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The Psychology of AI Dependency: A Conceptual Analysis of Cognitive Offloading and Human Decision-Making in the Generative AI Era

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ABSTRACT

The widespread adoption of generative artificial intelligence (AI) has significantly transformed the way people acquire knowledge, solve problems, and make decisions in both academic and professional settings. While these technologies improve efficiency and accessibility, their growing use has raised important psychological concerns regarding excessive reliance on AI for cognitive tasks. One emerging issue is AI dependency, where individuals increasingly shift mental effort to AI systems, a process commonly described as cognitive offloading. This study presents a conceptual analysis of how sustained engagement with generative AI may influence human thinking, reasoning, and decision-making. Drawing upon theories from cognitive psychology, distributed cognition, metacognition, and human–AI interaction, the paper examines the psychological mechanisms through which generative AI encourages the transfer of cognitive effort from individuals to intelligent systems. It further explores the potential impact of this shift on critical thinking, independent problem-solving, cognitive autonomy, and the quality of human decision-making. The study also discusses the circumstances under which cognitive offloading can serve as a beneficial strategy for improving efficiency, as well as the conditions in which prolonged dependence on AI may gradually weaken essential cognitive skills. Particular attention is given to factors such as user expertise, task complexity, and patterns of AI use that may shape these outcomes. By integrating insights from existing interdisciplinary literature, this paper develops a comprehensive conceptual framework explaining the relationship between generative AI use, cognitive offloading, and psychological dependency. The study aims to provide a theoretical foundation for future empirical research while offering practical insights for educators, technology developers, and policymakers seeking to encourage responsible AI use, strengthen AI literacy, and preserve human cognitive autonomy in an increasingly AI-driven society.

Keywords: *Generative artificial intelligence, AI dependency, cognitive offloading, cognitive autonomy, decision-making, metacognition, human–AI interaction*

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I. INTRODUCTION

The rapid advancement of generative artificial intelligence (AI) has fundamentally reshaped how individuals learn, work, communicate, and make decisions. Unlike earlier digital technologies that primarily assisted with information retrieval or task automation, modern generative AI systems can produce original content, analyse complex information, generate recommendations, and support reasoning across diverse domains. These capabilities have made generative AI integral to education, research, healthcare, business, law, and everyday life, and as interaction with these systems becomes routine an important psychological question has emerged: how does sustained reliance on generative AI influence human cognition and independent decision-making?

Generative AI is no longer simply a productivity tool; it increasingly functions as a cognitive partner that assists with memory, reasoning, writing, planning, and problem-solving. This collaboration improves efficiency and accessibility, but it also encourages users to delegate cognitive tasks that traditionally required independent mental effort, a process commonly referred to as cognitive offloading. While offloading has long been supported by notebooks, calculators, search engines, and other digital tools, generative AI marks a significant evolution: rather than simply storing or retrieving information, it generates ideas, evaluates alternatives, and participates directly in the reasoning process itself.

Recent management-science perspectives lend empirical weight to this concern. Eric So, Sloan Distinguished Professor of Global Economics and Behavioral Science at the MIT Sloan School of Management, argues that AI is changing how people's brains operate by creating conditions under which users become excessively dependent on the technology, with significant implications for organisations. Professor So describes this pattern as "AI gravity": a constant pull toward outsourcing more of one's thinking to AI in pursuit of greater efficiency. Three converging behavioural pressures drive this overreliance, according to this account: increasingly capable AI amplifies the basic human instinct to conserve mental effort; social pressure to succeed pushes individuals toward AI use to replicate expert-level performance; and the growing difficulty of detecting peers' AI use intensifies competitive pressure to adopt these tools. A preliminary MIT Media Lab study lends further weight to this concern, finding that 83 per cent of participants who used ChatGPT to write essays could not quote a single sentence from their own submissions moments later, suggestive evidence that offloaded cognitive work may fail to be genuinely internalised at all.¹

¹ Beth Stackpole, 'AI Gravity' Is Pulling You Toward Dependency. Here's How To Push Back, MIT SLOAN IDEAS MADE TO MATTER (June 2, 2026), <https://mitsloan.mit.edu/ideas-made-to-matter/ai-gravity-pulling-you-toward->

This shift raises questions that extend beyond the individual. Beyond personal skill, the erosion of independent cognitive effort threatens tacit institutional knowledge, the expertise built through years of hands-on experience, particularly among early-career workers, potentially undermining the organisational continuity that depends on accumulated practice. This organisational dimension extends the psychological concern beyond individual cognition into a broader question of collective and institutional cognitive capital.²

This growing dependence has stimulated academic interest in the concept of AI dependency: a behavioural tendency in which individuals progressively rely on AI systems for intellectual tasks they previously performed independently. AI undeniably has the potential to enhance productivity, creativity, and learning, but excessive dependence may reduce opportunities for reflective thinking, independent analysis, and the development of cognitive skill. As AI systems grow more capable and more widely accessible, understanding the psychological consequences of this dependency has become an increasingly urgent concern for researchers and policymakers alike.

II. STATEMENT OF THE PROBLEM

Despite the rapid and widespread adoption of generative AI across educational, professional, and everyday settings, there remains a limited theoretical understanding of how sustained reliance on these systems affects fundamental human cognitive processes, including critical thinking, metacognitive awareness, and independent decision-making. Existing scholarship has concentrated primarily on technological performance, algorithmic governance, ethical considerations, and regulatory challenges, leaving the psychological consequences of prolonged AI reliance comparatively under-examined.

Emerging research suggests that individuals who consistently rely on AI-generated outputs for reasoning, writing, and problem-solving may become less inclined toward independent evaluation and analytical reflection. Over time, such patterns of cognitive offloading may weaken metacognitive awareness, diminish confidence in personal judgment, and deepen dependence on AI-generated recommendations. Practitioner-oriented perspectives echo this concern, cautioning that working through cognitive difficulty, rather than avoiding it, is a necessary step in building critical thinking and problem-solving skill, and that removing this friction through AI assistance risks allowing those skills to atrophy at both the individual and organisational level.³ Beyond individual cognition, increasing cognitive offloading may also

dependency-heres-how-to-push-back.

² Stackpole, *supra* note 1.

³ Lisa Bodell, *Outsourcing Our Minds: How Generative AI Is Rewiring How We Think*, FORBES (Nov. 13, 2025).

reduce opportunities to build practical expertise and experiential knowledge, with downstream effects on organisational learning, institutional memory, and long-term professional competence.

Despite these emerging concerns, the literature remains conceptually fragmented. Psychological theories of cognition, cognitive offloading, human–computer interaction, decision science, and organisational behaviour have generally been examined in isolation, with little cross-pollination between them, and comparatively little dialogue with management and organisational-behaviour perspectives on AI adoption specifically. Consequently, no comprehensive conceptual framework yet exists that explains the psychological mechanisms underlying AI dependency or identifies the conditions under which cognitive offloading enhances human performance versus when it evolves into maladaptive dependency. Addressing this gap is essential, both for informing future psychological research and for guiding educators, organisations, technology developers, and policymakers in promoting responsible AI use while preserving human cognitive autonomy, critical thinking, and independent judgment.

III. RESEARCH OBJECTIVES

1. To examine how and why individuals increasingly rely on generative artificial intelligence for cognitive tasks such as information retrieval, idea generation, and problem-solving, and to explore the psychological factors that contribute to this dependence.
2. To analyse the effects of sustained reliance on generative AI on human decision-making, with particular emphasis on critical thinking, independent judgment, and metacognitive awareness.
3. To distinguish, from a conceptual perspective, between constructive cognitive offloading that enhances human performance and excessive AI dependency that may undermine independent cognitive functioning.
4. To evaluate the implications of AI-assisted decision-making for human cognitive autonomy by examining concerns relating to automation bias, diminished reasoning capacity, and reduced confidence in independent decision-making.
5. To develop a conceptual framework for the responsible use of generative AI that encourages cognitive enhancement while preserving human autonomy, critical thinking, and informed decision-making.

IV. RESEARCH QUESTIONS

1. What psychological mechanisms explain cognitive offloading and the emergence of dependency on generative artificial intelligence?
2. How does sustained reliance on generative AI influence human decision-making, particularly in relation to critical thinking, independent judgment, and metacognitive awareness?
3. Where should the conceptual boundary be drawn between beneficial cognitive offloading that enhances human performance and maladaptive AI dependency that diminishes cognitive autonomy?
4. What are the principal psychological risks associated with excessive dependence on generative AI, including automation bias, reduced cognitive effort, and the erosion of independent reasoning?
5. How can generative AI be integrated into cognitive and professional activities in a manner that enhances human capabilities while preserving cognitive autonomy and informed decision-making?

V. REVIEW OF LITERATURE

The rapid integration of generative artificial intelligence into education, professional practice, and everyday decision-making has prompted growing scholarly interest in the psychological consequences of relying on AI-assisted cognition. Earlier research on cognitive offloading conceptualised the delegation of mental tasks to external resources as an adaptive strategy that enables individuals to conserve cognitive effort and optimise performance. However, the emergence of generative AI has transformed this relationship by enabling AI systems not merely to retrieve information but also to generate ideas, evaluate alternatives, and participate in reasoning processes. Consequently, recent scholarship has increasingly questioned whether extensive reliance on these systems may alter critical thinking, metacognitive regulation, and independent decision-making.⁴

Among the most influential contemporary studies, Gerlich demonstrates a significant negative relationship between frequent generative AI use and critical thinking ability. The study further identifies cognitive offloading as a mediating mechanism through which extensive AI use contributes to diminished critical engagement. Importantly, Gerlich also reports that younger users exhibit greater dependence on generative AI than older individuals, while education level

⁴ Evan F. Risko & Sam J. Gilbert, *Cognitive Offloading*, 20 TRENDS IN COGNITIVE SCIS. 676 (2016).

moderates these effects, suggesting that psychological dependence on AI varies across demographic and educational contexts rather than affecting all users equally. These findings have positioned cognitive offloading as a central explanatory concept in discussions concerning AI dependency.⁵

Subsequent research has expanded this perspective by examining the mechanisms through which AI influences learning and reasoning. A 2025 study argues that frequent reliance on generative AI is associated with lower levels of deep learning and reduced critical analysis, particularly when individuals encounter unfamiliar or complex problems requiring independent reasoning. The study further identifies cognitive fatigue and AI literacy as important moderating variables, indicating that the effects of cognitive offloading are not inherently detrimental but depend upon users' ability to engage critically with AI-generated outputs. This emerging evidence suggests that the psychological impact of AI is shaped by both technological design and individual cognitive competencies.⁶

Recent scholarship has also introduced the concept of metacognitive laziness to explain a deeper form of AI dependency. Rather than merely outsourcing factual recall or routine tasks, users increasingly delegate higher-order metacognitive functions such as planning, monitoring, evaluating, and reflecting on their own thinking. A 2025 vocational education study argues that prolonged cognitive offloading may gradually reduce internal cognitive engagement, resulting in diminished self-regulation and independent problem-solving. This concept extends traditional theories of cognitive offloading by suggesting that generative AI may influence not only what individuals know but also how they regulate their own thinking processes.⁷

The relationship between AI dependency and human decision-making has further been examined through the concept of automation bias. The INTERNATIONAL AI SAFETY REPORT defines automation bias as the tendency of individuals to place excessive trust in automated recommendations while disregarding contradictory information or independent judgement. According to the report, excessive reliance on AI may weaken human agency by discouraging active reasoning and reducing judgement authenticity. The report also highlights experimental evidence indicating that AI-assisted writing systems can influence not only the content produced

⁵ Michael Gerlich, *AI Tools in Society: Impacts on Cognitive Offloading and the Future of Critical Thinking*, 15 SOCIETIES 6 (2025).

⁶ Jinrui Tian & Ronghua Zhang, *Learners' AI Dependence and Critical Thinking: The Psychological Mechanism of Fatigue and the Social Buffering Role of AI Literacy*, 260 ACTA PSYCHOLOGICA 105725 (2025), <https://doi.org/10.1016/j.actpsy.2025.105725>.

⁷ Amir Yunus, Gay Peng Rend & Lee Oon Teng, *From Co-Design to Metacognitive Laziness: Evaluating Generative AI in Vocational Education* (arXiv Working Paper No. 2512.12306, 2025), <https://arxiv.org/abs/2512.12306>.

by users but also their personal opinions, raising important questions regarding cognitive autonomy and the preservation of independent decision-making in the generative AI era.⁸

Despite growing concerns regarding AI dependency, contemporary literature does not uniformly portray cognitive offloading as harmful. A quasi-experimental study published in 2025 demonstrates that when generative AI is integrated through structured pedagogical approaches that deliberately delegate lower-order cognitive tasks while preserving higher-order reasoning, students exhibit stronger critical thinking skills and produce higher-quality written work. The findings indicate that cognitive offloading partially mediates these positive learning outcomes, suggesting that the educational value of generative AI depends upon how AI is incorporated into learning rather than on AI use itself. This balanced perspective challenges deterministic assumptions that AI inevitably undermines human cognition and instead distinguishes productive cognitive augmentation from maladaptive psychological dependency.⁹

More recent conceptual scholarship has similarly shifted towards developing comprehensive frameworks for responsible human-AI interaction. The proposed empowerment-entrapment framework conceptualises generative AI as simultaneously enhancing human capabilities while creating risks of excessive dependence if appropriate cognitive safeguards are absent.¹⁰ Likewise, Narayanan and Feigh examine how AI dependency and information abstraction influence human oversight within collaborative decision-making environments, demonstrating that increasing reliance on AI can gradually diminish active human supervision.¹¹ Complementing these approaches, Kalyuga's expertise reversal principle suggests that AI-assisted cognitive support should adapt to users' existing expertise, thereby preventing unnecessary dependence while maintaining meaningful cognitive engagement.¹²

Collectively, the existing literature demonstrates that cognitive offloading, automation bias, metacognitive regulation, and AI dependency are increasingly recognised as interconnected psychological phenomena. Nevertheless, current scholarship remains fragmented, with most

⁸ UK DEPARTMENT FOR SCIENCE, INNOVATION AND TECHNOLOGY, *International AI Safety Report 2026* (Yoshua Bengio, Chair), DSIT 2026/001 (Feb. 3, 2026), <https://internationalaisafetyreport.org/publication/international-ai-safety-report-2026>.

⁹ Hui Hong, Poonsri Vate-U-Lan & Chantana Viriyavejakul, *Cognitive Offload Instruction with Generative AI: A Quasi-Experimental Study on Critical Thinking Gains in English Writing*, 7 FORUM FOR LINGUISTIC STUD. 325 (2025).

¹⁰ Jackson G. Lu, Gerui Gloria Zhao & Anna Manyi Zheng, *Generative AI Use in Entrepreneurship: An Integrative Review and an Empowerment-Entrapment Framework* (arXiv Working Paper No. 2604.02567, 2026), <https://arxiv.org/abs/2604.02567>.

¹¹ Ranjani Narayanan & Karen M. Feigh, *Designing for Oversight: An Empirical Investigation of the Dual Impact of AI Dependency and Information Abstraction on Human Supervision in Decision-Making Teams*, INT'L J. HUM.-COMPUTER INTERACTION (2026) (advance online publication), <https://doi.org/10.1080/10447318.2026.2618568>.

¹² Slava Kalyuga, Paul Ayres, Paul Chandler & John Sweller, *The Expertise Reversal Effect*, 38 EDUC. PSYCHOLOGIST 23 (2003).

studies examining individual constructs in isolation or focusing primarily on educational and workplace contexts. Limited attention has been devoted to developing an integrated conceptual framework explaining how cognitive offloading evolves into psychological dependency and how this transformation influences autonomous human decision-making in the generative AI era. The present doctrinal research seeks to address this conceptual gap by synthesising contemporary psychological theories and emerging empirical evidence to develop a comprehensive understanding of AI dependency while distinguishing beneficial cognitive augmentation from maladaptive reliance.

VI. RESEARCH METHODOLOGY

This study adopts a qualitative doctrinal research methodology supported by conceptual and interdisciplinary analysis to examine the psychological dimensions of dependence on generative artificial intelligence. Rather than measuring behavioural outcomes through empirical methods, the research relies on the systematic examination, interpretation, and synthesis of existing academic literature, theoretical frameworks, policy documents, and legal scholarship relating to cognitive offloading, decision-making, and the growing influence of AI technologies.

The study primarily draws upon secondary sources, including peer-reviewed journal articles, books, conference papers, reports published by international organisations, and policy frameworks developed by institutions such as UNESCO, the OECD, and the European Union. It critically examines established psychological theories, including cognitive offloading, cognitive load theory, dual-process theory, automation bias, algorithm aversion, and technology dependency models, to understand how increasing reliance on AI-assisted systems may influence reasoning, judgement, and cognitive performance.

A conceptual analytical approach is employed to clarify the evolving meaning of AI dependency and distinguish it from related concepts such as technological assistance, automation reliance, and cognitive augmentation. The research further evaluates existing theoretical perspectives to explain the cognitive and psychological processes through which these technologies shape individual autonomy and decision-making.

To provide a broader perspective, the study also adopts an interdisciplinary approach by integrating insights from psychology, cognitive science, behavioural economics, artificial intelligence ethics, and technology governance. This facilitates a comprehensive understanding of AI dependence as both a cognitive and societal phenomenon, extending beyond purely technological considerations.

Where relevant, the research undertakes a comparative doctrinal analysis of international policy initiatives and ethical governance frameworks concerning trustworthy AI, human oversight, cognitive autonomy, and responsible AI use. The purpose is not to compare legal systems comprehensively but to identify shared principles and emerging governance approaches that may help address excessive cognitive reliance on AI technologies.

As the research is based exclusively on secondary sources, it does not involve human participants, interviews, surveys, or experimental methods. Consequently, ethical approval was not required. By combining doctrinal analysis with conceptual reasoning and interdisciplinary perspectives, this methodology provides a coherent framework for examining the psychological foundations of AI dependence and their implications for human judgement in the era of generative artificial intelligence.

VII. LEGAL ANALYSIS

A. The emerging legal challenges of AI dependency and cognitive offloading

The rapid integration of generative artificial intelligence into education, professional environments, and everyday decision-making has created legal questions that extend beyond concerns relating to privacy and data protection. Increasing dependence on AI-assisted systems raises broader issues concerning human autonomy, cognitive freedom, accountability, and meaningful human oversight. Although no international legal instrument specifically regulates AI dependency or cognitive offloading, contemporary AI governance frameworks increasingly recognise that artificial intelligence should augment, rather than replace, human judgement.

B. Human-centred AI governance under the UNESCO Recommendation

The UNESCO Recommendation on the Ethics of Artificial Intelligence establishes one of the most comprehensive international normative frameworks governing AI. It places human rights, human dignity, and fundamental freedoms at the centre of AI governance, emphasising transparency, fairness, accountability, and effective human oversight throughout the lifecycle of AI systems. Importantly, the Recommendation recognises that individuals must retain meaningful control over AI-assisted decision-making, thereby discouraging excessive reliance on automated systems that may undermine independent reasoning. These principles provide an important ethical foundation for addressing the psychological risks associated with cognitive offloading, even though the Recommendation does not expressly regulate AI dependency.¹³

¹³ UNESCO, *Recommendation on the Ethics of Artificial Intelligence* (Nov. 23, 2021).

C. Human oversight and trustworthy AI under the OECD AI Principles

Similarly, the OECD AI Principles adopt a human-centred approach by requiring AI systems to respect human rights, democratic values, privacy, and individual autonomy. The principles encourage the development of trustworthy AI supported by transparency, explainability, robustness, accountability, and appropriate human oversight. Rather than permitting AI to function as an autonomous decision-maker, the OECD framework consistently emphasises that human judgement must remain central throughout the deployment and use of AI technologies. This approach is particularly relevant where generative AI increasingly performs cognitive tasks that were traditionally undertaken by individuals.¹⁴

D. Protecting human rights through the Council of Europe AI Framework Convention

The Council of Europe's Framework Convention on Artificial Intelligence further strengthens this position by introducing legally significant obligations concerning human dignity, individual autonomy, equality, privacy, transparency, accountability, and procedural safeguards. The Convention requires States to ensure that individuals affected by AI systems have access to information, effective remedies, and opportunities to challenge decisions where AI significantly influences their rights. Although the Convention primarily addresses human rights protection rather than psychological dependence, its recognition of meaningful human oversight reflects growing international concern that AI should remain subject to human control.¹⁵

E. Data protection and automated decision-making under the GDPR

From a data protection perspective, the General Data Protection Regulation provides important safeguards against fully automated decision-making through Article 22, which grants individuals protections in situations where decisions producing legal or similarly significant effects are made solely through automated processing. While the Regulation strengthens transparency, accountability, and individual control over personal data, it was not designed to address cognitive dependence arising from frequent interaction with generative AI. Consequently, it offers indirect protection by regulating automated decision-making rather than the psychological consequences of continuous reliance on AI-assisted reasoning.¹⁶

¹⁴ OECD, *Recommendation of the Council on Artificial Intelligence*, OECD/LEGAL/0449 (adopted May 22, 2019, amended Nov. 8, 2023 and May 3, 2024).

¹⁵ COUNCIL OF EUROPE, *Framework Convention on Artificial Intelligence and Human Rights, Democracy and the Rule of Law*, CETS No. 225 (opened for signature Sept. 5, 2024).

¹⁶ Regulation (EU) 2016/679, of the European Parliament and of the Council of 27 April 2016 on the Protection of Natural Persons with Regard to the Processing of Personal Data (General Data Protection Regulation), art. 22, 2016 O.J. (L 119) 1.

F. India's digital personal data protection framework and cognitive autonomy

In the Indian context, the Digital Personal Data Protection Act, 2023 establishes obligations relating to lawful processing of personal data, consent, and data protection. However, like most existing legislation, its primary objective is the protection of informational privacy rather than cognitive autonomy. The Act does not specifically regulate behavioural dependence on AI systems, cognitive offloading, or the long-term impact of AI-generated recommendations on human judgement. This demonstrates that current legislative frameworks remain focused on data governance rather than the broader psychological implications of AI-assisted decision-making.¹⁷

G. Human rights foundations for cognitive autonomy

International human rights instruments further reinforce the importance of protecting individual autonomy. The Universal Declaration of Human Rights and the International Covenant on Civil and Political Rights recognise human dignity, freedom of thought, privacy, and personal autonomy as fundamental values.^{18,19} Although these instruments were drafted long before the emergence of generative AI, their principles provide an important normative foundation for interpreting emerging challenges relating to cognitive independence and human agency in the digital age. As AI systems increasingly influence personal choices, education, employment, and public decision-making, these established rights may require broader interpretation to safeguard cognitive autonomy against excessive technological dependence.

H. The World Health Organization's human-centred approach to AI governance

The World Health Organization similarly advocates a human-centred approach to AI governance by emphasising transparency, accountability, human supervision, and risk management in the deployment of AI technologies. These principles reinforce the view that AI should function as a supportive tool while preserving professional responsibility and independent human judgement, particularly in contexts where decisions directly affect individual welfare.²⁰

I. Doctrinal gaps in existing AI governance frameworks

Collectively, these international instruments demonstrate a clear convergence around common principles, including human dignity, autonomy, transparency, accountability, privacy, and human oversight. Nevertheless, they remain largely preventive and ethical rather than legally

¹⁷ Digital Personal Data Protection Act, No. 22 of 2023 (India).

¹⁸ Universal Declaration of Human Rights, G.A. Res. 217A (III), arts. 1, 12, 18–19 (Dec. 10, 1948).

¹⁹ International Covenant on Civil and Political Rights, arts. 17–19, Dec. 16, 1966, 999 U.N.T.S. 171.

²⁰ WORLD HEALTH ORG., *Ethics and Governance of Artificial Intelligence for Health: WHO Guidance* (2021).

responsive to the emerging phenomenon of AI dependency. None of the existing frameworks directly addresses cognitive offloading, declining critical thinking, or the gradual transfer of human reasoning to generative AI systems. This reveals a significant doctrinal gap within contemporary AI governance. While current frameworks successfully regulate the responsible development and deployment of AI, they provide limited guidance on protecting cognitive autonomy and preserving independent decision-making in an era characterised by increasing reliance on generative artificial intelligence.

VIII. FINDINGS

A. Psychological mechanisms driving cognitive offloading

The analysis indicates that dependence on generative AI arises from the interaction of three key psychological factors: the human tendency to minimise cognitive effort, the increasing capability of AI systems to produce sophisticated outputs, and social pressures created by expectations of high performance. Additionally, the difficulty in identifying the extent of AI use among peers may encourage competitive adoption of these technologies. Therefore, cognitive offloading through AI cannot be understood merely as a rational strategy for improving efficiency; it is also influenced by behavioural tendencies, social comparison, and the desire to reduce mental workload.

B. Effects on critical thinking, judgement, and metacognitive processes

Existing literature demonstrates a consistent association between frequent generative AI use and reduced critical thinking engagement, with cognitive offloading functioning as a significant mediating factor. However, this impact is not experienced equally across all users. Factors such as age, educational background, AI literacy, and task complexity influence the extent to which individuals become dependent on AI assistance. The findings further highlight the emergence of “metacognitive laziness,” where individuals begin delegating not only information retrieval but also higher-order cognitive activities, including planning, evaluation, and self-monitoring. This represents a deeper form of dependency compared with earlier forms of cognitive offloading involving tools such as calculators and search engines.

C. Distinguishing beneficial cognitive support from maladaptive dependency

The findings demonstrate that the distinction between productive AI assistance and harmful dependency is not absolute but depends on the manner in which AI is incorporated into human activities. When AI systems are used primarily for lower-order tasks while users continue to engage in analysis, evaluation, and independent reasoning, cognitive outcomes may improve.

This finding challenges the assumption that AI adoption inevitably weakens human cognition and suggests that the consequences of AI use are largely determined by the design, context, and method of implementation.

D. Cognitive autonomy risks arising from automation bias

Automation bias emerges as a significant concern associated with excessive reliance on AI-generated recommendations. The issue extends beyond the reduction of individual effort, as excessive trust in AI outputs may influence independent reasoning and even alter personal judgements and opinions. Therefore, the impact of AI dependency involves not only the possibility of reduced cognitive skills but also a broader concern regarding the preservation of human autonomy in decision-making.

E. Development of a conceptual framework for responsible AI integration

The analysis of frameworks such as the empowerment-entrapment model and the expertise reversal principle suggests that dependency risks are heightened when AI systems provide uniform assistance without considering individual expertise levels. This finding supports the development of a more adaptive approach to AI integration, where systems adjust the degree of support according to users' knowledge and capabilities rather than applying a standardised model. Such an approach provides a foundation for promoting responsible AI use while maintaining human cognitive engagement.

IX. RECOMMENDATIONS

A. Recommendations for educators and academic institutions

Educational institutions should develop AI-integrated learning models that preserve higher-order cognitive activities, including analysis, evaluation, and synthesis, as core student responsibilities while allowing AI tools to support lower-level tasks such as basic information retrieval and formatting. Such a structured approach can help ensure that AI functions as a cognitive aid rather than a substitute for independent reasoning.

Institutions should also incorporate comprehensive AI literacy programmes that enable students to critically assess AI-generated information, recognise potential inaccuracies, and avoid the passive acceptance of automated outputs. This would help reduce the risk of automation bias and encourage more reflective engagement with AI technologies.

Furthermore, educators should introduce reflective exercises, such as reasoning-based assessments and justification tasks, where students are required to demonstrate their

independent thought processes alongside AI-assisted work. Such practices can strengthen metacognitive awareness and prevent excessive dependence on AI-generated solutions.

B. Recommendations for technology developers

AI developers should incorporate the expertise reversal principle into system design by ensuring that the level of cognitive assistance provided by AI systems corresponds with the user's existing knowledge and experience. Rather than offering identical levels of assistance to all users, AI systems should provide greater guidance to beginners while allowing more experienced users to engage with reduced intervention.

Developers should also consider implementing “friction by design” mechanisms, such as prompts that encourage users to attempt problem-solving or reflection before receiving AI-generated responses. These features can preserve opportunities for independent cognitive engagement and reduce automatic reliance on AI outputs.

Additionally, AI systems should provide greater transparency regarding AI-generated suggestions and recommendations, enabling users to clearly distinguish between their own reasoning and machine-generated conclusions. This may help prevent the gradual transfer of personal judgement to automated systems.

C. Recommendations for organisations and employers

Organisations should ensure that employees, particularly those in early career stages, continue to develop practical experience, professional judgement, and tacit knowledge rather than relying exclusively on AI-supported shortcuts. Maintaining opportunities for direct learning and hands-on engagement is essential for preserving institutional expertise and long-term skill development.

Employers should establish responsible AI usage policies that encourage technological efficiency while maintaining appropriate human review mechanisms for decisions requiring professional judgement. Such oversight is necessary to minimise the risks associated with automation bias and excessive dependence on AI-generated recommendations.

D. Recommendations for policymakers

Policymakers should consider developing regulatory and governance frameworks, informed by emerging initiatives such as the INTERNATIONAL AI SAFETY REPORT, that promote transparency regarding the role and influence of AI systems in significant decision-making processes, particularly in high-impact contexts.

Additionally, governments and regulatory institutions should support further empirical research into AI dependency and cognitive offloading. Since this study is conceptual in nature, the recommendations proposed should serve as a foundation for evidence-based investigation rather than being treated as conclusive findings.

E. Recommendations for future research

Future research should empirically examine and validate the conceptual framework developed in this study through experimental, longitudinal, and comparative studies assessing the effects of different models of AI integration on critical thinking and decision-making abilities.

Further investigation should also explore demographic and contextual factors, including age, educational background, and AI literacy levels, to identify groups that may be more vulnerable to maladaptive forms of AI dependency and to develop more targeted approaches for responsible AI adoption.

X. CONCLUSION

This study examined the psychological dimensions of dependence on generative artificial intelligence, with particular emphasis on how sustained interaction with AI systems influences human cognition, critical thinking, and decision-making processes. Through a doctrinal and interdisciplinary analysis of existing theoretical perspectives and scholarly literature, the research demonstrates that cognitive offloading through generative AI cannot be classified as inherently beneficial or harmful. Instead, its impact depends on the manner of use, the user's level of expertise, and the complexity and nature of the task being performed.

The findings reveal that reliance on generative AI is shaped by several interconnected psychological factors, including the desire to reduce cognitive effort, increasing performance expectations, and the convenience offered by immediate AI-generated solutions. When such reliance becomes excessive, it may contribute to reduced critical engagement, weakened metacognitive awareness, and greater acceptance of AI-generated outputs without sufficient evaluation. However, the study also highlights that cognitive offloading, when purposefully managed, can support human capabilities by allowing individuals to delegate routine processes while focusing their attention on higher-order reasoning and creative problem-solving.

The central argument of this research is that the relationship between humans and generative AI should not be understood through a binary distinction between technological benefit and cognitive harm. Rather, the consequences of AI integration depend upon the balance between augmentation and dependency. The conceptual framework developed through this study,

incorporating cognitive psychology, distributed cognition, metacognition, and human–AI interaction theories, provides a foundation for understanding how this balance can be maintained across educational, professional, and organisational contexts.

Maintaining human cognitive autonomy in the generative AI era does not require rejecting AI technologies but requires developing appropriate safeguards that encourage responsible use. These include designing AI systems that promote human oversight, strengthening independent reasoning skills, and creating institutional environments that preserve opportunities for meaningful cognitive engagement. As generative AI continues to evolve, future approaches must ensure that technological efficiency complements rather than replaces human judgement, critical thinking, and intellectual independence. This study therefore provides a conceptual foundation for further empirical research aimed at examining and refining the relationship between AI assistance, cognitive offloading, and human decision-making.
