self-efficacy and TPS in digital work environments; self-efficacy improves the likelihood of obtaining a successful outcome from TPS and developing greater self-efficacy based on the success of the TPS task.

Influence Attitudes Towards Gen AI to Digital Self-efficacy

The view of Generative Artificial Intelligence (GenAI) as a positive attribute like the perception of GenAI being productive, user friendly and beneficial enough to be integrated in personal workflow; is aligned in the mind of a user with Digital Self Efficacy (DSE) which will influence as to whether they would approach GenAI with the views of exploring and continuing to utilize or developing an atmosphere of avoidance or low

engagement with GenAI products. This conclusion comes from a mixed methods Technology Acceptance Model (TAM) researching the use of ChatGPT among Vietnamese University students. The attitude and belief about ChatGPT were a major influence in creating efficacy beliefs toward ChatGPT; and the belief and attitude of ChatGPT (easily used and helpful) affected academic self-efficacy. Therefore, those with positive attitudes toward ChatGPT will develop a greater belief in the completion of academic tasks through GenAI compared to those with negative attitudes toward ChatGPT. While the outcome of the study was an increase in academic self-efficacy through learning to use GenAI, this result can be extended to the world of knowledge worker careers because Digital Self Efficacy develops from continued, confident use of Digital Tools for Work Tasks. And those who have positive attitudes about AI will continue to use digital tools like GenAI for Work and develop the skills, confidence and ability to accomplish their Work Tasks through GenAI.

The empirical adoption models reveal that there is a tight coupling between self-efficacy and attitudes when using GenAI, and that the two may reinforce each other in a reciprocal fashion over time through the development of positive attitudes and the strength of one's belief in their abilities to effectively use GenAI. This is evident in Mahmud et al.'s (2024) study of university students' adoption of ChatGPT, which found that self-efficacy was a strong predictor of students' attitudes toward ChatGPT and that students' attitudes toward ChatGPT predicted their intentions to use ChatGPT, indicating that self-efficacy is one of the key psychological factors influencing the formation of positive attitudes toward AI and ultimately uptake. In a similar vein, Kim (2025) used a large sample of respondents to investigate the impact of digital self-efficacy on attitudes toward GenAI tools. In this large-sample study, key findings indicated that digital self-efficacy is positively related to digital attitudes toward GenAI tools, and, as with the previous study by Mahmud et al., the benefits of using tools were also impacted through the positive evaluations of the users through a new process. Based on the combined findings of both studies, we conclude that digital self-efficacy and attitudes toward using GenAI tools are interconnected. Therefore, when a person feels digitally competent, they may evaluate GenAI tools positively, and when an individual evaluates a tool positively, they may increase their digital competence and confidence through continued use of that tool.

Literature shows that attitudes toward GenAI influence the DSE in two ways. First, through behavioral exposure, from the perspective of increasing the frequency of using GenAI and the amount of different digital task types enabled by GenAI, with an impact on the development of mastery experiences. Second, through cognitive framing, positive attitudes reduce threat appraisal of GenAI and enable higher perceived control or confidence when using genai to troubleshoot and/or adapt to the tool. One important gap in this area is that most of the research available is in education settings and often focuses on general, or domain-specific self-efficacy; there is little research on workplace digital self-efficacy for knowledge workers. Hence, this gap provides a rationale for your proposed model, which includes the role of attitudes toward GenAI as a key antecedent to DSE in a professional context where the use of GenAI for day-to-day knowledge tasks (e.g., drafting, analyzing and generating ideas, and supporting decisions), will be common and probably increasing in frequency (Kim, 2025; Le & Tran, 2025; Mahmud et al., 2024).

Future Research Perspectives (highlight gaps, significance)

The literature reviewed identifies critical areas for future research with respect to how the increasing integration of Generative Artificial Intelligence (GenAI) into knowledge-based and professional decision-making processes. To understand how attitudes toward GenAI will influence the digital self-efficacy of knowledge workers across different types of organizational contexts, additional empirical research needs to be conducted outside of only higher education contexts. Longitudinal and/or cross-industry study designs may provide a more thorough understanding of how attitudes change over time as GenAI tools mature, the ways by which organizations implement policies regarding the usage of these tools, and how these changes shape workers' confidence in using digital and AI technologies.

While much of the literature on attitudes toward AI generally is available; however, limited research has examined how attitudes toward GenAI differ from other AI constructs, particularly in relation to how GenAI

reshapes creative problem-solving processes and digital self-efficacy development. Development and validation of psychometric tools specific to GenAI would allow researchers to accurately model the relationship between affective and cognitive responses to GenAI, creative problem-solving, and digital self-efficacy. Such work is essential for advancing theory on human–AI interaction beyond general technology acceptance frameworks and toward explaining how creative engagement functions as a cognitive pathway to digital competence.

Concerns regarding cognitive offloading, homogenization of ideas, and AI dependency have also raised questions about the possible developmental influence of GenAI representing gaps in future research. Future studies should investigate the conditions that lead to GenAI positively or negatively affecting creative problem-solving and digital self-efficacy, determining how factors such as training, reflective prompts, task structure, and organizational support might play a role.

Researchers will need to understand how the use of GenAI is combined with human agency, creativity, and adaptive expertise to develop responsible AI-enhanced learning and working environments. Addressing the gaps created by these unanswered questions and developing clear and comprehensive evidence-based policies will enhance the nature of human–AI collaboration.

METHODS

Study Design and Locale

This study adopts a descriptive-correlational and cross-sectional design to examine how attitudes toward generative AI influence knowledge workers' digital self-efficacy. A cross-sectional design is appropriate for the quantitative nature of this research as it enables the collection of data on the primary variables at a single point in time, providing a systematic snapshot of participants' attitudes toward GenAI, levels of creative problem-solving, and digital self-efficacy within real workplace contexts.

This approach is particularly suitable for identifying patterns of association and testing hypothesized relationships among variables without the need for longitudinal tracking or experimental manipulation. While the design supports the examination of predictive relationships and underlying mechanisms, it does not establish causality; rather, it provides evidence of statistically significant associations consistent with the proposed theoretical framework.

Shandong Province in China is a major center for digital transformation and innovation. Regional governments have established strong policies in support of artificial intelligence (AI), smart manufacturing, and widespread enhancement of digital skillsets across many industries (higher education, IT, manufacturing, finance and professional consulting). The combination of the policies and the digital infrastructure provide a conducive opportunity to study how knowledge workers incorporate GenAI into their regular daily work. Therefore, the geographical nature of Shandong and the unique diversity of the population provide an excellent and representative opportunity to examine how the perception of GenAI impacts creative problem solving and digital self-efficacy under the real-world conditions of work. Hence, results from this research will reflect the day-to-day experiences of knowledge workers in a rapidly changing innovation and technology-intensive economy, as many AI-based technologies continue to be included in day-to-day work.

Study Participants

Sample Size and Sampling Method

A convenience sampling method with proportional allocation was drawn from selected organizations in Shandong Province. To avoid over-concentration in a few industries, the study targeted approximately 395 respondents. After data cleaning,.a total of 394 valid responses were retained for analysis. The sample allocation was based on industry population sizes (Shandong Statistical Yearbook, 2025, as shown in Table 1)." . This method allows the researcher to gather data from participants across diverse

sectors such as e-commerce, healthcare, manufacturing, finance, and information technology, ensuring that the sample reflects the variety of professional roles in which GenAI is currently being applied

Using G*Power 3.1 (test family: F tests; statistical test: linear multiple regression – fixed model, R^2 deviation from zero), with $\alpha = .05$, power $(1-\beta = .80)$, a conservative small effect size $f^2 = .02$, and 2 predictors (attitudes toward GenAI and creative problem-solving) for the dependent variable (digital self-efficacy), the minimum required sample size is N = 395 to account for attrition (estimated 10–15%), the study will target 420–450 respondents.

Table 1 presents the demographic and professional characteristics of the respondents. The most commonly used GenAI tools were Kimi, Nami AI, or Tencent Yuanbao, reported by 42.64% of the respondents. This was followed by DeepSeek at 33.25% and Doubao at 24.11%.

Most respondents were between 31 and 40 years old, accounting for 38.83% of the sample, while 36.80% were between 41 and 45 years old. Respondents aged 22 to 30 years comprised 24.37%. In terms of gender, the majority were male at 61.93%, while 26.90% were female and 11.17% preferred not to disclose their gender.

Table 1 Demographic and Professional Characteristics of the Respondents (n = 394)

Variable	Category	Frequency (n)	Percentage (%)
GenAI Tools	DeepSeek	131	33.25
	Doubao	95	24.11
	Kimi Nami AI Tencent Yuanbao	168	42.64
Age	22-30	96	24.37
	31-40	153	38.83
	41-45	145	36.8
Gender	Female	106	26.9
	Male	244	61.93
	Prefer not to say	44	11.17
Education	Bachelor's degree	110	27.92
	Doctorate degree	86	21.83
	Master's degree	94	23.86
	Others	104	26.4
Sector	E-Commerce/Retail	37	9.39
	Finance	108	27.41
	Healthcare	83	21.07

	Information Technology/Software Services	46	11.68
	Manufacturing	120	30.46
Job Role	Financial Analyst	35	8.88
	Healthcare Worker	74	18.78
	Online Store Manager	58	14.72
	Production Supervisor	85	21.57
	Software Developer	142	36.04
Work Experience	Less than 1 year	50	12.69
	1-7 years	72	18.27
	8-10 years	197	50.00
	More than 10 years	75	19.04

Regarding educational attainment, 27.92% held a bachelor's degree, 23.86% held a master's degree, and 21.83% held a doctorate degree. The remaining 26.40% reported other educational qualifications. The largest sector represented was manufacturing at 30.46%, followed by finance at 27.41% and healthcare at 21.07%.

Software developers comprised the largest occupational group at 36.04%, followed by production supervisors at 21.57% and healthcare workers at 18.78%. Half of the respondents had eight to ten years of work experience. Overall, the respondents represented a relatively experienced group of knowledge workers from different technology-intensive and professional sectors.

Inclusion and Exclusion Criteria

Participants must meet all of the following criteria to be included in the study: they should be currently employed as a knowledge worker in the following sectors: E-commerce/Retail, Healthcare, Manufacturing, Finance, and Information Technology; based in Shandong Province, China, and engaged in work tasks that involve digital technologies or AI-assisted tools; have at least six months of professional experience in their current role to ensure adequate exposure to workplace systems and workflows and aged 22 years or older. On the other hand, individuals currently on extended leave, probation, or undergoing major workplace transitions that may affect their ability to provide accurate self-assessments of work-related cognition, who are unable or unwilling to provide informed consent and those who fail to complete the questionnaire are excluded from the study.

Research Instruments

The study utilized four questionnaires adopted from published articles and have been validated and was tested with reliability although another round of reliability tests will be done using Cronbach's Alpha.

Following the completion of the actual data collection, the internal consistency reliability of each research construct was examined using Cronbach's alpha coefficient. Reliability analysis was conducted to determine the extent to which the items within each construct consistently measured the same underlying concept

As presented in Table 2, the Benefits of AI construct obtained a Cronbach's alpha coefficient of 0.743, indicating acceptable internal consistency. The Risks of AI construct yielded a Cronbach's alpha of 0.807, while the Use of AI construct achieved an alpha coefficient of 0.851, both demonstrating good reliability. The Digital Self-Efficacy scale recorded a Cronbach's alpha of 0.913, and the Metacognition in Creative Problem-Solving scale obtained the highest reliability coefficient of 0.915. Both values indicate excellent internal consistency, suggesting that the items within these constructs consistently measure their respective latent variables.

Table 2 Internal Consistency Reliability of the Research Constructs

Construct	**Cronbach's α**	**Interpretation**	**Decision**
Benefits of AI	0.743	Acceptable	Reliable
Risks of AI	0.807	Good	Reliable
Use of AI	0.851	Good	Reliable
Digital Self-Efficacy	0.913	Excellent	Reliable
Metacognition in Creative Problem-Solving	0.915	Excellent	Reliable

Note. Interpretation of Cronbach's alpha: α ≥ .90 = Excellent; .80–.89 = Good; .70–.79 = Acceptable; .60–.69 = Questionable; < .60 = Poor (George & Mallery, 2003).

Artificial Intelligence Attitude Scale (AIAS) (Aktay, Gok, & Yildirim, 2024)

The Artificial Intelligence Attitude Scale (AIAS), developed by Aktay, Gok, and Yildirim (2024), is a 13-item survey designed to measure attitudes towards artificial intelligence. The AIAS consists of three dimensions, namely Benefits of AI, Risks of AI, and Use of AI. The AIAS uses a five-point Likert-type scale with a response option of 1 = Strongly Disagree and 5 = Strongly Agree. In this research study, the AIAS is adapted for measuring knowledge workers' attitudes towards GenAI to gain insight into how their beliefs, fears, and usage behaviors factor into posing trust, thinking, and creativity within an AI-mediated work context. The negatively worded Risks of AI items will be presented in their raw direction for item-level descriptive interpretation and reverse-scored only when computing the favorable Risks of AI dimension and the overall Attitudes toward GenAI composite. Dimension and overall composite scores were reported using means and standard deviations; no researcher-defined Low, Moderate, or High categories were assigned to composite scores.

Digital Self-Efficacy Scale (DSE) (Conte et al., 2025)

Digital self-efficacy in this study is measured using the Digital and Technological Self-Efficacy Scale (Digitech-S), a validated self-report instrument designed to assess individuals' confidence in performing digital and technological tasks in professional contexts. The scale consists of 10 items that evaluate respondents' perceived ability to effectively use digital tools and technologies in daily work activities, such as acquiring new technological knowledge, utilizing online resources, engaging in video communication, and collaborating through digital platforms. Each item is rated on a five-point Likert scale ranging from 1 (Completely Unconfident) to 5 (Completely Confident), with higher scores indicating greater levels of digital self-efficacy. The Digitech-S demonstrates a unidimensional structure and strong psychometric properties established through rigorous validation procedures, including Mokken Scaling Analysis and confirmatory factor analysis, which confirmed robust scalability and model fit. The final version of the scale showed excellent internal consistency with a Cronbach's alpha of 0.928, indicating high reliability in measuring

digital self-efficacy among professionals. In this study, the instrument is utilized to assess knowledge workers' confidence in using digital technologies and generative artificial intelligence (GenAI) tools, which may influence their ability to engage in higher-order cognitive processes such as creative problem-solving in technology-rich work environments. For descriptive reporting, individual Digitech-S item means were interpreted using the confidence response anchors and researcher-defined equal-width intervals: 1.00-1.80 = Completely Unconfident, 1.81-2.60 = Unconfident, 2.61-3.40 = Moderately Confident, 3.41-4.20 = Confident, and 4.21-5.00 = Completely Confident. The overall Digital Self-Efficacy composite was reported using its mean and standard deviation, with higher scores indicating greater confidence in performing digital and technological tasks; no researcher-defined Low, Moderate, or High category were assigned to the overall composite.

Metacognition in Creative Problem-Solving Scale (MCPS) (Urban & Urban, 2023)

The Metacognition in Creative Problem-Solving Scale (MCPS), an instrument created by Urban and Urban (2023), is a valid and reliable measure for metacognitive processes while creatively solving a problem. The MCPS is based on dual processes and metacognitive monitoring theories of creativity and focuses on the interrelation between planning, metacognitive monitoring, regulation, and evaluation. The scale includes 11 items across four sections, which represent different aspects of cognitive executive control in creative work. In the present study, respondents answered each item using a five-point agreement scale (1 = Strongly Disagree to 5 = Strongly Agree). Individual MCPS item means will be interpreted using the administered agreement anchors and the same researcher-defined equal-width intervals used for the AIAS. The overall MCPS composite will be reported using its mean and standard deviation, with higher scores indicating greater engagement in metacognitive processes during creative problem-solving; no researcher-defined Low, Moderate, or High category will be assigned to the overall composite. For Digital Self-Efficacy, it further used the research-defined interpretation of 1 = Completely Unconfident to 5 = Complete Confident and the other 2 scales, 1 = Very Low to 5 = Very High.

Table 3 Researcher-Defined Mean Ranges for Descriptive Interpretation

Mean Range	AIAS and MCPS Item Interpretation	Digital Self-Efficacy Item Interpretation	Dimension/Overall Composite Interpretation
1.00-1.80	Strongly Disagree	Completely Unconfident	Very Low
1.81-2.60	Disagree	Unconfident	Low
2.61-3.40	Neither Agree nor Disagree	Moderately Confident	Moderate
3.41-4.20	Agree	Confident	High
4.21-5.00	Strongly Agree	Completely Confident	Very High

Note. Item-level descriptors reflect the response categories of the respective instruments. For the AIAS and MCPS, item interpretations range from Strongly Disagree to Strongly Agree, while for the Digitech-S they range from Completely Unconfident to Completely Confident. The Very Low to Very High categories for dimension and overall composite means are researcher-defined equal-width ranges used solely for descriptive interpretation. They are not validated cut-off scores prescribed by the original instrument developers.

Pilot Study, Validity and Reliability

A pilot study was conducted prior to the full implementation of the survey instrument to ensure the clarity, reliability, and suitability of the questionnaire items. The pilot test involved 30 respondents who possess characteristics similar to the target population of the study but will not be included in the final sample. The primary purpose of this pilot testing was to identify ambiguous items, assess the clarity of instructions, and evaluate the internal consistency of the measurement scales. After collecting the pilot data, a reliability analysis using Cronbach's Alpha was performed through statistical software to determine the internal consistency of the questionnaire. Cronbach's Alpha measures the extent to which the items within a scale are correlated and consistently measure the same construct. Generally, a Cronbach's Alpha coefficient of 0.70 or higher is considered acceptable for research instruments, indicating good reliability of the scale. If any items show low item–total correlations or reduce the overall reliability of the instrument, necessary revisions or deletions will be made before the final data collection. This process will help ensure that the instrument used in the study demonstrates adequate reliability and is suitable for the main survey administration. A pilot test was conducted to evaluate the internal consistency reliability of the research instrument before the administration of the main survey. Reliability was assessed using Cronbach's alpha coefficient for each construct. As presented in Table 4, the Benefits of AI scale obtained a Cronbach's alpha of 0.727, while the Risks of AI scale yielded an alpha of 0.716, indicating acceptable internal consistency. The Use of AI construct recorded a Cronbach's alpha of 0.837, demonstrating good reliability. Similarly, the Digital Self-Efficacy scale achieved a Cronbach's alpha of 0.864, indicating good internal consistency. Among all constructs, Metacognition in Creative Problem-Solving obtained the highest reliability coefficient ($\alpha = 0.891$), which also falls within the good reliability range

Table 4 Reliability Analysis of the Research Instrument during the Pilot Test

Construct	**Cronbach's α**	**Interpretation**	**Decision**
Benefits of AI	0.727	Acceptable	Retained
Risks of AI	0.716	Acceptable	Retained
Use of AI	0.837	Good	Retained
Digital Self-Efficacy	0.864	Good	Retained
Metacognition in Creative Problem-Solving	0.891	Good	Retained

Note. Interpretation based on Cronbach's alpha guidelines: $\alpha \geq .90$ = Excellent; .80–.89 = Good; .70–.79 = Acceptable; .60–.69 = Questionable; < .60 = Poor (George & Mallery, 2003).

Specific Procedures

Informed Consent and Data Collection

Data collection began only after obtaining approval from the appropriate institutional ethics committee. Participating organizations and sector representatives in Shandong Province will be contacted to facilitate survey distribution among eligible knowledge workers with varying cultural backgrounds. Before accessing the questionnaire, participants were required to read an online informed consent form explaining the study's purpose, confidentiality measures, voluntary participation, and their right to withdraw at any time. Only those who provide digital consent proceeded to the survey. Data was collected using an online survey platform to

ensure accessibility across sectors such as higher education, information technology, finance, telecommunications, manufacturing, healthcare administration, and corporate services. The instrument used two languages – Mandarin and English to ensure understandability,

Administration of Research Instrument

The survey consisted of validated scales measuring attitudes toward GenAI, digital self-efficacy, and creative problem-solving. Instructions were clearly provided to guide participants in completing the questionnaire. To ensure high-quality responses, automated checks (e.g., completeness verification) and attention-control prompts may be embedded within the survey. The estimated completion time of 10–15 minutes was communicated in advance. Once the data collection window closes, all responses were exported into statistical software for cleaning, coding, and preparation for analysis.

Preliminary Data Processing and Analysis

For Objective 1, descriptive statistics (means, standard deviations, frequencies, and percentages) will be computed to summarize respondent characteristics and scores for each study construct. Data was screened for missing values, outliers, and normality using skewness and kurtosis. For Objective 2, Pearson correlation coefficients were calculated to examine initial relationships among attitudes toward GenAI, digital self-efficacy, and creative problem-solving.

Ethical Considerations

Before conducting the study, the researcher submitted the research protocol to the AUF-OVPRI Ethics Review Committee for ethical review and approval. Any modifications to the study will be communicated to the AUF-OVPRI Ethics Review Committee for additional approval.

Informed Consent Process, Duration of Participation, and Withdrawal Criteria

Prior to participation, the participants were provided with detailed consent forms that outline the study's purpose, procedures, potential risks, and benefits. The consent form clearly stated that participation was voluntary and that the participant can withdraw from the study at any time without penalty. Moreover, the expected duration of participation for respondents ranged from one to two months, depending on the phase of data collection in which they are involved. Participants were informed that they can freely withdraw from the study at any time without any questions and without the potential loss of any benefits. All data collected prior to withdrawal were also disregarded.

Risks and Inconveniences

The study poses minimal risk to participants, primarily related to the potential stress of recalling and sharing personal opinions and experiences. To minimize these risks, the researcher ensured a supportive environment during surveys, allowing participants to skip any questions they prefer not to answer. Additionally, participants were asked to complete the survey forms during their most convenient time.

Benefits of the Study

Participants and the broader professional and academic communities may benefit from the insights generated by this study, which aims to deepen understanding of how attitudes toward generative artificial intelligence

influence digital self-efficacy, and creative problem-solving among knowledge workers.

The findings may help organizations design more effective AI training programs, support evidence-based digital transformation initiatives, and promote responsible, skill-enhancing use of GenAI in the workplace. Additionally, this research may inform policy directions and capacity-building strategies for fostering AI

readiness and cognitive resilience in rapidly evolving work environments. As a token of appreciation, participants received a small gift card in recognition of their time and valuable contributions to the study.

Privacy, Confidentiality, and Data Management

All personal data will be anonymized to protect participant confidentiality. Identifiable information were separated from the study data and stored securely. Additionally, all electronic data will be stored for a period of one year on password-protected servers, accessible only to the researcher ethics committee after which will be deleted from the file.

Physical data will be kept in locked cabinets in secured facilities. Participants were given the option to receive a summary of the research findings upon the study's completion, ensuring transparency and accessibility by emailing the researcher of the request.

Conflict of Interest

There are no conflicts of interest to declare by any research team members regarding the conduct and outcomes of this study.

Statistical Analysis of Data

Descriptive Analyses

The demographic information of all participants were captured through a descriptive analysis of their demographics and to provide a general overview of participant scores on the three primary variables, which are attitudes towards GenAI, creativity and creative problem solving, and digital and technology self-efficacy. Descriptive statistics were calculated for each variable based on the average score, standard deviation, number of participants and percentage of total participants who completed each question for each participant group. The normality of the variable distributions was assessed using normality tests, including skewness and kurtosis, and normality was determine whether the distribution of the data is adequate for parametric analyses of the data. The results of these descriptive and testing procedures created an initial representation of the cognitive and attitudinal profiles of Shandong province intellectual workers. For questionnaire-item descriptive analyses, item means were interpreted using the construct-appropriate response anchors in Table 4: agreement-based descriptors for the AIAS and MCPS, and confidence-based descriptors for the Digitech-S. These equal-width ranges were used only for individual item means. Dimension and overall composite scores were reported as means and standard deviations without researcher-defined categorical levels; higher scores were interpreted according to the scoring direction of each construct.

Correlational Analysis

Correlational analysis was conducted to examine the nature of the relationship that exists between attitudes toward GenAI and creativity and problem solving and the individual worker's technology self-efficacy. Using Spearman's rho, an assessment of the significance of the association were made between the three variables measured in this study. This analysis served as an initial test of the proposed hypotheses and support future testing of the impact of creative thinking and digital technology on the performance of knowledge workers.

RESULTS

Descriptive Statistics for attitudes toward GenAI in terms of benefits of AI, risks of AI and use of AI

As shown in Table 5, the Benefits of AI dimension obtained a composite mean of 3.75 (SD = 0.89). At the item level, all three statements fell within the Agree range. Respondents agreed that AI is an important technological advancement and can make significant contributions to humanity, both with a mean of 3.80.

The statement that AI makes life easier received the lowest item mean (M = 3.65), although it also remained within the Agree range.

For the Risks of AI dimension, the raw negatively worded item responses were used for descriptive interpretation. The raw dimension mean was 2.21 (SD = 0.88), and all four risk statements fell within the Disagree range. This indicates that respondents generally disagreed that AI poses a threat to society, reduces human-to-human communication, replaces human workers, or reduces human creativity. The item concerning reduced human creativity received the highest raw risk-item mean (M = 2.28), indicating comparatively greater concern about this issue. For computation of the favorable Risks of AI dimension and the overall Attitudes toward GenAI composite, the risk items were reverse-scored, yielding a reverse-scored dimension mean of 3.79. The Use of AI dimension obtained a composite mean of 3.79 (SD = 0.85). At the item level, all six statements fell within the Agree range. The strongest agreement was recorded for using AI to create written content, followed by creating visual content and interacting with AI through conversation.

The overall Attitudes toward GenAI composite mean was 3.78 (SD = 0.81). The composite score was not assigned a categorical interpretation; higher scores indicate a more favorable attitude toward GenAI.

Table 5 Respondents' Attitudes Toward Generative Artificial Intelligence

Dimension and Item	**Mean**	**SD**	**Interpretation**
Artificial intelligence is an important technological advancement.	3.80	1.14	Agree
Artificial intelligence makes life easier for people.	3.65	1.09	Agree
Artificial intelligence can make significant contributions to humanity.	3.80	1.06	Agree
Overall Benefits of AI	**3.75**	**0.89**	**High**
*Artificial intelligence poses a threat to society.	2.19	1.12	Disagree
*Artificial intelligence reduces human-to-human communication.	2.20	1.07	Disagree
*Artificial intelligence may replace human workers.	2.18	1.08	Disagree
*Artificial intelligence may reduce human creativity.	2.28	1.16	Disagree
***Overall Risks of AI (raw)**	**2.21**	**0.88**	**Low***
I enjoy using artificial intelligence to create written content.	3.86	1.16	Agree
I like keeping up with developments in artificial intelligence.	3.72	1.09	Agree
I enjoy discussing topics related to artificial intelligence.	3.73	1.12	Agree
I would like to interact with AI through conversation.	3.83	1.09	Agree
I enjoy using artificial intelligence to create visual content.	3.84	1.09	Agree
I would like to use artificial intelligence tools for entertainment.	3.73	1.16	Agree
Overall Use of AI	**3.79**	**0.85**	**High**
Overall Attitudes Toward Generative AI	**3.78**	**0.81**	**Positive**

Note. AIAS items were rated from 1, Strongly Disagree, to 5, Strongly Agree. *Raw scores are shown for the negatively worded Risk of AI items to preserve their item-level meaning; these items were reverse-scored only when computing the favorable Risks of AI dimension and the overall Attitudes toward GenAI composite. Composite scores are reported without researcher-defined categorical classifications.

Descriptive Statistics for Digital Self-efficacy

Table 6 shows that the overall Digital Self-Efficacy composite mean was 3.78 (SD = 0.83). The overall composite was not assigned a Low, Moderate, or High category. At the item level, all mean scores fell within the Confident range. Respondents expressed the greatest confidence in gaining knowledge through fully online courses or seminars (M = 3.89, SD = 1.09). They were also confident in rapidly acquiring new technological knowledge and collaborating with teams using digital tools, both with a mean of 3.83. The lowest item mean was observed for sending an email containing multiple attachments (M = 3.69, SD = 1.20), which remained within the Confident range.

Table 6 Respondents' Level of Digital Self-Efficacy

Dimension and Item	**Mean**	**SD**	**Interpretation**
Acquire new technological knowledge within a short period, considering how rapidly technologies change.	3.83	1.09	Confident
Find answers to challenging work situations using search engines and web-based applications.	3.78	1.07	Confident
Gain new knowledge by attending fully online courses or seminars.	3.89	1.09	Confident
Become familiar with new applications or technologies through practical learning rather than note-taking.	3.74	1.09	Confident
Plan a self-directed learning process to improve digital and technological skills.	3.72	1.14	Confident
Send an email containing multiple file attachments.	3.69	1.2	Confident
Start a video call within a few minutes using the available tools.	3.76	1.11	Confident
Stay updated with new versions of applications, digital services, and devices.	3.8	1.12	Confident
Collaborate effectively with a team while using digital tools such as video calls and email.	3.83	1.12	Confident
Overcome preconceived beliefs about technology, such as doubts regarding the effectiveness of distance learning.	3.78	1.08	Confident
Overall Digital Self-Efficacy	**3.78**	**0.83**	**Confident**

Note. Each item was rated on a five-point scale ranging from 1, Completely Unconfident, to 5, Completely Confident. Item means were interpreted using the confidence response anchors in Table 4. The overall composite is reported as a mean and standard deviation without a researcher-defined categorical level.

Descriptive Statistics for Metacognition in Creative Problem-Solving

Table 7 shows an overall Metacognition in Creative Problem-Solving composite mean of 3.77 (SD = 0.80). The overall composite was not assigned a Low, Moderate, or High category. At the item level, all statements fell within the Agree range. The highest-rated behavior was thinking innovatively rather than repeatedly using the same approach (M = 3.88, SD = 1.14), followed by regularly asking oneself questions to ensure progress toward a goal (M = 3.87, SD = 1.03). Respondents also agreed that they changed their approach when encountering difficulties and evaluated whether completed solutions achieved their intended objectives. The lowest item mean was observed for evaluating whether ongoing actions contributed to achievement of a project goal (M = 3.65, SD = 1.03), which also remained within the Agree range.

Table 7 Respondents' Level of Metacognition in Creative Problem-Solving

Dimension and Item	**Mean**	**SD**	**Interpretation**
When working on a project, I evaluate whether my actions are helping me achieve my goal.	3.65	1.03	Agree
When I cannot develop an original approach to a problem, I revisit the task and try to find another solution.	3.68	1.08	Agree
When I encounter difficulties while solving a problem, I change my approach.	3.84	1.09	Agree
Before starting a project, I consider how to approach the problem in an original way.	3.8	1.11	Agree
I regularly ask myself questions to ensure that I am progressing toward my goal.	3.87	1.03	Agree
When solving a problem, I adapt my approach to best meet the task requirements.	3.81	1.1	Agree
When solving a problem, I think innovatively rather than repeatedly using the same approach.	3.88	1.14	Agree
When preparing for a task, I identify potential problems or aspects that I do not fully understand.	3.71	1.06	Agree
After completing a project, I evaluate whether my solution achieved the intended goal.	3.83	1.05	Agree
Before starting a project task, I establish the steps needed to achieve my goal.	3.73	1.14	Agree
After completing a project, I evaluate whether my solution is more original than those of others.	3.66	1.08	Agree
Overall Metacognition in Creative Problem-Solving	**3.77**	**0.8**	**High**

Correlations of Attitudes Toward GenAI with Creative Problem-Solving and Digital Self-Efficacy

As presented in Table 8, all relationships were positive and statistically significant. Benefits of AI were moderately associated with creative problem-solving, $\rho = 0.463$, and digital self-efficacy, $\rho = 0.527$. This

indicates that respondents who more strongly recognized the benefits of AI also tended to report higher creative problem-solving and digital confidence.

The reverse-scored Risks of AI dimension was positively associated with creative problem-solving, ρ = 0.517, and digital self-efficacy, ρ = 0.542. Since higher values indicate lower perceived risk, respondents who expressed less concern about AI risks tended to report stronger creative problem-solving and digital self-efficacy. Use of AI was also positively related to creative problem-solving, ρ = 0.476, and digital self-efficacy, ρ = 0.527. Overall Attitudes toward GenAI had a positive correlation with creative problem-solving, ρ = 0.497, and a comparatively stronger positive correlation with digital self-efficacy, ρ = 0.575. Creative problem-solving was positively associated with digital self-efficacy, ρ = 0.476.

Table 8 Spearman's Rank-Order Correlations of Attitudes Toward GenAI with Creative Problem-Solving and Digital Self-Efficacy

Variable	Creative Problem-Solving	Digital Self-Efficacy
Benefits of AI	0.463 ***	0.527 ***
Risks of AI[1]	0.517 ***	0.542 ***
Use of AI	0.476 ***	0.527 ***
Overall Attitudes Toward GenAI	0.497 ***	0.575 ***
Creative Problem-Solving	—	0.476 ***

Note. Values are Spearman's rho coefficients. [1]Higher reverse-scored Risk of AI values indicate lower perceived AI risk. *** p-value <.001.

DISCUSSION

Respondents' Attitudes Toward GenAI in Terms of Benefits, Risks, and Use of AI

Benefits of AI

The first research aim was to analyze respondents' attitudes toward GenAI through Benefits of AI, Risks of AI, and Use of AI. The overall Attitudes toward GenAI composite mean was 3.78, with higher composite scores representing a more favorable orientation toward GenAI. For the Benefits of AI dimension, the composite mean was 3.75, and all three item means fell within the Agree range. Respondents therefore generally agreed that AI is an important technological advancement, makes life easier, and can make significant contributions to humanity. This finding is in line with the increased perception of GenAI as useful for educational, professional, and creative tasks among students and knowledge workers. Attitudes toward AI are commonly discussed through cognitive, affective, and behavioral evaluations of its usefulness, opportunities, and relevance in education and work (Acosta-Enriquez et al., 2024; Almahasees et al., 2023; Grassini, 2023).

Risks of AI

Regarding Risks of AI, the raw negatively worded items produced a dimension mean of 2.21, and all four item means fell within the Disagree range. Respondents therefore generally disagreed that AI poses a threat to society, reduces human-to-human communication, replaces human workers, or reduces human creativity. For computation of the favorable risk-related attitude and the overall Attitudes toward GenAI composite, the risk

items were reverse-scored, yielding a mean of 3.79. The item on AI potentially reducing human creativity received the highest raw risk-item mean, suggesting comparatively greater concern regarding this issue. It is important to note that the literature identifies both opportunities and risks of AI use; GenAI may enhance productivity, personalized learning, and creativity, while also presenting concerns related to overreliance, originality, algorithmic dependency, and ethics (Kasneci et al., 2023; Popenici & Kerr, 2021; Zhai et al., 2024; Zhang et al., 2023).

Use of AI

The Use of AI dimension obtained a composite mean of 3.79, while all six item means fell within the Agree range. Respondents generally agreed with statements reflecting enjoyment of and willingness to use AI technologies. The strongest agreement involved the use of AI to create written content, followed by creating visual content and interacting with AI through conversation. These responses indicate a generally favorable behavioral orientation toward using AI for productive and creative activities. This result is supported by recent studies reporting increased acceptance and use of ChatGPT and other GenAI tools in higher education (Hussain et al., 2024; Mahmud et al., 2024; Tlili et al., 2024).

Level of Creative Problem-Solving

The study also examined the respondents' metacognition in creative problem-solving. The overall composite mean was 3.77; however, no categorical level was assigned to this composite score. At the item level, all statements fell within the Agree range, indicating that respondents generally endorsed behaviors involving monitoring their thinking, modifying strategies, asking themselves questions, and evaluating solutions. Thinking innovatively rather than repeatedly using the same approach received the highest item mean (M = 3.88), followed by asking oneself questions to ensure progress toward a goal (M = 3.87).

Findings indicate that respondents were not just using a mechanical way of problem solving but were reflecting and adapting. Creative problem solving is when one uses an innovative way of approaching tasks, adjusting when obstacles appear, and checking whether the solutions achieved the required objectives. This corresponds with the notion that creativity and innovation involve the idea generation process and the self-regulatory process that enables action towards achievement of meaningful outcomes (Amabile & Pratt, 2016; Cromwell, 2023; Nazzal et al., 2020). The finding further emphasizes the significance of metacognition in the process of creative problem solving. This is because of the fact that metacognitive knowledge helps an individual plan and revise strategies in case of complex situations. The observed creative problem-solving scores may also be considered in relation to respondents' attitudes toward GenAI. GenAI can help users generate prompts, alternatives, explanations, and examples that allow them to approach problems from different perspectives and consider multiple potential solutions. Recent evidence suggests that GenAI can support creative problem-solving when it functions as a thinking partner rather than a replacement for human reasoning (Habib et al., 2024; Urban et al., 2024).

Level of Digital Self-Efficacy

The third goal of the study was to describe respondents' Digital Self-Efficacy. The overall composite mean was 3.78; however, no categorical level was assigned to this composite score. At the item level, all Digitech-S statements fell within the Confident range. Respondents therefore generally reported confidence in acquiring new technological knowledge, using search engines and web-based applications, attending online courses or seminars, learning new applications through practice, collaborating through digital technology, and overcoming doubts regarding technology use. The highest item mean concerned gaining new knowledge through fully online courses or seminars.

Such findings can be related to the idea of self-efficacy, which is one of the central concepts proposed by Bandura and which focuses on people’s perceptions about their ability to make actions needed for achieving certain results (Bandura, 1997). In the sphere of the usage of digital technologies, self-efficacy refers to the perceptions of learning and applying digital technologies successfully. The results can also be associated with

the findings that consider digital self-efficacy as an essential element of adopting technology, being engaged in digital learning, and developing digital competence (Ulfert-Blank & Schmidt, 2022; Paredes-Aguirre et al., 2024; Getenet et al., 2024). This finding is important because the application of GenAI involves not only using the tools but also having faith in one's ability to navigate digital platforms, learn new software, assess the results, and integrate technology into work and learning assignments. Respondents with greater digital self-efficacy are more likely to try out GenAI, overcome the digital problems, and apply AI tools to writing, graphics design, communication, and solving problems. It can be explained by the findings according to which digital self-efficacy positively correlates with digital technology attitudes and the integration of ICT (Ibrahim & Aldawsari, 2023; Peng et al., 2024).

Significant Relationship of Attitudes Toward GenAI on Creative Problem-Solving

The above finding is consistent with the notion that the presence of positive attitude towards AI might lead people to get involved more in exploratory, adaptive, and creative behavior. It means that people would be ready to use AI more often as a helper to come up with ideas, to find alternatives, and to improve their solutions when they find AI to be beneficial, safe, and fun to use. This finding is consistent with studies claiming that acceptance of AI and positive attitude to AI is related to creativity, digital literacy, and productive behavior in AI-assisted activities (Khoso et al., 2026; Kim, 2025; Mahmud et al., 2024). The finding is consistent with researches proving that GenAI is capable of influencing creative behavior (Habib et al., 2024; Urban et al., 2024).

Significant Relationship of Creative Problem-Solving on Digital Self-Efficacy

It implies that the ability to creatively solve problems may lead to an enhancement in digital self-efficacy since individuals who can adopt their strategies, think in innovative ways, and analyze the problem might feel more competent in dealing with digital issues. It is because there may be occasions where digital environments might force people to deal with the problem, use an unknown tool or change their technologies. Therefore, participants who have more skills of metacognition and problem solving creatively may feel more competent while using digital platforms and learning new software applications. This result is in line with other studies stressing the importance of self-efficacy regarding technological problem-solving and curiosity.

ignificant Relationship of Attitudes Toward GenAI on Digital Self-Efficacy

This implies that positive attitudes towards GenAI can boost digital self-efficacy through increased exploration of digital applications and participation in AI-supported activities. In situations where participants hold positive perceptions towards GenAI, in terms of its helpfulness, usefulness, and threats, the likelihood of being more confident when dealing with digital applications increases. This is consistent with empirical evidence that links attitudes, usefulness, acceptance, and self-efficacy in contexts of artificial intelligence and digital technology applications (Kim, 2025; Le & Tran, 2025; Naiseh et al., 2025; Peng et al., 2024).

CONCLUSION AND RECOMMENDATIONS

Conclusions

The findings of this research showed that respondents generally agreed with statements describing the benefits and use of Generative Artificial Intelligence and generally disagreed with the raw negatively worded AI-risk statements. The overall Attitudes toward GenAI composite mean was 3.78, with higher scores representing a more favorable orientation toward GenAI. Respondents recognized GenAI as useful and relevant for activities such as creating written and visual content, interacting with AI, and keeping up with technological developments. The second descriptive finding was an overall mean of 3.77 for Creative Problem-Solving and 3.78 for Digital Self-Efficacy. At the item level, respondents generally agreed with the creative problem-solving statements and reported confidence across the digital self-efficacy items. The creative problem-solving responses indicate that respondents endorsed behaviors such as changing approaches when facing challenges, monitoring their progress, and evaluating their solutions.

Recommendations

First, educational organizations need to increase the responsible and productive utilization of GenAI by students and knowledge workers. Given respondents' general agreement with statements about AI benefits and AI use, there is potential to develop courses that teach learners how to write prompts, perform AI-assisted writing, generate visual content, use AI responsibly and ethically, verify sources, and make decisions responsibly.

Second, GenAI should be used as a tool to solve creative problems, not just to complete tasks quickly. Teachers, trainers, and leaders of educational organizations could develop activities which would involve the learners using GenAI to come up with alternatives, to choose solutions to a problem, to develop ideas and evaluate outputs.

Third, initiatives designed to enhance digital self-efficacy should include technical skills along with activities that strengthen confidence. Respondents generally reported confidence across the Digital Self-Efficacy items, and this can be further supported through workshops, online courses, peer coaching, simulation exercises, and guidance on how to use new digital tools. Educational institutions should provide opportunities to become familiar with unfamiliar software, solve digital problems, collaborate through online platforms, and evaluate their digital learning process.

Fourth, since respondents generally disagreed with the raw negatively worded AI-risk statements, educational institutions should still provide comprehensive AI literacy training. Openness toward GenAI should be accompanied by critical thinking and risk awareness. Training should address issues such as information privacy, academic honesty, bias, hallucinated information, intellectual property, and human responsibility. This is essential because the benefits of GenAI are more likely to be realized when users understand both its strengths and its limitations.

Lastly, future research should be aimed at building a strong link between attitudes towards AI, creative thinking, and digital confidence. As the results have revealed significant interrelations among the variables, it is possible for the educational institutions to create comprehensive projects that will develop attitudes towards AI, creative problem solving, and digital confidence simultaneously. For instance, students can be required to use GenAI in the context of project-based activities and assess the output of AI solutions.

Limitations

“One of the limitations is due to the use of self-reported data from a survey, which may be subject to social desirability, self-assessment bias, or variability in respondent interpretation of the constructs. The cross-sectional nature of the research precludes any possibility of making causal claims regarding Attitudes toward GenAI, Creative Problem-Solving, and Digital Self-Efficacy.

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