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To,
The Select Committee on Adopting Artificial Intelligence (AI)
PO Box 6100
Parliament House
Canberra ACT 2600

10th May 2024

Dear Members of the Select Committee on Adopting Artificial Intelligence,

Re: Inquiry into the opportunities and impacts for Australia arising out of the uptake of artificial intelligence (AI) technologies in Australia.

Thank you for the invitation to contribute to this inquiry.

I am an Information and Communications Technology Associate Professor at Central Queensland University's School of Engineering and Technology. As a socio-technological expert, my research is dedicated to exploring information systems and the social dynamics of educational technologies, delving into their impact on both individuals and organisations. I have been at the forefront of advocating for the transformative potential of generative artificial intelligence tools, delivering multiple informative sessions across educational, professional, and entrepreneurial landscapes [1,2,3]. More recently, I have also published a peer-reviewed research study outlining the impact of ChatGPT, a generative AI tool, in the higher education context[4]. Hence, I am deeply invested in advancing our understanding and harnessing the potential of generative artificial intelligence. In this submission, I aim to juxtapose AI's opportunities, benefits and challenges and offer relevant recommendations.

Before proceeding further, it is crucial to highlight that global attention towards artificial intelligence (AI) surged significantly since November 2022, following the public release of ChatGPT by OpenAI. In fact, it is important to note that current discussions among the general populace predominantly revolve around generative AI (GenAI) rather than AI as a whole. Despite AI's existence for decades, the accessibility of ChatGPT, a GenAI tool, garnered widespread attention and adoption worldwide. Prior to this development, the emphasis on AI was comparatively muted. However, what ensued immediately after was a mix of apprehension and admiration. Therefore, this submission specifically centres on GenAI, a subset of AI technologies, with attention paid to the phrasing unless explicitly stated.

The release of ChatGPT elicited both apprehension and admiration for several reasons. Firstly, its creative capabilities were widely acknowledged. GenAI, exemplified by ChatGPT, demonstrated

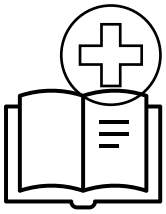
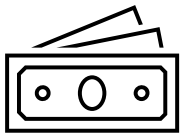
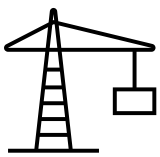
remarkable capabilities in producing human-like text, engaging in conversations, and even creating art and music. This technological prowess inspired admiration for its potential to revolutionise various industries, from content creation to marketing. However, alongside this admiration came significant concerns about the potential misuse of GenAI technology. Its ability to generate compelling fake content raised fears about the spread of misinformation and manipulation of public opinion. Ethical considerations also played a pivotal role in the mixed response to GenAI. Questions arose regarding its use in areas such as customer service, health support, and education, with concerns about boundaries between human and AI interaction, as well as potential biases and invasions of privacy in AI-generated content. Additionally, the automation potential of GenAI raised apprehension about its impact on employment. There were fears that widespread adoption of GenAI tools could lead to job displacement and exacerbate socioeconomic inequalities.

As with any technology, acceptance hinges on its perceived usefulness and ease of use[5]. Aside from ChatGPT, a plethora of user-friendly GenAI platforms began to emerge, catering to diverse needs such as content development, copyediting, image and video generation, audio production, code generation, and research writing. These platforms have found applications in various sectors, fulfilling needs in areas such as marketing, entertainment, education, healthcare, and more.

As an educator, I have personally witnessed GenAI's remarkable capabilities, not only in enhancing my productivity but also in influencing educational design considerations more broadly. GenAI's capacity to facilitate personalised learning, writing and brainstorming, research and analysis, guidance, swift investigations, and time management optimisation has been recognised.[4,6] Nevertheless, concerns about its potential for academic misconduct are widespread, alongside apprehensions regarding its potential impact on student creativity, critical thinking and learning [4, 6, 7]. However, educators, recognising the evolving landscape, are cautiously incorporating it into their learning and teaching practices, albeit at varying paces, amidst these concerns, but with promising signs of adoption.

At this juncture, it is important to acknowledge that every technology follows an adoption curve, illustrating the evolution of acceptance and integration over time as more users gradually incorporate the technology into their daily lives, guided by their perceptions of its utility and ease of use. The acceptance and integration cycle of GenAI is no different; in fact, it appears to be progressing faster than other technologies. As an example, in the early days post-launch, educational institutions, particularly Australian public schools, hastily banned ChatGPT's usage, only to later rescind these prohibitions as reasoned judgment prevailed[8]. Hence, as of writing, we are experiencing a period of transformation and acceptance as the perception of GenAI is shifting positively. There is growing recognition that GenAI is a permanent fixture, akin to mathematical calculators and the Internet. Therefore, adapting to GenAI's presence is advisable rather than resisting its influence by focusing on the opportunities and remaining mindful of the inherent challenges.

In direct response to the inquiry, Table 1 outlines some opportunities and challenges arising from the uptake of AI technologies, including GenAI, for five key industries in Australia.

Main Industries (based on output share) in Australia[9]	Opportunities and benefits	Challenges
Mining (14.3%) 	• Optimises exploration efforts by analysing data obtained from geological surveys, remote sensing, and chemical analyses. • Contributes to improved productivity and profitability in mining setup through the design of mining sites. • Enhances workplace safety by autonomously monitoring mining environments for risks. • Improves operational efficiency throughout the mining supply chain. [10,11]	• Heavy resource requirement for developing and training AI-enabled tools. • Creates power imbalances between different stakeholders. • Ethical concerns include issues related to autonomy, bias, and transparency. [10,11]
Health and Education (12.8%) 	• Analyses individual learners' strengths, weaknesses, and preferences to tailor educational content. (Education) • Provides real-time feedback. (Education) • Overcomes language obstacles by providing accurate and efficient translation. (Education) • Improves clinical services by assisting in disease detection, diagnosis, and screening processes. (Health) • Informs multiple health service functions. (Health) [12, 13]	• Overreliance and potential for misunderstanding. (Education) • Promotes plagiarism and diminishes the value of original, human-generated writing, leading to creativity loss. (Education). • Erroneous content (Education and Health) • Concerns related to cost, privacy, misuse, and regulatory aspects. (Health) • Need to assess the clinical accuracy of tools. (Health) [12, 13]
Finance (7.4%) 	• Facilitates automated customer service solutions. • Produces human-like explanations of financial models and provides risk analyses. • Enhances data analysis. • Enhances productivity through automation of repetitive tasks. • Democratises financial analysis. • Simulates market scenarios • Improves decision-making. [14, 15]	• Ethical concerns regarding data privacy • Inability to respond to market emergencies. • Continuous monitoring and refining of the model to maintain its stability. • Diverse and noisy financial data sources. • Compliance with regulatory standards and ethical guidelines, particularly regarding data privacy, fairness, and transparency. [14, 15]
Construction (7.1%) 	• Improves productivity through reduced errors and quicker decision-making facilitated by AI. • Enhances collaboration across teams with real-time project updates. • Contributes to sustainable construction and energy savings through AI-driven insights. • Reduces waste and optimises resource usage via real-time monitoring. [16,17]	• Data security and privacy concerns. • Workforce adaptation and training. • Integrating AI systems with existing technologies. • Ensuring ethical use and mitigating bias. [16,17]

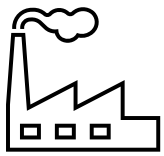
Manufacturing (5.7%) 	• Transforms product design by swiftly producing optimum solutions and navigating extensive design spaces. • Monitors adherence to production norms and standards, providing critical insights for refining and optimising performance. • Assists in fault diagnosis and predictive maintenance by integrating GenAI with machine vision approaches. • Analyses vast amounts of data to detect emerging trends and changes in consumer preferences, enhancing decision-making. • Forecasts market trends and consumer demand, aiding strategic planning and resource allocation. [18, 19]	• Need for extensive data for training GenAI models. • Lack of access to industry data • Potential for AI systems to perpetuate biases present in the training data. • Lack of trust in AI-based high-level decisions. • Training large AI models consumes significant energy. • The accuracy of AI predictions depends on the quality and relevance of the input data.[18, 19]
Although this table highlights Australia's five primary industries, some of the information provided is expected to apply to other sectors equally.		

Table 1: Opportunities, benefits, and challenges of AI technologies

GenAI paves the way for transformative advancements across diverse industries without being agnostic to a specific sector. For the road ahead, the following recommendations aim to address the challenges outlined in Table 1 while considering the broader implications for society, ethics, and regulation. By implementing these recommendations, Australia can position itself as a leader in responsible GenAI adoption.

- **Establish** a clear differentiation between AI and GenAI, emphasising its significance.
- **Develop** a national overarching GenAI framework that guides the wide proliferation of existing frameworks in different sectors. Include clear ethical standards and regulations to address concerns related to autonomy, bias, transparency, data privacy, fairness, and misuse across sectors leveraging GenAI.
- **Facilitate** collaboration between stakeholders to address challenges such as heavy resource requirements for AI development and training by promoting industry data sharing. Encourage the creation of platforms for data exchange while ensuring privacy and security.
- **Allocate** resources to educate the workforce on GenAI technologies and their implications. Develop training initiatives to empower individuals to adapt to AI-driven changes in the workplace, mitigating concerns about workforce adaptation and ensuring ethical use.
- **Implement** systems to monitor and evaluate the performance of GenAI models, particularly in critical sectors like healthcare and finance, to ensure accuracy, reliability, and compliance with regulatory standards.
- **Encourage** collaboration between GenAI experts, domain specialists, ethicists, and policymakers to address emerging challenges and opportunities.
- **Invest** in socio-technological research initiatives focused on understanding and mitigating biases, improving data quality, and enhancing the interpretability of GenAI systems.
- **Provide** funding and incentives for research institutions, startups, and industries to develop AI-enabled solutions that address pressing societal needs while prioritising ethical considerations.
- **Launch** public awareness campaigns to educate citizens about GenAI technologies' potential benefits and risks. Concentrate efforts on bridging the digital gap caused by educational disparities in GenAI.

- **Foster** dialogue and engagement with diverse stakeholders, including community groups, non-government organisations, and industry representatives, to ensure inclusive decision-making and address public concerns.
- **Create** regulatory sandboxes or experimental environments where companies can test GenAI applications under controlled conditions, allowing regulators to assess their impact on society and refine regulatory frameworks accordingly.
- **Facilitate** the exchange of best practices, standards, and guidelines to promote responsible GenAI innovation.
- **Establish** independent bodies or agencies responsible for auditing GenAI systems and ensuring compliance with ethical and regulatory requirements. Provide these entities with the authority and resources necessary to conduct thorough assessments and hold stakeholders accountable for their AI practices.
- **Call** for similar inquiries in specific sectors to gain comprehensive insights tailored to their unique challenges and opportunities, thus facilitating more effective integration and implementation of GenAI technologies.

In conclusion, AI technologies' rapid advancement and adoption present a dual narrative of promise and caution. While AI holds immense potential to revolutionise industries and drive innovation, some inherent risks and challenges must be addressed to ensure responsible and equitable deployment. One significant concern is the potential for disparities in AI development and adoption, favouring entities with greater resources and capabilities. This raises questions about fairness and inclusivity in AI-driven solutions, where AI algorithms may influence critical decisions. Transparency in AI systems' decision-making processes and functionality is crucial for fostering trust and mitigating resistance to their adoption. Effective communication and stakeholder engagement are essential for establishing ethical boundaries. Furthermore, the use of GenAI introduces additional considerations regarding content vetting, data privacy and ownership. While GenAI offers creative possibilities, it also requires cautious use and human oversight to mitigate potential risks. By promoting transparency, accountability, and collaboration, the transformative potential of AI can be harnessed while upholding ethical principles and safeguarding against unintended consequences. In navigating the evolving landscape of AI, it is imperative to adopt a cautious yet proactive approach, continually assessing the real-world implications and ensuring that AI technologies serve the collective good of Australian society.

In a media interview in January 2023, I expressed how this space captures my attention with a mix of wonder and worry[2], although the initial worry has gradually faded. Now, I continue to watch this space with fascination and curiosity. I hope that this submission proves beneficial to your deliberations. Should it be of further assistance, I am open to providing additional input in person to the Select Committee on Adopting Artificial Intelligence.

Yours sincerely,

[redacted]

Ritesh Chugh

References

1. The Australia Today. (2022). Dr Ritesh Chugh explains how ChatGPT is produces near-professional standard reply to your questions. 18 December, https://youtu.be/RjmYgIWnFjU?si=m4hdMi6CdJxeVH1D
2. The Australia Today. (2023). Will ChatGPT take away your job?. 25 January, https://www.youtube.com/live/iV2PnPB-w_s?si=rg3hH9qrkR1l4_ZR
3. CQUniversity. (2023). A conversation about leveraging ChatGPT's power! - A/Prof. Ritesh Chugh - for CQUni TELCoP Mar 2023. 10 March. https://youtu.be/Zw4teGtamD4?si=1o38Kjx8TysP2XSH
4. Bhullar, P.S., Joshi, M., & Chugh, R. (2024). ChatGPT in higher education - a synthesis of the literature and a future research agenda. *Education and Information Technologies*, (online first), 1-22. https://doi.org/10.1007/s10639-024-12723-x
5. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340.
6. Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, 20(43), 1-18
7. Lim, W. M., Gunasekara, A., Pallant, J. L., Pallant, J. I., & Pechenkina, E. (2023). Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators. *The International Journal of Management Education*, 21(2), 1-13.
8. Henebery, B. (2023). Why the ChatGPT ban in public schools is being reversed, https://www.theeducatoronline.com/k12/news/why-the-chatgpt-ban-in-public-schools-is-being-reversed/282834
9. Reserve Bank of Australia (2024). Composition of the Australian economy: Snapshot, https://www.rba.gov.au/education/resources/snapshots/economy-composition-snapshot/
10. Corrigan, C. C., & Ikonnikova, S. A. (2024). A review of the use of AI in the mining industry: Insights and ethical considerations for multi-objective optimisation. *The Extractive Industries and Society*, 17, 101440, 1-13.
11. Mishra, A. K. (2021). AI4R2R (AI for Rock to Revenue): A Review of the Applications of AI in Mineral Processing. *Minerals*, 11(10), 1-17.
12. Alasadi, E. A., & Baiz, C. R. (2023). Generative AI in education and research: Opportunities, concerns, and solutions. *Journal of Chemical Education*, 100(8), 2965-2971.
13. Yim, D., Khuntia, J., Parameswaran, V., & Meyers, A. (2024). Preliminary Evidence of the Use of Generative AI in Health Care Clinical Services: Systematic Narrative Review. *JMIR Medical Informatics*, 12(1), 1-19.
14. Chen, B., Wu, Z., & Zhao, R. (2023). From fiction to fact: the growing role of generative AI in business and finance. *Journal of Chinese Economic and Business Studies*, 21(4), 471-496.
15. Che, C., Huang, Z., Li, C., Zheng, H., & Tian, X. (2024). Integrating generative AI into financial market prediction for improved decision making. *arXiv preprint* arXiv:2404.03523.
16. Ghimire, P., Kim, K., & Acharya, M. (2024). Opportunities and challenges of Generative AI in construction industry: Focusing on adoption of text-based models. *Buildings*, 14(1), 1-29.
17. Rane, N. (2023). ChatGPT and similar Generative Artificial Intelligence (AI) for building and construction industry: Contribution, opportunities and challenges of large language models for Industry 4.0, Industry 5.0, and Society 5.0, *SSRN*, 1-12. http://dx.doi.org/10.2139/ssrn.4603221
18. Doanh, D. C., Dufek, Z., Ejdys, J., Ginevičius, R., Korzynski, P., Mazurek, G., ... & Ziemba, E. (2023). Generative AI in the manufacturing process: theoretical considerations. *Engineering Management in Production and Services*, 15(4), 76-89.
19. Plathottam, S. J., Rzonca, A., Lakhnori, R., & Iloeje, C. O. (2023). A review of artificial intelligence applications in manufacturing operations. *Journal of Advanced Manufacturing and Processing*, 5(3), 1-19.

**The views expressed herein are solely those of the author and do not necessarily reflect the views of my employer.*