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A Plan for a Joint Study into the Impacts of AI on Professional Competencies of IT Professionals and Implications for Computing Students

Tony Clear*

tony.clear@aut.ac.nz
Department of Computer Science and
Software Engineering, Auckland
University of Technology
Auckland, New Zealand

Åsa Cajander†

Department of Information
Technology, Uppsala University
Uppsala, Sweden
asa.cajander@it.uu.se

Alison Clear‡

School of Business, Eastern Institute
of Technology
Auckland, New Zealand
aclear@eit.ac.nz

Roger McDermott§

School of Computing, Robert Gordon
University
Aberdeen, United Kingdom
roger.mcdermott@rgu.ac.uk

Andreas Bergqvist

Department of Information
Technology, Uppsala University
Uppsala, Sweden
andreas.bergqvist@it.uu.se

Mats Daniels

Department of Information
Technology, Uppsala University
Uppsala, Sweden
mats.daniels@it.uu.se

Monica Divitini

School of Computer Science,
Norwegian University of Science and
Technology
Trondheim, Norway
divitini@ntnu.no

Matthew Forshaw

The Alan Turing Institute
School of Computer Science,
Newcastle University
Newcastle, United Kingdom
mforshaw@turing.ac.uk

Niklas Humble

Department of Information
Technology, Uppsala University
Uppsala, Sweden
niklas.humble@it.uu.se

Maria Kasinidou

Open University of Cyprus
Nicosia, Cyprus
maria.kasinidou@ouc.ac.cy

Styliani Kleanthous

CYENS Center of Excellence
Nicosia, Cyprus
s.kleanthous@cyens.org.cy

Can Kultur

School of Computer Science, Carnegie
Mellon University
Pittsburgh, USA
ckultur@cs.cmu.edu

Ghazaleh Parvini

Manning College of Information
Computer Sciences, University of
Massachusetts
Amherst, USA
gparvini@umass.edu

Mohammad Polash

School of Computer Science,
University of Sydney
Sydney, Australia
masbaul.polash@sydney.edu.au

Tingting Zhu

Department of Geography, Geomatics
and Environment, University of
Toronto Mississauga
Toronto, Canada
tingting.zhu@utoronto.ca

CCS CONCEPTS

• **Social and professional topics** → **Professional topics; Computing education; Computing education programs; Computer science education;**

*Working Group Co-leader; All authors contributed to this research.

†Working Group Co-leader.

‡Working Group Co-leader.

§Working Group Co-leader.

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KEYWORDS

Artificial intelligence, generative AI, large language models, IT Profession, computing competencies, computing curricula

1 BACKGROUND AND RELATED WORK

As Artificial Intelligence (AI) continues to make its presence felt in transforming workplaces around the world [4][10], and the Information Technology industry in particular, it is essential to understand its impact on the work practices of IT professionals, and the implications for computing students and curricula. This research project builds on work initiated jointly, in Sweden, New Zealand and Scotland, investigating concerns about the increasing impacts of Artificial Intelligence in IT Sector workplaces for employee work engagement [11][13][10] and the implications for tertiary study, assessment and curricula in computing [3], [8],[10], [9]. “Work engagement”, has been defined as the positive inner state where employees are fully present and engaged in their work, and is closely linked to motivation, learning, productivity, and accountability [11], [13]. Within the context of (Generative) AI at work, IT professionals have been noted as early adopters of AI [10], [4]. Their involvement in implementing and utilising AI technologies can provide valuable insights into the interplay between AI and work engagement. The implications for students are significant as future IT professionals, who must acquire and enhance competencies to adapt and thrive in digital workplaces.

2 GOALS OF THE WORKING GROUP

By exploring the relationship between work engagement and learning, this study aims to shed light on the dynamics that drive employee engagement and its connection to the professional development of competencies. The previous study has interviewed IT professionals with the following research questions (RQ):

RQ1: How does AI influence work engagement for IT professionals?

RQ2: How does AI affect the socio-technical work dynamics for IT professionals?

RQ3: What are the implications of integrating AI on the acquisition and enhancement of professional competencies and the learning processes of IT professionals?

3 METHODOLOGY

This working group aims to analyse the corpus of interview data collected from multiple countries to better understand the implications for computing students, tertiary computing education curricula and assessment of the new professional competencies emerging from this work. This study informed by the literature on work engagement, automation and motivation for IT professionals [11], [13], will use a combination of multi-vocal literature review [7] and qualitative research methods [1], [5], including thematic analysis of the interviews, to investigate the state of the practice in and challenges IT Professionals face within their local/global work contexts [12]. The literature on professional competencies in computing [3], [2], [6], will be drawn upon to characterise the new needs identified in this analysis. Further implications for computing curricula design and assessment will be developed from this analysis.

4 EXPECTED DELIVERABLES

The working group report will provide an empirically derived set of global findings relating to the new competencies and needed

adaptations required by the integration of AI into IT professional work practices and patterns. Insights informing policy, curriculum development and assessment design for AI-integrated curricula are also potential outcomes of the work.

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REFERENCES

- [1] Virginia Braun and Victoria Clarke. 2021. One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative research in psychology* 18, 3 (2021), 328–352.
- [2] Alison Clear, Tony Clear, Abhijat Vichare, Thea Charles, Stephen Frezza, Mirela Gutica, Barry Lunt, Francesco Maiorana, Arnold Pears, and Francois Pitt. 2020. *Designing Computer Science Competency Statements: A Process and Curriculum Model for the 21st Century*. ACM, New York. <https://doi.org/10.1145/3437800.3439208>
- [3] Alison Clear, Allen Parrish, and CC2020 Task Force. 2020. *Computing Curricula 2020 - CC2020 - Paradigms for Future Computing Curricula*. Report. ACM. <https://doi.org/DOI:10.1145/3467967>
- [4] ACM Technology Policy Council. 2023. *Principles for the development, deployment, and use of generative AI technologies*. Report. ACM. <https://www.acm.org/binaries/content/assets/public-policy/ustpc-approved-generative-ai-principles>
- [5] Daniela S Cruzes and Tore Dyba. 2011. *Recommended steps for thematic synthesis in software engineering*. IEEE, 275–284.
- [6] S Frezza, T Clear, and A Clear. 2020. *Unpacking Dispositions in the CC2020 Computing Curriculum Overview Report*. IEEE, Uppsala, Sweden. <https://doi.org/10.1109/FIE44824.2020.9273973>
- [7] Vahid Garousi, Michael Felderer, and Mika V Mäntylä. 2019. Guidelines for including grey literature and conducting multivocal literature reviews in software engineering. *Information and software technology* 106 (2019), 101–121.
- [8] Lorraine Jacques. 2023. Teaching CS-101 at the Dawn of ChatGPT. *ACM Inroads* 14, 2 (2023), 40–46.
- [9] Mark Liffiton, Brad Sheese, Jaromir Savelka, and Paul Denny. 2023. CodeHelp: Using Large Language Models with Guardrails for Scalable Support in Programming Classes. *arXiv preprint arXiv:2308.06921* (2023).
- [10] James Prather, Paul Denny, Juho Leinonen, Brett A Becker, Ibrahim Albluwi, Michelle Craig, Hieke Keuning, Natalie Kiesler, Tobias Kohn, and Andrew Luxton-Reilly. 2023. The robots are here: Navigating the generative ai revolution in computing education. *arXiv preprint arXiv:2310.00658* (2023).
- [11] Virpi Roto, Philippe Palanque, and Hannu Karvonen. [n. d.]. Engaging automation at work—a literature review. In *Human Work Interaction Design. Designing Engaging Automation: 5th IFIP WG 13.6 Working Conference, HWID 2018, Espoo, Finland, August 20–21, 2018, Revised Selected Papers 5*. Springer, 158–172.
- [12] SFIA. 2023. <https://sfia-online.org/en/tools-and-resources/standard-industry-skills-profiles/european-union/sfia-and-eu-ict-role-profiles>
- [13] Helen Sharp, Nathan Baddoo, Sarah Beecham, Tracy Hall, and Hugh Robinson. 2009. Models of motivation in software engineering. *Information and software technology* 51, 1 (2009), 219–233.