University of Reading

“So what if ChatGPT wrote it?” Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy

Article

Published Version

Creative Commons: Attribution-Noncommercial-No Derivative Works 4.0

Open Access

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., Carter, L., Chowdhury, S., Crick, T., Cunningham, S. W., Davies, G. H., Davison, R. M., Dé, R., Dennehy, D., Duan, Y., Dubey, R., Dwivedi, R., Edwards, J. S., Flavián, C., Gauld, R., Grover, V., Hu, M.-C., Janssen, M., Jones, P., Junglas, I., Khorana, S., Kraus, S., Larsen, K. R., Latreille, P., Laumer, S., Malik, F. T., Mardani, A., Mariani, M. ORCID: https://orcid.org/0000-0002-7916-2576, Mithas, S., Mogaji, E., Nord, J. H., O’Connor, S., Okumus, F., Pagani, M., Pandey, N., Papagiannidis, S., Pappas, I. O., Pathak, N., Pries-Heje, J., Raman, R., Rana, N. P., Rehm, S.-V., Ribeiro-Navarrete, S., Richter, A., Rowe, F., Sarker, S., Stahl, B. C., Tiwari, M. K., van der Aalst, W., Venkatesh, V., Viglia, G., Wade, M., Walton, P., Wirtz, J. and Wright, R. (2023) “So what if ChatGPT wrote it?” Multidisciplinary perspectives on opportunities, challenges

University of Reading

and implications of generative conversational AI for research, practice and policy. International Journal of Information Management, 71. p. 102642. ISSN 02684012 doi: 10.1016/j.ijinfomgt.2023.102642 Available at https://centaur.reading.ac.uk/111210/

It is advisable to refer to the publisher's version if you intend to cite from the work. See Guidance on citing.

To link to this article DOI: http://dx.doi.org/10.1016/j.ijinfomgt.2023.102642

Publisher: Elsevier

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the End User Agreement.

www.reading.ac.uk/centaur

CentAUR

Central Archive at the University of Reading

Reading's research outputs online

International Journal of Information Management 71 (2023) 102642

Contents lists available at ScienceDirect

International Journal of Information Management

journal homepage: www.elsevier.com/locate/ijinfomgt

Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy☆

Yogesh K. Dwivedi [a,b,*], Nir Kshetri [c], Laurie Hughes [a], Emma Louise Slade [d], Anand Jeyaraj [e], Arpan Kumar Kar [f,g], Abdullah M. Baabdullah [h], Alex Koohang [i], Vishnupriya Raghavan [j], Manju Ahuja [k,1], Hanaa Albanna [l,1], Mousa Ahmad Albashrawi [m,1], Adil S. Al-Busaidi [n,o,1], Janarthanan Balakrishnan [p,1], Yves Barlette [q,1], Sriparna Basu [r,1], Indranil Bose [s,1], Laurence Brooks [t,1], Dimitrios Buhalis [u,1], Lemuria Carter [v,1], Soumyadeb Chowdhury [w,1], Tom Crick [x,1], Scott W. Cunningham [y,1], Gareth H. Davies [z,1], Robert M. Davison [aa,1], Rahul Dé [ab,1], Denis Dennehy [a], Yanqing Duan [ac,1], Rameshwar Dubey [ad,ae,1], Rohita Dwivedi [af,1], John S. Edwards [ag,1], Carlos Flavián [ah,1], Robin Gauld [ai,1], Varun Grover [aj,1], Mei-Chih Hu [ak,1], Marijn Janssen [al,1], Paul Jones [am,1], Iris Junglas [an,1], Sangeeta Khorana [ao,1], Sascha Kraus [ap,1], Kai R. Larsen [aq,1], Paul Latreille [ar,1], Sven Laumer [as,1], F. Tegwen Malik [at,1], Abbas Mardani [au,1], Marcello Mariani [av,aw,1], Sunil Mithas [ax,1], Emmanuel Mogaji [ay,1], Jeretta Horn Nord [az,1], Siobhan O'Connor [ba,1], Fevzi Okumus [bb,bc,1], Margherita Pagani [bd,1], Neeraj Pandey [be,1], Savvas Papagiannidis [bf,1], Ilias O. Pappas [bg,bh,1], Nishith Pathak [bi,1], Jan Pries-Heje [bj,1], Ramakrishnan Raman [bk,1], Nripendra P. Rana [bl,1], Sven-Volker Rehm [bm,1], Samuel Ribeiro-Navarrete [bn,1], Alexander Richter [bo,1], Frantz Rowe [bp,1], Suprateek Sarker [bq,1], Bernd Carsten Stahl [br,1], Manoj Kumar Tiwari [be,1], Wil van der Aalst [bs,1], Viswanath Venkatesh [bt,1], Giampaolo Viglia [bu,bv,1], Michael Wade [bw,1], Paul Walton [bx,1], Jochen Wirtz [by,1], Ryan Wright [bq,1]

[a] Digital Futures for Sustainable Business & Society Research Group, School of Management, Swansea University, Bay Campus, Fabian Bay, Swansea, Wales, UK
[b] Department of Management, Symbiosis Institute of Business Management, Pune & Symbiosis International (Deemed University), Pune, Maharashtra, India
[c] Bryan School of Business and Economics, University of North Carolina at Greensboro, USA
[d] University of Bristol Business School, University of Bristol, BS8 1SD, UK
[e] Professor of Information Systems, Raj Soin College of Business, Wright State University, 3640 Colonel Glenn Highway, Dayton, OH 45435, USA
[f] School of Artificial Intelligence, Indian Institute of Technology Delhi, Hauz Khas, New Delhi, India
[g] Department of Management Studies, Indian Institute of Technology Delhi, Hauz Khas, New Delhi, India
[h] Department of Management Information Systems, Faculty of Economics and Administration, King Abdulaziz University, Jeddah, Saudi Arabia
[i] School of Computing, Middle Georgia State University, Macon, GA, USA
[j] Client Advisory and Transformation, Stackroute, NIIT Limited, India
[k] Department of Information Systems, Analytics and Operations, College of Business, University of Louisville, USA
[l] Northumbria University London, UK
[m] IRC-FDE, KFUPM, Saudi Arabia, ISOM, KFUPM Business School, KFUPM, Saudi Arabia
[n] Innovation and Technology Transfer Center, Sultan Qaboos University, Oman
[o] Department of Business Communication, Sultan Qaboos University, Oman
[p] Department of Management Studies, National Institute of Technology, Tiruchirappalli, India

☆ This editorial opinion paper provides a subjective viewpoint on the potential impact of generative AI technologies such as ChatGPT in the domains of education, business, and society. Its objective is to offer initial guidance on the opportunities, challenges, and implications associated with these technologies. It is worth noting that, given its nature as an editorial opinion piece, this submission has not undergone a formal double-blind review process but has been reviewed informally by appropriate experts.

* Corresponding author at: Digital Futures for Sustainable Business & Society Research Group, School of Management, Swansea University, Bay Campus, Fabian Bay, Swansea, Wales, UK.
E-mail address: y.k.dwivedi@swansea.ac.uk (Y.K. Dwivedi).

https://doi.org/10.1016/j.ijinfomgt.2023.102642
Received 1 March 2023; Accepted 1 March 2023
Available online 11 March 2023
0268-4012/© 2023 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

[q] Montpellier Business School (MBS), Montpellier, France
[r] FORE School of Management, New Delhi, India
[s] Indian Institute of Management Ahmedabad, Vastrapur, Ahmedabad 380015, India
[t] Information School, University of Sheffield, UK
[u] Bournemouth University Business School, Poole, UK
[v] School of Information Systems and Technology Management, University of New South Wales, Sydney, Australia
[w] Information, Operations and Management Sciences Department, TBS Business School, 1 Place Alphonse Jourdain, 31068 Toulouse, France
[x] Department of Education & Childhood Studies, Swansea University, Swansea, United Kingdom
[y] Faculty of Humanities and Social Sciences, University of Strathclyde, Glasgow G1 1XQ, United Kingdom
[z] School of Management, Swansea University, Swansea, UK
[aa] Department of Information Systems, City University of Hong Kong, Hong Kong Special Administrative Region
[ab] Indian Institute of Management Bangalore, India
[ac] Business and Management Research Institute, University of Bedfordshire, UK
[ad] Montpellier Business School, Montpellier, France
[ae] Liverpool Business School, Liverpool John Moores University, UK
[af] Prin. L. N. Welingkar Institute of Management Development and Research, Mumbai, India
[ag] Operations & Information Management Department, Aston Business School, UK
[ah] Department of Marketing and Marketing Management, Faculty of Economics and Business, University of Zaragoza, Zaragoza, Spain
[ai] Otago Business School, Co-Director, Centre for Health Systems and Technology, University of Otago, Dunedin, New Zealand
[aj] Distinguished Professor and George & Boyce Billingsley Endowed Chair of Information Systems, IS Doctoral Program, Walton College of Business, University of Arkansas, Room 216, Fayetteville, AR 72703, USA
[ak] Institute of Technology Management, National Tsing Hua University, Hsinchu 300, Taiwan
[al] Faculty of Technology, Policy and Management, Delft University of Technology, the Netherlands
[am] School of Management, Swansea University, United Kingdom
[an] College of Charleston, School of Business, USA
[ao] Bournemouth University Business School, Bournemouth University, UK
[ap] Free University of Bozen-Bolzano, Italy & University of Johannesburg, South Africa
[aq] Leeds School of Business, Boulder, University of Colorado, Boulder, USA
[ar] Sheffield University Management School, The University of Sheffield, UK
[as] Schöller-Endowed Chair of Information Systems, Institute of Information Systems Nürnberg, School of Business, Economics and Society, Friedrich-Alexander University Erlangen-Nuremberg, Germany
[at] School of Management, Swansea University Bay Campus, Swansea, SA1 8EN Wales, UK
[au] Business School, Worcester Polytechnic Institute, Worcester, MA 01609-2280, USA
[av] Henley Business School, University of Reading, Henley-on-Thames, Oxfordshire, UK
[aw] Department of Management, University of Bologna, Bologna, Italy
[ax] School of Information Systems and Management, University of South Florida, Tampa, FL, USA
[ay] Greenwich Business School, University of Greenwich, London SE10 9LS, UK
[az] Management Science and Information Systems, Spears School of Business, Oklahoma State University, Stillwater, OK 74078, USA
[ba] Division of Nursing, Midwifery and Social Work, School of Health Sciences, The University of Manchester, Manchester, United Kingdom
[bb] Rosen College of Hospitality Management University of Central Florida 9907 Universal Boulevard, Orlando, FL 32819, USA
[bc] Department of Business, WSB University, Wrocław, Poland
[bd] SKEMA Research Center for Artificial Intelligence, SKEMA Business School, 5 quai Marcel Dassault – Suresnes, France
[be] National Institute of Industrial Engineering (NITIE), Mumbai, India
[bf] Newcastle University Business School, Newcastle upon Tyne, United Kingdom
[bg] Department of Information Systems, University of Agder, Norway
[bh] Department of Computer Science, Norwegian University of Science and Technology, Norway
[bi] Microsoft AI MVP and Microsoft Regional DirectorGlobal lead - Innovation and Architecture at DXC Technologies India
[bj] Department of People and Technology, Roskilde University, Denmark
[bk] Symbiosis Institute of Business Management, Pune & Symbiosis International (Deemed University), Pune, India
[bl] Department of Management and Marketing, College of Business and Economics, Qatar University, P.O. Box 2713, Doha, Qatar
[bm] HuManiS Research Center – Humans and Management in Society, UR 7308, Université de Strasbourg – EM Strasbourg Business School, France
[bn] ESIC University, Madrid, Spain and University of Economics and Human Sciences, Warsaw, Poland
[bo] Wellington School of Business and Government, Rutherford House, 23 Lambton Quay, Wellington, New Zealand
[bp] Nantes University, LEMNA, and SKEMA Business School, France
[bq] Rolls-Royce Commonwealth Commerce, McIntire School of Commerce, University of Virginia, USA
[br] School of Computer Science, The University of Nottingham, UK
[bs] Process and Data Science, RWTH Aachen University, Ahornstraße 55, Aachen 52074, North Rhine-Westphalia, Germany
[bt] Eminent Scholar and Verizon Chair, Director of Executive PhD in Business, Pamplin College of Business, Virginia Tech, Blacksburg, Virginia, USA
[bu] University of Portsmouth, Department of Strategy, Marketing and Innovation, Richmond Building, Portsmouth, United Kingdom
[bv] Department of Economics and Political Science, University of Aosta Valley, Aosta, Italy
[bw] Digital Transformation, Global Center for Digital Business Transformation, IMD Business School, Lausanne, Switzerland
[bx] Capgemini UK Ltd, United Kingdom
[by] Department of Marketing, National University of Singapore, Singapore

ARTICLE INFO

Keywords:
Conversational agent
Generative artificial intelligence
Generative AI
ChatGPT
Large language models

ABSTRACT

Transformative artificially intelligent tools, such as ChatGPT, designed to generate sophisticated text indistinguishable from that produced by a human, are applicable across a wide range of contexts. The technology presents opportunities as well as, often ethical and legal, challenges, and has the potential for both positive and negative impacts for organisations, society, and individuals. Offering multi-disciplinary insight into some of these, this article brings together 43 contributions from experts in fields such as computer science, marketing, information systems, education, policy, hospitality and tourism, management, publishing, and nursing. The contributors acknowledge ChatGPT's capabilities to enhance productivity and suggest that it is likely to offer

[1] Equal contributions

significant gains in the banking, hospitality and tourism, and information technology industries, and enhance business activities, such as management and marketing. Nevertheless, they also consider its limitations, disruptions to practices, threats to privacy and security, and consequences of biases, misuse, and misinformation. However, opinion is split on whether ChatGPT's use should be restricted or legislated. Drawing on these contributions, the article identifies questions requiring further research across three thematic areas: knowledge, transparency, and ethics; digital transformation of organisations and societies; and teaching, learning, and scholarly research. The avenues for further research include: identifying skills, resources, and capabilities needed to handle generative AI; examining biases of generative AI attributable to training datasets and processes; exploring business and societal contexts best suited for generative AI implementation; determining optimal combinations of human and generative AI for various tasks; identifying ways to assess accuracy of text produced by generative AI; and uncovering the ethical and legal issues in using generative AI across different contexts.

1. Introduction

Artificial Intelligence (AI) has significantly impacted organisations, societies, and individuals. It offers systematic capabilities of reasoning based on inputs and learning via the differences of expected outcomes as it predicts and adapts to changes in its ecosystems and stimulus that the system receives from its external environment. When AI was in its formative years, the focus of algorithms was generally restricted to supervised and unsupervised learning, whereby it borrowed inspiration from biological organisms and physical properties of nature and established these properties computationally to solve data intensive problems (Kar, 2016). However, traditional AI algorithms needed structured data for both model building and information processing. These older and more established AI algorithms such as neural networks, genetic algorithms, decision trees, random forests, support vector machines, k-means clustering and many more (Duan et al., 2019), were somewhat restricted in their capabilities due to these limitations.

Newer AI algorithms have evolved over time and can now process data in their natural form, hence mining unstructured data such as raw text and images is feasible. AI algorithms such as deep learning and reinforcement learning have now evolved where specific algorithms such as convoluted neural networks and recurrent neural networks have gained prominence for being able to analyse images, audio, and even video (LeCun et al., 2015). Furthermore, industrial needs involving text mining and natural language processing (NLP) have grown in demand triggering the development and growth of algorithms which could run on unstructured data. Algorithms such as *Bidirectional Encoder Representations from Transformers* (BERT), *Long short-term memory* (LSTM) and language models have gained prominence for industrial automation (Guan et al., 2019; Kushwaha and Kar, 2021). Many of these algorithms were heavily dependent on two resources: (1) abundant data for the algorithms to train and operate upon, and (2) very elaborate computational resources to deploy and run the algorithms. However, real-world applications did not have access to high computational resources, especially when deployed. Over time, newer models of AI such as federated learning and tiny machine learning (ML) algorithms were developed and adopted in industrial applications (Li et al., 2020a, 2020b). Many of these applications created scenarios, where data were not available to initially train these algorithms, called the cold start problem. If data were not available, how would these applications learn patterns and predict future trends? This started developments in reinforcement learning and industrial applications of reinforcement learning gained prominence in both marketing and financial management applications (Singh et al., 2022a, 2022b).

In parallel to the ongoing development of AI algorithms, the literature has seen an increased level of chatbot related studies (Lokman and Ameedeen, 2018). Chatbots traditionally used NLP to respond to queries raised by the user, while mapping it to the best possible response sets available in the system. In order to provide real time feedback to customers, chatbots have adopted language models along with deep learning while addressing NLP problems (Bellegarda, 2004; Melis et al., 2017; Kushwaha and Kar, 2021). The recent launch of OpenAI's ChatGPT significantly extends the capabilities of chatbots via the integration of deep learning and language models based on the Generative Pre-training Transformer (GPT) architecture (Radford et al., 2018). Language models attempt to predict the likelihood of a sequence of words a typical human interaction is likely to create through generative and discriminative algorithms, typically through the application of deep learning and transformer architectures of neural networks (Bengio et al., 2000; Bellegarda, 2004; Vaswani et al., 2017). ChatGPT uses a combination of unsupervised pre-training and supervised fine-tuning to generate human-like responses to queries and provide responses to topics that resemble that of a human expert. The GPT-3 model is the latest extension built on a language model with 175 billion parameters, trained on a diverse dataset of naturally used text obtained from different internet sources such as web pages, books, research articles and social chatter. While current language models generally utilise deep learning with a focus on supervised learning, future evolutionary models may be built more on reinforcement learning (Uc-Cetina et al., 2022).

The recent widespread global adoption of ChatGPT has demonstrated the tremendous range of use cases for the technology including software development and testing, poetry, essays, business letters, and contracts (Metz, 2022; Reed, 2022; Tung, 2023). However, it has also raised a number of concerns related to the difficulty in differentiating human versus AI authorship within academic and education communities, and renewed debate on the role of traditional human endeavours (Else, 2023; Stokel-Walker, 2023). These challenges arise because ChatGPT can be extensively used for NLP tasks such as text generation, language translation, and generating answers to a plethora of questions, engendering both positive and adverse impacts.

With this background, in this article we seek to answer the two following research questions:

RQ1) What are the opportunities, challenges, and implications related to generative AI technologies such as ChatGPT in the context of education, business, and society?
RQ2) What are the most important research questions to investigate related to generative AI technologies such as ChatGPT in the context of education, business, and society?

The remainder of this article is structured as follows. In the next section, we list the individual contributions of AI experts from various disciplines including information systems (IS), computer science, data science, marketing, management, industrial engineering, nursing, education, policy, hospitality and tourism, and publishing. Further, based on the expert contributions that indicate a clear need for scientific research on various issues related to ChatGPT, we provide a synthesised narrative of the nature of generative AI technologies, issues underlying their adoption and use, and directions for future research.

2. Perspectives from leading experts

In accordance with Foerster's (2003) original proposal and multiple subsequent studies that have followed an expert-based viewpoint on a diverse range of IS related topics (Dwivedi et al., 2015, 2020, 2022a,a,b, b–d), we examine the critical perspectives on the impact and core

challenges from the widespread adoption of ChatGPT and associated generative AI technologies. The full list of experts and their individual contributions are listed in Table 1, dividing the contributions into five broad categories.

2.1. Broad perspectives on generative AI

2.1.1. Contribution 1: ChatGPT: disruption and what next? - Viswanath Venkatesh

Even saying that ChatGPT has become the talk of every town and every person may be an understatement. It appears to have rocked the very foundation of many a domain of work. Its basic functionality of "ask me anything" and "I may have a good answer" has become more than a hassle in many a domain. Let's start with scientific knowledge, which is disseminated in journals like this one—science is already wrestling with what role such a technology will play. Will it be a co-author? Can it be a co-author? The other crisis professors who create knowledge immediately face is how do they assess the students? In this short note, I am not going to tackle or consider these and related highly valid questions. Over the past few days, I thought it best to step back and ask broader questions, albeit spurred by more abstract ideas underlying the above valid and yes, practical questions.

What ChatGPT has done is to be disruptive. It is not unpredictable that something like this could have happened. It is that it has happened suddenly and quickly. Technology, by its very nature, does evolve. Sometimes, it is disruptive. What it does is to reshape the way in which activities and behaviours are altered. For instance, when I was a PhD student in the previous millennium, the access to research articles at the click of a button was not feasible. It required going to two different university libraries and either reading and making notes or making copies of articles. The fact that these articles are now readily available does make for more efficient and even more effective scientists. The skill of finding and having a collection of the relevant articles is no longer in demand, but the demand for another skill, the volume of the articles a student may be expected to comprehend, emerged instead. This technology-driven skills reorganisation can be expected to permeate in various spheres of human life and existence. Thus, I offer the following proposition:

2.1.1.1. P1. The skills required in the world powered by ChatGPT and related technologies will be different.

The disruption caused by technologies in general results in challenging assumptions about the way domains have functioned. For instance, in an article on AI systems and their impacts, we argued that the assumptions underlying various fields in IS research were fundamentally altered by these new technologies (see Schuetz and Venkatesh, 2020). This will naturally extend to ChatGPT. Thus, I offer the following proposition:

2.1.1.2. P2. The assumptions underlying various domains of research will be impacted by ChatGPT.

Based on these two propositions, I suggest researchers go to work! Here are a few non-exhaustive and not necessarily mutually exclusive ideas.

2.1.1.2.1. Direction #1. The various domains that are affected by ChatGPT should be clearly articulated and the disruptions clearly understood. This will then lead to a better delineation of what the new world looks like and the skills needed to function in that new world. It should be readily obvious that how this technology impacts different professional domains and jobs will be drastically different. Various job frameworks and skills frameworks can be leveraged for a rich understanding.

2.1.1.2.2. Direction #2. Life, society and personal interactions will clearly change, perhaps even more so than it did with social media and other technologies. These changes will bear investigation.

Table 1
Individual contributions on ChatGPT.

Contribution Title	Author (s)
2.1. Broad perspectives on generative AI	
Contribution 1: ChatGPT: Disruption and What Next?	Viswanath Venkatesh
Contribution 2: AI Platforms, ChatGPT, and Innovation	Marcello Mariani
Contribution 3: Human and Generative AI collaboration: Lessons from Utilitarianism	Lemuria Carter and Soumyadeb Chowdhury
Contribution 4: ChatGPT's biggest disruption: Knowledge Work Productivity	Michael Wade
Contribution 5: ChatGPT as a Member of Hybrid Teams	Alexander Richter
Contribution 6: ChatGPT as the New Calculator	Wil van der Aalst
Contribution 7: ChatGPT for Human Augmentation	Ilias O. Pappas
Contribution 8: Overcoming Resistance to Change with AI: Can ChatGPT Help You?	Jan Pries-Heje
2.2. Organisational and societal impacts	
Contribution 9: Societal Impact of ChatGPT	Rahul Dé
Contribution 10: The Potential of ChatGPT: Awe, Fear, Disgust and Transformation	Robert M. Davison
Contribution 11: ChatGPT: the Digital Transformation Challenge for Organisations Just Became Harder	Paul Walton
Contribution 12: Services Marketing and Management Implications of ChatGPT	Jochen Wirtz
Contribution 13: Marketing in the World of GPT-3.0 and ChatGPT: Futuristic Reflections	Janarthanan Balakrishnan, Rohita Dwivedi, Samuel Ribeiro-Navarrete and Adil S. Al-Busaidi
Contribution 14: ChatGPT in Banking Services	Emmanuel Mogaji, Mousa Ahmad Albashrawi, Sriparna Basu and Sangeeta Khorana
Contribution 15: Using ChatGPT in Tourism, Travel, Transport and Hospitality Industries	Dimitrios Buhalis
2.3. Impact on the academic sector	
Contribution 16: Generative AI in Teaching and Research: Some Preliminary Thoughts	Ryan Wright and Suprateek Sarker
Contribution 17: ChatGPT: The New Wave of AI Tools in Higher Education	Siobhan O'Connor
Contribution 18: ChatGPT: The digital transformation of academia is underway	Sven Laumer
Contribution 19: How to enhance critical thinking of students, educators and researchers in the ChatGPT era	Giampaolo Viglia
Contribution 20: ChatGPT and Education – Is a Symbiotic Relationship Possible?	Ramakrishnan Raman, Gareth H. Davies and Abbas Mardani
Contribution 21: ChatGPT in the context of education: how to deal with its disruptive effects?	Yves Barlette
Contribution 22: The Use of ChatGPT in Educational Institutions: Challenges, Opportunities and Future Scope	Nripendra P Rana, Jeretta Horn Nord, Hanaa Albanna and Carlos Flavian
Contribution 23: Disrupting higher education and human communication by Language models	Marijn Janssen
Contribution 24: ChatGPT and Education Policy and Practice	Tom Crick
Contribution 25: How Does ChatGPT Benefit or Harm Academic Research?	Varun Grover
Contribution 26: ChatGPT, scholarly writing, and publishing	Rameshwar Dubey and Denis Dennehy
Contribution 27: ChatGPT and its potential impact on research and publishing	Savvas Papagiannidis
Contribution 28: Magic or fast-food writing? when transformers challenge	Frantz Rowe

(*continued on next page*)

Table 1 (*continued*)

Contribution Title	Author (s)
our epistemic values in teaching and research and our humanity	
Contribution 29: Recommendations for dealing with ChatGPT, Bard & Co. in academic publishing	Paul Jones and Sascha Kraus
2.4. Ethical issues	
Contribution 30: ChatGPT and Ethics – 'ChatGPT Doesn't Matter'?	Laurence Brooks
Contribution 31: Good Bot or Bad Bot? On the Ethics of ChatGPT	Bernd C Stahl
2.5. Challenges, opportunities, and research directions	
Contribution 32: Towards a research agenda for generative AI in education, industry and research	John S. Edwards and Yanqing Duan
Contribution 33: Use the SACE and ADROIT Framework to Assess Challenges, Opportunities, and Research Agenda Related to ChatGPT	Sunil Mithas
Contribution 34: ChatGPT: Challenges and Opportunities	Margherita Pagani
Contribution 35: Moving from Prediction to Creativity: Implications of Generative AI on Measurement of Success	Kai R. Larsen
Contribution 36: ChatGPT: Challenges, Opportunities, Impact and Research Agenda	Neeraj Pandey, Manoj Tiwari, Fevzi Okumus and F. Tegwen Malik
Contribution 37: ChatGPT: Challenges, Opportunities, Impact and Research Agenda	Paul Latreille
Contribution 38: ChatGPT: challenges, opportunities, impact and research agenda	Robin Gauld
Contribution 39: Challenges, opportunities, and impact of ChatGPT in the IT industry	Nishith Pathak
Contribution 40: Challenges of ChatGPT	Indranil Bose
Contribution 41: On the Challenges and Opportunities of ChatGPT	Iris Junglas and Sven-V. Rehm
Contribution 42: ChatGPT3: Technology Development, Impact and Challenges	Scott W. Cunningham and Mei-Chih Hu
Contribution 43: ChatGPT: A Research Agenda	Manju Ahuja

The remainder of this section showcases the 43 contributions, presented mostly in their original and unabridged form. This approach may result in some unevenness and overlapping narrative but preserves the individual perspectives of each expert as they highlight important aspects of the impact and challenges stemming from ChatGPT and generative AI (Dwivedi et al., 2022a,b,c,d).

2.1.1.2.3. Direction #3. Underlying our research domains are assumptions. One illustration of a framework of assumptions is Alvesson and Sandberg (2011). Assumptions in various domains, many of which often have unarticulated assumptions, will need to be articulated and validated (see Schuetz and Venkatesh, 2020).

2.1.1.2.4. Direction #4. Not mutually exclusive from direction #3 above but equally important is that many domains may now require a paradigm shift in Kuhnian terms. This presents an exceptional opportunity for scholars to get away from existing views and theories—ones that perhaps do not give as much agency to technology should be reconsidered so as to provide new theories rooted in the new paradigm.

In closing, I am neither alarmed nor not alarmed. It's a technology. It's disruptive. It's a great opportunity for science. It's a great opportunity to grow as a society. And, when the two meet, science can help society grow.

2.1.2. Contribution 2

2.1.2.1. AI platforms, ChatGPT, and Innovation - Marcello Mariani. While information management (IM) and IS scholars have started discussing opportunities and challenges pertaining to AI platforms as soon as AI technologies and systems emerged and advanced, innovation management researchers have been lagging behind. They focused on the relevance of AI technologies for innovation recently, mostly after the AI hype across (mass) media (Davenport and Ronanki, 2018). However, innovation management researchers have rapidly understood the potential relevance of AI for innovation management. This is reflected by the field at the intersection of AI and innovation evolving rapidly in response to calls for more studies on the multifaceted relationship between AI and innovation (see Cockburn et al., 2019).

As clear from a recent systematic literature review of the scientific work produced on AI in innovation research (Mariani et al., 2022), so far innovation management researchers have focused on three types of drivers of AI adoption for innovation (economic, technological, and social) and three types of outcomes of AI adoption (economic, competitive, organisational, and innovation). Among the innovation outcomes, the development of new technology as well as product, process and business model innovation have been found to be relevant potential application areas for AI.

So far, not all forms of AI have been analysed in innovation management studies (Mariani et al., 2023), and generative AI has been severely underexplored. However, the launch of multiple generative AI platforms over the last five years (e.g., GPT3 in 2020, ChatGPT in 2022), and more generally Large Language Models, has attracted the attention of the media, organisations, and users. Indeed, one of the most striking features of these generative AI platforms is that they have been adopted massively in a short period of time: launched on November 30, 2022, ChatGPT has been used by 1 million users in the first 5 days after its launch.

The distinctive feature of ChatGPT is precisely its capability to generate textual content. In just 3 months after its release, ChatGPT has been deployed by many software developers, creative writers, scholars/teachers, and songwriters to generate computer software and apps, text, academic essays, song lyrics. Platform users have expressed mixed feelings. I tried ChatGPT myself in early December asking the platform to develop an essay on the relationships between "big data" and "innovation management". The result was rather disappointing as the text seemed ***rather weak in terms of logical flow, inaccurate in terms of factuality and truth, not critical in terms of elaboration of data, and not novel***. When asked to provide references and sources to back the arguments of the essay, the software simply pulled together a list of 5 references with wrong titles associated wrongly to authors, journals and publications years. Very much like GPT3, also ChatGPT can be ***potentially*** used by journalists and software developers to generate articles/software, but the outcome will need to be carefully double checked as the software seems to generate **inaccurate content**, based on **inaccurately reported sources of ideas**.

The absence of originality of the output generated by ChatGPT is even more acute when it comes to products that are related to the creative industries such as song lyrics. For instance, songwriter Nick Cave recently received from one of his fans a song's lyrics that had been generated by Chat-GPT based on a specific prompt: "in the style of Nick Cave". Disappointed by the outcome, Cave wrote in response to his fan: "Writing a good song is not mimicry, or replication, or pastiche, it is the opposite. It is an act of self-murder that destroys all one has strived to produce in the past. It is those dangerous, heart-stopping departures that catapult the artist beyond the limits of what he or she recognises as their known self." (Cain, 2023). The **absence of originality,** detected during my own essay generation experience with ChatGPT and expressed also by Cave, is perhaps an unimportant aspect for some routinised software generation tasks, but it becomes clearly of paramount importance in creative writing.

We might argue that inaccuracy, weakness in logical flow, issues of factuality/truth, lack of critical elaboration, and non-originality of the generated content could be the outcomes of a technology that is still being tested. Indeed, the AI platform's underlying deep learning models were perhaps trained on an outdated and low-quality training set. On the other hand, we might expect that if the training model and the data

quality improve, the AI platform might enhance its performance. However, it is not clear if better technical performance will lead to more meaningful innovation outcomes. Accordingly, one of the key questions for innovation management scholars then becomes: "Are AI platforms (such as ChatGPT) capable to lead ***independently*** to ***meaningful*** product, process, or business model innovation?".

The impression is that there is no ready answer and there is a long way before AI platforms such as ChatGPT can become an independent agent in innovation processes and innovation management. Recent uses of generative AI in text, movie, and music generation suggest that these AI platforms at best can become a partner in product innovation and value creation (Vargo et al., 2008).

In complex activities that involve several areas of the human brain, such as creative activities and innovation activities, a good prompt appears to be not enough to allow a generative AI system to generate independently a distinctively different and original new product. We expect this to be even more relevant for products that involve some form of emotional intelligence (Jena & Goyal, 2022).

To summarise, there is a long way before AI platforms such as ChatGPT could be capable to lead ***independently*** to ***meaningful*** product, process, or business model innovation. At best they can help enhance human intelligence for innovation by augmenting human intelligence. As AI platforms and the underlying technology will evolve, future research will need to investigate if and to what extent the role played by generative AI will be increasingly relevant in triggering innovation outcomes.

2.1.3. Contribution 3

2.1.3.1. Human and generative AI collaboration

2.1.3.1.1. Lessons from utilitarianism -Lemuria Carter and Soumyadeb Chowdhury. ChatGPT is a cutting-edge AI language model that leverages generative AI techniques to provide algorithm generated conversational responses to question prompts (van Dis et al., 2023). The outputs from generative AI models are almost indistinguishable from human-generated content, as they are trained using nearly everything available on the web (for e.g., around 45 terabytes of text data in the case of ChatGPT). The model can be trained to perform specific tasks, such as preparing slides in a specific style, writing marketing campaigns for a specific demographic, online gaming commentary and generating high resolution images (Chui et al., 2022a, 2022b).

While the benefits of this new AI tool for businesses have been widely discussed by various media outlets, it is essential to understand the limitations of generative AI models which may lead to reputation and legal risks, using offensive or copyrighted content, loss of privacy, fraudulent transactions and spreading false information. In this commentary, we explore the intersection of risk management and ethics in the context of generative AI to propose four themes for future research.

2.1.3.1.2. Exploring the ethics of responsible AI: lessons from utilitarianism. Threats posed by ChatGPT, and similar AI bots include black-box algorithms, discrimination and biases, vulgarity, copyright infringement, plagiarism, fabricated unauthentic textual content, and fake media. Hence, it is essential for organisations to understand, manage and mitigate risks resulting from AI adoption. Ethical reviews and bias screening should complement periodic risk assessments because the algorithm is evolutionary in nature, i.e., the voluminous data used to train the algorithmic models possess high velocity, heterogeneous and variability characteristics. The Artificial Intelligence Risk Management Framework ("AI RMF 1.0) developed and released by National Institute of Standards and Technology ("NIST") can guide the organisations developing, adopting, and implementing AI solutions to systematically assess, understand, and manage risks, and promote responsible usage, development, and evolution of AI tools (National Institute of Standards and Technology, 2023). The working version of the risk management playbook released by NIST grounded in research suggests that context is a significant factor to identify, assess, prioritise, and mitigate risks (NIST, 2023). Therefore, risks related to ChatGPT adoption in any business sector should be mapped to its context of use and application. With regards to ChatGPT, the risk stems from the quality, authenticity and reliability of the data used to train the model and how model is being rectified by the human designers and developers.

Once the risks are identified, ethical models can be used to help determine a path forward (Ashok et al., 2022). Utilitarianism is one of the most common approaches to making ethical decisions that does the least harm (or most good) to individuals, society, environment, weighing both the positive and negative impact of the action (Böhm et al., 2022). From the AI risk management perspective, the theory provides an approach for resolving conflicts through a flexible result-oriented lens for formulating and testing policies at each stage of the risk management cycle. For example, the risks of adopting ChatGPT in a specific context can be assessed by the RMF, where-as the impact and consequences of the risks on each stakeholder can be prioritised using the utilitarianism perspective, i.e., making a decision whether the adoption will promote welfare compared to any other alternative. Similarly, the contextual importance of AI adoption (in each sector for a specific application) can enable AI developers, organisations planning to deploy AI and even policy makers to make realistic and workable moral decisions understanding and weighing both the opportunities and negative implications. Therefore, AI risk management frameworks and ethical theory perspectives should be consolidated to make socially responsible judgements which will help ensure purposeful, cautious, reasoned, and ethical way of leveraging generative AI models such as ChatGPT. According to utilitarianism, the most optimal decisions and actions related to ChatGPT design, development, adoption, deployment, maintenance and evolution should provide the most good or does the least harm for the society. This also calls for responsible AI toolkits and frameworks to embed ethical perspectives to enable a balanced view of what is right and wrong.

2.1.3.1.3. Future research agenda. We present four future research themes for generative AI models such as ChatGPT considering four different perspectives, viz, tool, proxy, ensemble and skills (Kim et al., 2021).

- **Theme 1**

  From a tool view, it is necessary to develop techniques to enhance the transparency of generative and self-adaptive AI models that will facilitate explainability of the outcome responses. For instance, an important question to explore is how can transparency and explainability either enhance or diminish the competitiveness and productivity of organisations adopting ChatGPT?
- **Theme 2**

  From a proxy view, there are several interesting questions. For instance**,** how can responsible and ethical policies, practices and regulations can help in diffusion of generative AI applications across organisations? What is the impact of consolidating risk management frameworks and ethics theoretical perspectives on ChatGPT adoption within organisations?
- **Theme 3**

  From the ensemble view, where, when, and under what organisational contexts is it best to implement ChatGPT? How do societal contexts shape the meaning and the outcomes of adopting ChatGPT, from an ethics and moral judgement perspectives? What are the conceptualisations of responsible ChatGPT according to customers, employees, stakeholders, managers, the community, and government policy makers. In light of the United Nation's sustainable development goals 4, 5, 8, 9 and 10, how can responsible development, deployment, and evolution of ChatGPT, promote wellbeing among humans and in society.
- **Theme 4**

From a skills view, it will be interesting to explore which skills, resources and capabilities (both technical and non-technical) are necessary within organisations to better understand the limitations of ChatGPT within different contexts of use, and promote ethical decision-making? What is the role of government policies, training providers, higher education and technology developers to help develop these skills among the human workforce (whose jobs are likely to be made redundant as a result of robotic process automation)?

2.1.3.1.4. Conclusion. Given ChatGPT has been coined "the industry's next big disrupter" due to its analytical and computational capabilities, efficiency in producing human-like responses and round the clock availability, it is important for researchers and practitioners to examine the ethical concerns surrounding black-box algorithms and how multi-disciplinary research can help alleviate these concerns.

2.1.4. Contribution 4

2.1.4.1. ChatGPT's biggest disruption: knowledge work productivity - Michael Wade. New digital services and technologies are released all the time, and every so often one comes along that hits the viral jackpot. Bitcoin did this in 2017, Google's audio chatbot Duplex made a big splash in 2018, and the metaverse and Web 3.0 caught fire in 2022. Some, like Bitcoin, endure; most, however, remain on the sidelines and slowly fade away. Remember how Clubhouse was going to disrupt social media, or how we were going to be 3D printing everything?

How will ChatGPT fare in the disruption sweepstakes?

Much has been said about how ChatGPT will disrupt the education sector, and as someone who operates from within this sector, I can only hope that this is the case. But my interest, at least from a research perspective, lies elsewhere. In fact, I believe that the biggest potential source of disruption will be ChatGPT's effect on the productivity of knowledge work.

ChatGPT is generative, meaning that it can create new data, not just analyse existing data. This capability, specifically for text, is what sets ChatGPT apart from the earlier avatars of ML. ML has been good at pattern recognition for many years now – whether it is distinguishing cats from dogs, or scanning for cancerous tumours. ChatGPT takes this one step further. It not only recognizes patterns, it uses them to create new data based on those patterns, which makes it generative.

From a research perspective, we can test how effective ChatGPT is at generating content that can enhance knowledge worker productivity. Among the many ways that ChatGPT do this, I predict that the biggest impact will be associated with its ability to create a first draft.

Compared to physical labour, knowledge work is notoriously hard to study due to the difficulty of measuring inputs versus outputs (Drucker, 1999). Nevertheless, research suggests that 41% of a knowledge worker's time is spent on discretionary activities that offer little personal satisfaction and could be handled competently by others (Birkinshaw & Cohen, 2013). 'Others' has typically been thought of as another person, but could equally be a technology solution, like ChatGPT.

Knowledge workers know that it takes a lot of time and effort to write a first draft of anything – an email, a report, a blog, a business plan, a proposal, an article, or an employee review. Interestingly, I could not find any research that compares the time it takes to create a first draft of something versus the time it takes to transform that draft into a finished product. Most of us would agree that, generally speaking, having something to work with is a lot easier than starting something from scratch. Ultimately, however, this is an empirical question.

An experimental research program can be designed to test the difference in productivity between two conditions. Condition one would be where a research subject completes a task from start to finish, while in the second condition, a subject uses ChatGPT to create a first draft, and then completes the task using the draft as a foundation. Experiments could be conducted employing both within-subject and between-subject designs.

Productivity could be measured in two ways: time to complete the task (efficiency) and quality of the output (effectiveness).

The experiments could test different types of tasks, ranging from simple to more complex. Simple tasks might include writing a thank you email, producing a written summary from a point form list of items, or creating a simple report. More complex tasks could include writing a performance evaluation, responding to a sensitive argument in an email, or writing a complex report.

There are many promising research programs linked to ChatGPT and other text-based generative AI tools, as my colleagues have outlined. However, the lack of significant improvement in the productivity of knowledge work (and workers), has long been a source of frustration for organisational leaders and policy makers (Shujahat et al., 2019). ChatGPT has the potential to enhance the productivity of knowledge work through various mechanisms, such as simplifying the information search process, but I predict that its most significant impact will be to provide a competent first draft for our most common written knowledge tasks.

2.1.5. Contribution 5: ChatGPT as a member of hybrid teams – Alexander Richter

2.1.5.1. The emergence of hybrid teams. Movies[2] such as 'The Terminator ', 'The Matrix ', and 'I, Robot' depict AI as powerful, autonomous entities that ultimately turn against humanity. This portrayal of AI as a threat has contributed to the common perception that AI and human actors compete with one another, at least for jobs, rather than being able to work together in a mutually beneficial way. However, the idea of humans and AI working together is as old as the field of AI itself. The pioneers of AI research recognised the potential benefits of AI and humans working together and envisioned a symbiotic relationship between the two. They anticipated AI would augment human intelligence to solve complex problems and make better decisions and ultimately help humans achieve their goals more efficiently (e.g., Licklider, 1960).

Based on the significant advancements of AI in the last decade (specifically in deep learning and built on large amounts of data and computing power), it seems reasonable to assume we will increasingly see hybrid teams consisting of humans and AI. In order to understand the potential of AI in hybrid teams and to effectively navigate their complexities, it helps to explore what types of activities AI can take over in these team settings.

In this contribution, I will illustrate some of ChatGPT's possible roles in a team consisting of humans and AI, including coach, innovator and software developer. I aim to use these examples to show how human actors and AI are becoming hybrid teams. I will conclude this contribution with an initial set of research questions about the future of hybrid work from this brief analysis.

2.1.5.2. ChatGPT as a partner. ChatGPT is based on GPT-3 (Generative Pre-trained Transformer 3), which was introduced in June 2020. GPT-3 has 175 billion parameters[3] and is one of the most powerful language models available to date. Whereas ChatGPT uses the same dataset and parameters as GPT-3, its conversational focus and ease of use (or readiness-to-use) made it a huge success (which even surprised many

[2] Thanks to Markus Luczak-Roesch, Shahper Richter, Kai Riemer, Gerhard Schwabe as well as David Wagner for comments that helped me to improve this contribution and to the anonymous student who shared their insightful experience with ChatGPT with me and allowed me to use it in this article.

[3] The more parameters (or tunable values) a model has, the more complex patterns it can learn and the better it can perform on a variety of tasks. However, having more parameters also requires more data and (computational) resources to train. In the case of ChatGPT, this raises open questions including 'How ethical is it to pay human workers $2 an hour to improve the quality of the training data' (Perrigo, 2023)?

information technology (IT) experts) when it was made available in November 2022. Globally, practitioners, academics and students started experimenting with ChatGPT and shared their "eureka"-moments with colleagues, friends and family. Despite its high degree of accuracy, there were also justified warnings about the reliability of the produced texts.[4] Like many other deep learning-based tools, ChatGPT can only be as good as its training data and is probabilistic and stochastic (e.g., Bender et al., 2021).[5]

A typical social media post (out of many by the end of 2022) read like this: "I asked ChatGPT to write me a [text/abstract/soliloquy/…] about [topic]. It did a [good/great/amazing] job, (certainly) (way) better than I would have done." Whereas many of those initially circulated anecdotes relate to relatively straightforward roles of content production such as text producer, language editor and translator, there are examples of how ChatGPT can also contribute to hybrid teams in more sophisticated roles.

2.1.5.3. Roles of ChatGPT. One of my EMBA students shared their experience with ChatGPT: *"In my interactions with ChatGPT, it felt as if I'm interacting with a team member* via *a chat function. […] I received an immediate response and I felt I could trust the information that was given to me. […] I felt emotionally supported, I was so worried that I'm falling behind schedule and in using ChatGPT I actually felt a sense of relief. In a way, it is scary, isn't it? Could this type of interactions replace group work?"*.

In this case, ChatGPT was initially thought of as a tool for (re-)search support, i.e., the student used it to make sense of a new topic. But it also became a team member that provided emotional support to the EMBA student. This example is in line with studies that showed that AI can act as a **coach**, i.e., supporting humans in achieving their goals, e.g., health-related ambitions such as weight loss (Stein and Brooks, 2017), physical activity (Wlasak et al., 2023) or when it comes to skills development (Terblanche and Cilliers, 2020). Generally, it has been observed that AI acting as a coach has the potential to collaborate with individuals in planning, monitoring, and control of thinking, feeling, and actions (Cranefield et al., 2022). AI-based coaches can help individuals to develop new practices and skills, e.g., when it comes to tracking their well-being or allocating their time more mindfully in order to be able to focus better (e.g., Winikoff et al., 2021).

A study by Bouschery et al. (2023) explores how GPT-3 can become a member of a hybrid innovation team by acting as an **innovator** in the new product development process. They found that it allowed for larger problem and solution spaces and ultimately led to higher innovation performance. Further studies have shown that the generative nature of ChatGPT enables it to contribute new ideas and concepts (Stevenson et al., 2022), for example, by completing sentences, paragraphs or whole texts based on a given context and problem definition.[6] Whereas it may still deliver less original and valuable ideas than humans, ChatGPT can help human team members better understand their problem and solution space.

Another potential role of AI in a hybrid team is that of a **software developer**. Research on so-called AI-based development is still in its infancy. Still, many software developers have shared over the last couple of months how they did not only test ChatGPT but how they already operatively use it. Examples entail using AI to assist with code writing, automating simple tasks (including testing) and error management (in development and post-deployment phases).[7]

2.1.5.4. A new perspective on "hybrid work" and a preliminary research agenda on hybrid teams. This contribution identifies a couple of roles AI can play in hybrid teams:

- Rather simple roles, such as text producer, language editor and research assistant
- And more sophisticated roles, such as coach, innovator and software developer

The list of these roles has an illustrative character and is incomplete. As a next step, it seems reasonable to use group role or task frameworks to identify the strengths and weaknesses of ChatGPT. For instance, McGrath (1984) identifies the following tasks in his group task circumplex: generate (planning tasks, creativity tasks), choose (intellective tasks, decision-making tasks), negotiate (cognitive conflict tasks, mixed-motive tasks) and execute (contests, battles, performances). It appears ChatGPT could contribute valuable input to many of these tasks, but research will need to show which tasks ChatGPT (or other AI) is best suited to and what challenges its use will bring.

Knowing AI can assist with various tasks in a team can also enrich the discussion about hybrid work. So far, the term hybrid work has been mostly limited to the traditional binary of presence work vs virtual work. The addition of AI to collaborative teams warrants to re-consider the term and concept of hybrid work. Hybrid work is no longer limited to the continuum of presence and virtual but also comprehends the duality of human/human vs human/AI (cf. Fig. 1). The various implementations of the Metaverse concept will take these considerations further.

Humans will need to develop new approaches and strategies for hybrid teamwork, which opens the space for manifold research questions, for example:

1. How to allocate tasks between humans and AI? Who delegates these tasks, and who coordinates them? How do humans delegate tasks, and how does AI delegate tasks?
2. Will human actors feel the same sense of achievement when a lot of the creative work is done by AI? Will human-human interaction change in hybrid teams?
3. What are the implications of over-reliance on AI for human actors' creativity, problem-solving abilities, and decision-making skills, and how can we mitigate these effects?

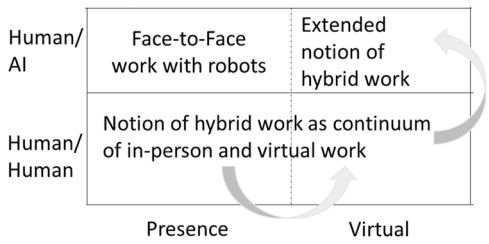

Fig. 1. Towards a new conceptual understanding of hybrid work (own illustration).

[4] See (Pearl, 2022) for examples. Shah and Bender (2022) caution against the opaqueness of search systems using ML, i.e., it is difficult to retrace what information they present. The use of large language models has the potential to further decrease transparency and accountability. Shah and Bender suggest measures to counteract these potential problems.

[5] In other words: ChatGPT is a tool generating text based on the input it receives and the parameters it has been trained on. I am not implying that ChatGPT has consciousness, autonomy or the ability to act with intent.

[6] It has yet to be determined what that means from an intellectual property perspective, since the generated output is based on other people's patterns that are usually given as training data without consent and as free labour. So, there is the question whether AI can only ever plagiarise.

[7] There are also other AI-based software developers. For instance, GitHub announced its "Copilot" tool in June 2021. It can assist users of several integrated development environments (IDEs), e.g., Visual Studio, by autocompleting code.

4. Who assesses the quality of the work results? If AI assesses them, does accountability of the work results only entail the team or potentially the developer of the AI-based team member?

These questions add to other previously raised AI-related research questions that our community is still working on resolving, e.g., who is accountable for AI-based actions (Martin, 2019)? How can we ensure that AI systems are transparent, explainable/contestable, and trustworthy?

It will be interesting to observe how ChatGPT and the many other AI tools already available will contribute to the changing nature of work in the near and distant future.

2.1.6. *Contribution 6: ChatGPT as the new calculator - Wil van der Aalst*

When asking ChatGPT, "What is the effect of calculators in teaching?" the response is, "The use of calculators in teaching mathematics can have both positive and negative effects on student learning. On the positive side, calculators can help students perform complex calculations quickly and accurately, allowing them to focus more on understanding mathematical concepts and problem-solving. Additionally, calculators can provide immediate feedback on their answers, allowing students to check and correct their work. On the other hand, over-reliance on calculators can lead to students lacking basic arithmetic skills, as well as the ability to perform mental calculations. It is important for teachers to use calculators as a tool to support learning, rather than as a replacement for traditional mathematical instruction." When asking ChatGPT, "What is the effect of ChatGPT in teaching?" a similar answer is given with the closing remark, "it is important to note that ChatGPT should be used as a supplement to, not a replacement for, traditional instruction and human teacher interaction."

It is interesting to see that ChatGPT is, seeming, able to reflect on itself, which is something a calculator cannot do. As its acronym indicates, ChatGPT is a Generative Pre-training Transformer; hence it uses a mixture of supervised learning to predict the continuations combined with supervised learning to fine-tune the result. The development of ChatGPT has been so spectacular that there are no representative empirical studies on the use of this new technology. Earlier versions of GPT were more primitive and not representative for its current capabilities. However, the use of calculators in education has been widely researched (Ellington, 2003; Mao et al., 2017). In the 1970 s, also the use of calculators in education was a controversial topic, just like ChatGPT today. Hence, it is interesting to compare both. Most studies confirm that the effect of calculators is twofold. On the one hand, students get more time to focus on problem-solving and understanding. On the other hand, to effectively use a calculator, it is important to understand how it works, i.e., students should be able to do the same task manually. This is where ChatGPT is different.

Most people using ChatGPT have no idea how it works and cannot reproduce the results manually. However, it makes no sense to ban the technology for students that will live in a world where this technology will play a major role (King, 2023). Therefore, it is essential to create two types of tasks: (1) tasks with no access to tools like ChatGPT (like a math exam without calculators allowed) and (2) tasks where tools like ChatGPT are explicitly integrated (e.g., homework). For the first type, there is no need to change much. However, it can only be tested in a controlled environment. It is not feasible to use AI to check for the use of AI, despite attempts to develop such checkers. For the second type, significant changes are needed. Open-ended homework assignments where students need to write text cannot be used anymore. Instead, one should think of tasks that require a combination of both or that involve an oral examination afterward. Interestingly, ChatGPT is not limited to natural language. ChatGPT also speaks several programming and querying languages, e.g., Python, Java, C+ +, C#, JavaScript, SQL, PHP, SPARQL, and XQuery. When correctly used, it will speed up programming tasks dramatically. Therefore, assignments need to be more challenging.

The biggest challenge is that ChatGPT may produce correct-sounding but logically incorrect results. This potentially puts a significant burden on the teacher, that needs to correct the results. Moreover, this will also have dramatic consequences on research. The number of published papers is growing exponentially. For example, the number of scientific papers doubled between 2000 and 2014 (Fire & Guestrin, 2019). The number of papers per author increased dramatically, and it seems unrealistic that all papers are read extensively. An urban legend tells us that 50% of the articles are only read by the authors and the reviewers. This is probably not true, but it illustrates the problem that too many low-quality papers are published. There is an increasing number of papers that are not very original and have errors that remain unnoticed. ChatGPT will make this situation worse and produce papers that are convincing, but often wrong. This will distort scientific facts, stimulate plagiarism, and spread misinformation. Review processes cannot keep up with this. Therefore, ChatGPT and the like will change how research results are disseminated and verified. This will have a much bigger impact than the introduction of the calculator.

2.1.7. *Contribution 7*

2.1.7.1. ChatGPT for human augmentation - Ilias O. Pappas. Technology and the value it brings drives society forward and often will be ahead of society itself. AI is being integrated in multiple ways in our lives and a major challenge remains on how to design and develop inclusive AI for all. Chatbots have been extensively implemented to deal with communication tasks that used to be performed by humans. Depending on the situation, some tasks are perfectly handled by chatbots' based on their current capabilities, while others still require human competencies. Humans started using chatbots for automation purposes, which quickly evolved into human task augmentation and the creation of hybrid teams, where humans collaborate closely with machines to perform relatively simple tasks (Vassilakopoulou et al., 2023). The question is on what is next? OpenAI ChatGPT enables functionalities that were not possible before with by the current generations of chatbots.

OpenAI ChatGPT technology, now open to everyone, has made a critical, possibly historical, transition. So far, many advanced AI applications have been employed to deal with challenges and problems in which failure comes at a high cost (e.g., aviation, medicine). On the other hand, implementation has been lagging when it comes to dealing with tasks where failure is expected, acceptable, and comes with a low cost (e.g., education) (Kabudi et al., 2021). The latter makes the use of AI applications perfect for learning and OpenAI ChatGPT is enabling this. Learning happens everywhere, it doesn't happen only "in class". Besides traditional settings (e.g., university) learning includes training of employees & qualification of leaders. The latter can be either planned (e.g., organisations training their employees) or occur naturally as employees are using new technologies or the existing ones in different ways, such as in Vassilakopoulou et al. (2023).

The educational sector is trying to catch up with the impact of ChatGPT, especially in exams. Teachers are debating about its use and if it should be allowed while students are asking for advice or permission on if and how to use it. At the same time, AI tools to detect AI generated text are being developed as a counter measure. Considering that these tools are constantly learning it can be expected that a tool can be asked to generate text that is not detectable by AI. As educators, we remain responsible for training the students to develop critical thinking. This objective has not changed over the years. Applications like ChatGPT can be used either as a companion or tutor, to support for example self-regulated learning, or as a way to pass exams without any effort, thus minimal, if any, learning. As with most things, ChatGPT sometimes works great or just fine and sometimes it fails.

Depending on the task and question, it can give useful, funny, or just wrong and misleading answers. While the latter is expected to be reduced over time considering that the training datasets will continue

growing, the responsibility remains with the human to evaluate and assess these responses. Hence, we need to rethink how we design learning in order for learners to develop soft skills, such as critical thinking, complex problem solving, creativity and decision-making, that takes into account various teaching and learning spaces (e.g., classrooms, meeting rooms, the industry) using new digital resources (Pappas & Giannakos, 2021). Finally, using technologies like ChatGPT can be fun as it changes the way we interact with the computer, raising the need for new studies on how both cognitive and affective factors shape our behaviours towards more advanced chatbots and "truly" conversational agents.

Research is ongoing on what entails inclusive AI, with inclusive AI tools requiring inclusivity to be considered both when it is developed and when it is used. Design for inclusive AI starts by providing access to a diverse group of users, then ensuring their engaged participation, that will eventually lead to empowered success. ChatGPT, now open to everyone, has the opportunity to allow this. Making AI applications available to all can help overcome several existing challenges due to a lack of data-driven culture or technological culture, which coupled with the need for innovative and trustworthy AI can lead to solutions that are understood by non-expert users as well. Latest news report that companies will be able to create their own custom versions of ChatGPT, thus allowing them to launch their own chatbots using OpenAI ChatGPT technology, possibly without using other branding, except their own. At the same time, considering the potential of low/no code platforms, a new generation of chatbots can be developed to help deal with multiple aspects of societal impact, both short and long term.

ChatGPT, while rather unique today, is on the first of similar chatbots that will become available over time. Businesses and organisations that understand and embrace this change will develop competitive advantages. Already, soon after ChatGPT became open to all, Google announced the launch of LaMDA, its own ChatGPT competitor. While these tools are free to use today, they require a lot of resources, thus it is only a matter of time before they become paid services, especially the ones leading the market. Digital divide and digital inequity will widen. For example, digital equity in education means ensuring that every learner, regardless of socioeconomic status, language, race, geography, physical restrictions, cultural background, gender, or other attributes historically associated with inequities, has equitable access to advanced technologies, communication and information resources, and the learning experiences they provide. While the use of advanced chatbots like ChatGPT is still at its infancy, it is expected to experience a breakthrough in the following years and holds the potential to become a new paradigm in business. The following research questions can inspire researchers from a wider range of disciplines to further research on the next generation of conversational agents and their impact on all the actors and stakeholders in our societies.

RQ1: How to design inclusive AI applications for enabling human augmentation?
RQ2: How do social and institutional context influence the design and deployment of inclusive AI applications?
RQ3: How can AI applications enhance collective intelligence and enable new forms of community action for bridging the digital divide and digital inequity?
RQ4: How can the key actors collaborate and take proactive action towards the integration of technologies like ChatGPT for championing practical applications of inclusive AI to increase successful human/AI partnerships?

Overall, I view ChatGPT as a training arena that I can throw ideas to it and help me think. I often do this with colleagues and friends. Sometimes it might be about trivial tasks, pointing to automation of tasks, and sometimes it can be about more meaningful tasks, pointing to task augmentation. Instead of focusing on how to mitigate the use of such tools we should train our students, the future employees, to understand the implications of using such tools. Developing critical thinking is key and ChatGPT might help in this direction if used appropriately. Would we accept a statement from another person without some form of critical reflection? Of course, the answer is that it depends on so many variables.

A similar approach can be followed when assessing and evaluating responses from ChatGPT and all the advanced conversational agents that will follow in the future. The ongoing interaction with ChatGPT allowed me to reflect on how I respond to questions and how accurate are these responses. The recent trend of posting ChatGPT chats on social media shows that I am not the only one reflecting on this matter. How do we respond when we are not completely sure about our answer? Depending on the context and how expensive or cheap is to fail, we will either do some fact checking or simply state that we are not fully sure (e.g., use the term probably). After all, how easy it is to improve and succeed without failing first?

2.1.8. Contribution 8: overcoming resistance to change with AI

2.1.8.1. Can ChatGPT help you? - Jan Pries-Heje. This short paper explores an emerging AI based tool named "Chat Generative Pre-trained Transformer" (hereafter, ChatGPT) and its usefulness in overcoming resistance to change when implementing new digital innovations.

The way I go about it is to identify relevant questions in relation to well-known literature on resistance to change and then discuss whether a project manager responsible for implementing a given new innovation would find the AI-based ChatGPT answers useful? In the following I have showed a few of answers and not fully (that would take up all several more pages). I have chosen to show enough so you as reader can follow my line of argumentation.

When adopting and diffusing new IS the recipients often show signs of resistance when they are required to change their behaviour or adopt new behaviour. This was identified in academic literature 75 years ago by Coch & French Jr (1948) who carried out studies of changes to production at the factory floor. Thus, the first question we could ask ChatGPT to help us with may ask would be: Why is there resistance to change? The answer to that was:

1. Fear of the unknown: People may be unsure of what the new change will bring and fear the unknown consequences.
2. Loss of comfort or control…
3. Lack of trust … [and three more bullets - left out here]

This answer is pretty good and covers most of the knowledge we have today. What is missing is for example that the person showing resistance has a vested interest e.g., because they were part of or responsible for the "old" thing that is being taken over by the new thing.

The "Nestor" in diffusion and adoption Everett M. Rogers (2010) identified five categories (groups) of adopters called innovators, early adopters, early and late majority, and laggards. The early majority expects and waits for certain members of the group of early adopters called "opinion leaders" to demonstrate and communicate the advantages. Furthermore, the late majority not only wants the advantages demonstrated; they are also waiting for the right opportunity. Hence, the late majority group can be seen as having resistance to change but are in fact just waiting for the right opportunity.

Let us try use ChatGPT to answer: "How do we identify opinion leader?" ChatGPT answers:

1. Observe behaviour: Look for individuals who are vocal and actively involved in shaping the opinions and attitudes of their peers.
2. Survey employees …
3. Analyse social networks …
4. Assess communication skills … [and four more bullets with explanations]

This is an excellent answer. Better than the one Rogers give. If I was a project manager, that answer would be really helpful.

Another important source about resistance to change is Oreg (2003) that identified 17 factors to measure the expected level of resistance at the individual level. He came up with a 5-point scale, from "I generally consider change to be negative thing" to "I sometimes find myself avoiding changes that I know will be good for me". Oreg used the scale to show in a teaching environment at a University that the higher the score the less likely teachers were to be using a given innovation (new technology) for their teaching (Oreg, 2003, p. 688). Thus, the next question we may ask is "How can I overcome resistance to change when introducing a new system?". The answer to that by ChatGPT was:

1. Communicate effectively …
2. Involve employees …
3. Offer training …
4. Lead by example … [and three more bullets with explanations]

Again, a good answer but not as good as the other answers above because this answer leaves out a lot of things that could be done. Some answers that Kotter (Kotter, 2007) would give could be "Build a guiding coalition" and thereby focus on the team responsible for change, and "Create short term wins". Thus, to use ChatGPT you need help to judge the quality of the answers. And you need to be knowledgeable about the theory in order to formulate questions. With the observation that I was missing some points from Kotter I reformulated my question to "How can I overcome resistance to change when introducing a new system? Please include Kotters 8 phases in the answer". And then I got an answer that was just Kotters 8 phases no more no less. That is even less useful than the answer I go above.

As a project manager we are interested in phases that should be in a plan towards the change. Therefore, we ask "What phases do people go through when they change". The answer we get from ChatGPT is:

(1) Awareness …	(2) Desire …	(3) Knowledge …	(4) Ability …	[and two more bullets]

This is not a good answer. It is just a repetition of the ADKAR-model but without a useful reference such as (Hiatt, 2006). There are many other phased models for organisational change with IT. Rogers (2010) has an individual change model with phases such as "Prior Conditions – Knowledge – Persuasion – Decision – Implementation – Confirmation". And Cooper and Zmud (1990) had another phase-model based on a number of empirical studies.

Hence, ChatGPT in this case gives an answer that may be OK – using the ADKAR-model as inspiration is not a bad idea – but leave out important and probably better alternatives. However, to realise that there are alternatives you need to know that the answer given is based on the ADKAR-model. But ChatGPT never tells you any references or where the knowledge it based the answer on was found. That is a feature given by the technology used.

Finally, we could ask: "Why do people fear change?". The answer to that was.

People often fear change because it brings uncertainty and the unknown. Change can challenge one's comfort zone and disrupt familiar routines, causing stress and anxiety … [continues three more lines].

Again, a good answer but not a very insightful one. To get deeper we need to understand psychological theories such as theory of planned behaviour (Ajzen, 2011).

So, to conclude, ChatGPT is a valuable tool that can be very useful for you as responsible for a project leading to organisational change, e.g., a digital transformation. ChatGPT may help you at the level of a good collection of textbooks. However, if you want to get deeper and get 'behind' the surface ChatGPT may not be the tool The main deficiency is that you have no idea where the knowledge in the answers come from? Thus, you cannot judge or evaluate the quality of the answers. The other important concluding point is that the more pre-existing knowledge you have the better you can use ChatGPT and make sure that you get quality information out of the use.

2.2. Organisational and societal Impacts

2.2.1. Contribution 9

2.2.1.1. Societal Impact of ChatGPT – Rahul Dé. Since its launch in November 2022, barely three months from the time of this writing, ChatGPT has drawn considerable media and academic attention (Mishra, 2023). It is variously described as a generative AI, a large language model, and a chatbot.

At its core ChatGPT is a generative pre-processed transformer (GPT), a neural network that is trained on a large corpus of publicly available data. While training, the inputs to the network are sentences and paragraphs, where the desired or target output for the network are subsequent phrases and sentences. The GPT network is thus trained to predict blocks of text that will logically and grammatically follow the input phrases and sentences. If these output phrases are then given as inputs, the network can predict further text.

ChatGPT is more advanced than previous versions of GPT, as it is also trained with a reinforcement learner that grades the many responses it produces, and outputs the most suitable one. Human trainers provide the rewards for the reinforcement learning. ChatGPT is also able to retain the state of the input-output responses and is thus able to participate in a sustained conversation.

ChatGPT is now used for many applications - to generate stories and reports on various topics; for generating or correcting computer code, though this facility does not provide perfect results as yet; and to summarise articles or chapters (Kundalia, 2023). It is being used as an advanced search engine where it can provide answers to queries in a narrative form. It can also function as a chatbot, engaging in an extended conversation, where it remembers the questions it responded to and the answers it generated, thus resembling the programme envisaged by Turing in the famous Imitation Game.

ChatGPT raises some prominent issues and questions. An immediate set of questions that have arisen in the media are about students using it to cheat on assignments and examinations, about replacing jobs of certain types (Aleksander, 2017; Mitchell, 2023), about the originality and creativity of responses (Chakravarti, 2023), and about integrating ChatGPT in various tasks in organisations. IS research questions have been about use of digital assistance for learning, shopping, and advertising (Chen et al., 2022; Kuswaha and Kar, 2021; Pizzi et al., 2021), about use of chatbots in different tasks (Lin and Wu, 2023; Van den Broek et al., 2019), the communicative agency of chatbots (Araujo, 2018) and their success in handling conversations (Hill et al., 2015; Konya-Bombach et al., 2023). Issues of bias and discrimination in data and algorithms are prominent in AI and chatbot research (Akter et al., 2021; Conboy et al., 2022). Another set of questions have arisen that are focused at the societal level, raising larger issues of policy and regulation.

2.2.1.1.1. Societal questions. One goal of AI is to produce Artificial General Intelligence (AGI), or programmes that are capable of a wide variety of intelligent tasks, rivaling or exceeding human capabilities (Goertzel and Pennachin, 2007; Kissinger et al., 2021). This goal is in contrast to the current AI systems that have superior capabilities, much beyond that of the best humans, but in narrow domains, where these are referred to as Artificial Narrow Intelligence (ANI). It is in this context of the difference between AGI and ANI that ChatGPT has a strong influence. ChatGPT is one of the first set of programmes that are tending towards AGI, along with programmes such as Siri, Alexa, LaMDA, as they have a wide range of seemingly intelligent capabilities that may not exceed expert human levels at individual tasks, but are overwhelming owing to their scale, speed, and scope.

As newer and more capable versions of ChatGPT are produced, a few things are certain: 1) these programmes will require massive investments and computing resources, and hence only the largest private firms or governments will be able to develop them (Kissinger et al., 2021); and 2) these programmes will be made available through the cloud, either for free or at a very low cost, to generate network effects and to onboard a large number of users (who will then participate in further refining and training them).

Across many societies and regions there is a distinct possibility that people will begin to depend on programmes like ChatGPT and delegate (Baird & Maruping, 2021) important tasks to them, initially with small scope, and then with growing import. Particularly in developing countries, where there may be a shortage of experts on specific topics, like high technology, the entire understanding and discourse will be determined by ChatGPT - as it will be a ready source of answers and will also be always available. From school children to senior policy analysts, all will either use ChatGPT as an assistant or rely entirely on its answers to develop their own thinking, intuition, and understanding of all matters of which they have weak knowledge. There may arise a need, then, for educational institutions, policy writers, and governments to understand the extent to which opinions and thinking are being influenced by the answers produced by ChatGPT. There will be a need in various developing countries to understand the basis of training of publicly available ChatGPT programmes, and how their own values are represented and explicated.

As tools like ChatGPT are integrated into human-AI hybrid solutions (Rai et al., 2019), researchers will have to address societal questions of access asymmetries. In the developing country context, there already exists an issue of the digital divide (Venkatesh and Sykes, 2013), where disparities in use of technology can lead to disparities in incomes and well-being. Though tools like ChatGPT are easy to learn and adopt, and their designers will ensure they are even more integrated with everyday-use apps, they can amplify inequality of resource access. One example is of users who cannot use English (and other languages ChatGPT can work in), as they will suffer from their inability to use the AGI tool, while their peers will be able to. Further, inequality of access will lead to asymmetry in the data used to train and refine these algorithms, where marginalised groups will not have their data represented (Chen and Wellman, 2004; Weissglass, 2022).

Along with abilities and skill, the agency of human-AI systems will raise questions of responsibility. Research shows that there are gradations in degrees of agency, with humans and AI systems displaying varying values on different dimensions of agency (Dattathrani and De', 2022). With increased use of ChatGPT, for tasks such as coding, or planning, there will be increased focus on responsibility when things go wrong. Along with blame and accountability, there will be the problems of allocating legal and financial liability. Future research will have to identify the human vs AI agentic responsibilities for various domains and tasks.

2.2.1.1.2. Conclusion. ChatGPT presents immense possibilities of a powerful AGI, one of the original goals of the field of AI. Though these tools are likely to have a strong impact on many aspects of business, society and government, in terms of both creating innovation possibilities and destroying old ways of doing things, the need for research to address the issues of discourse, divided access, and agency identified in this note are urgent.

2.2.2. Contribution 10

2.2.2.1. The Potential of ChatGPT: Awe, Fear, Disgust and Transformation – Robert M. Davison. I[8] recently chanced across a newspaper article relating how students in Australia had been found cheating in an online exam by outsourcing (to an AI chatbot) the creation of their answers to exam questions. The article did not reveal the quality of the submitted answers nor the fate of the students who had perpetuated this action, but nevertheless the message was clear. If one can train an AI chatbot to generate an answer to an exam question, one can presumably train it to do many other things, including writing a complete journal article, if that same chatbot has access to the relevant literature, data, interpretation, etc. I imagine that some types of article may be easier for a chatbot to write, e.g., those that are more formulaic in character. Articles that require extensive citation of references, as well as author interpretations, may be harder, at least for the time being. AI chatbots can also analyse data, or fish for whatever relationships might exist in data, so as to concoct a plausible contribution to knowledge. Indeed, an AI chatbot will likely perform these activities much more effectively and efficiently than a human, discerning patterns that elude the human brain, and so conceivably creating a better quality or more useful contribution to knowledge than could the human author. Whether the AI chatbot will then suggest a theory, which can be retrospectively tested with this fished data, or to be inductively created from the fished data, is another matter. I imagine that it's possible. Furthermore, the AI chatbot may well 'improve' the linguistic fidelity of the final article, leveling the playing field for non-native speaker authors. However, such chatbots are also accused of producing 'cogent waffle' (Vincent, 2022), i.e., grammatically accurate combinations of chunks of text from the training materials that doesn't really say anything useful and may also contain much misinformation. Cogent waffle is by no means a new phenomenon in scholarly publishing, but the creativity of the chatbot is circumscribed by the breadth and depth of the training materials.

My perspective here is primarily that of the Editor of two scholarly journals (the Information Systems Journal and the Electronic Journal of Information Systems in Developing Countries). I must emphasize that this is an opinion with some possible implications. My investigation of ChatGPT has not gone far beyond Wikipedia[9] and a few websites,[10,11] though I have also benefitted from conversations with a few colleagues (see acknowledgements). There is no formal literature review: actually, I am not sure that there is a literature that can be reviewed since no peer-reviewed articles on ChatGPT have yet been published, though I did find an editorial (O'Connor, 2023). Moreover, this is not an empirical piece: I have no data to analyse or interpret. My general reaction is a strange mix of awe and fear, disgust and transformation: awe that this is possible, fear of what the consequences may be, disgust that people would be so lazy to resort to such chicanery, and transformation of what we find ethically acceptable.

Perhaps I should not be surprised that AI has moved to this level. Received wisdom[2] is now that we have gone well beyond the Turing test, since we (humans) cannot distinguish between a human crafted piece of writing and a machine crafted piece of writing. Perhaps the AI chatbots can distinguish, a point I come to later. I am in awe to the creators of the chatbot and their NLP models. No matter the myriad constructive and positive opportunities to make the world a better place with such AI, there is also an equally huge potential both to overturn centuries of scholarly tradition and to overwhelm the peer-review process with a veritable deluge of artificially generated papers. Even if those same papers are not of sufficient quality to justify publication, having them all reviewed (or even just desk rejected) will consume considerable time and resources.

In ante-diluvian times, we fondly imagined that contributing authors would also be willing to engage as peer reviewers and thus to review

[8] I gratefully acknowledge Roger Clarke, Samantha Moore, Gerhard Schwabe, Kirstin Krauss, Monideepa Tarafdar, Marco Marabelli, Angsana Techatassanasoontorn and Sven Laumer for insightful comments on this short piece.

[9] https://en.wikipedia.org/wiki/ChatGPT

[10] https://scholarlykitchen.sspnet.org/2023/01/11/chatgpt-thoughts-on-ais-impact-on-scholarly-communications/?informz= 1&nbd=db8af4e3–980 f-47 cd-93ab-4039cea17bea&nbd_source=informz

[11] https://www.ce-strategy.com/the-brief/chat/

papers written by others. Since each paper needs 2–3 reviewers, we could reasonably expect each submitting author team to review (between them) 2–3 papers submitted by other author teams. Indeed, many journals automate this such that in order to submit a paper you need to have an account in a submission system where you must provide some keywords that reflect your research interests; sooner or later you will be 'invited' through the same system to review another paper. But if the creation-agents of papers (should I call them authors?) are essentially robots who/that generate papers for people who then submit them (I hope that the intricacies, vagaries and inconsistencies of the submission systems make it impossible to automate this too) in uncountable numbers, I hardly imagine that these same authors will be enthusiastic about reviewing the same number of papers as they submit! Perhaps they will outsource the reviewing task to an AI chatbot?!.

That's neither a fanciful nor a flippant remark: there seems to be no reason why reviewers should not do this. Whether the AI chatbot can detect that the paper it is reviewing was written by (an instantiation of) itself I don't know and perhaps it doesn't matter. But it opens up several more cans of worms of prodigious girth. Will the AI chatbot be able to write a critical yet constructive review of a paper that it itself wrote? Or will it find that its original creation was 'perfect' and thus return the review comment of 'Accept without Modification'?! What will the SE or AE think about that? I can't speak for other journals, but in my experience as Editor of the Information Systems Journal, for instance, accepted papers are, on average, revised 3.5 times. That implies several rounds of 'revise and resubmit', not instant acceptance.

Clearly something is missing in this equation: if the AI chatbot both writes the papers and reviews them, what's the point of having a human-based peer review process at all? Indeed, perhaps the robots will also publish the papers and we can dispense with the publishers as well? More practically, I suspect that if the AI chatbot proves to be as accurate or useful as the current media hype suggests, then the journal publishers will defend themselves by implementing detection programmes (presumably using AI[12]) so as to detect the likelihood that a paper was AI-authored. Indeed, ChatGPT-detection programmes already exist.[13] Meanwhile, my own publishing contacts assure me that this is already happening with both new policies related to machine generated papers and checks on the provenance of papers in the works. I note with some amusement that the International Conference on Machine Learning has banned the use of AI tools in writing the papers to be submitted to the same conference, though it's acceptable to use those same AI tools to edit and improve text (Vincent, 2023). The line between writing and editing seems quite thin to me. Is there any real difference between editing, improving and writing?

Finally, disgust, that our esteemed colleagues might resort to such unethical means to outsource paper crafting to an AI program and pass it off as their own work. In my view it amounts to plagiarism. But then I have to temper my disgust with the sober realization that to be unethical, a behaviour has to be proscribed in a code of ethics: if we didn't yet proscribe that behaviour, i.e., there is no code regulating its enactment, then it's hardly fair to label the behaviour as unethical. The rise of ChatGPT thus creates an opportunity for us to discuss ethical issues when using these and similar tools. This will potentially be a transforming conversation. If chatbots do a better job than humans, should we not use them? If AI tools can analyse data and produce findings, can they also present the findings to an audience? Should we openly acknowledge these AI tools? There seems to be a continuum from a paper that is entirely written by humans without any non-human intervention, through papers that are improved with spell checkers, grammar checkers, reference checkers and the like, through to papers that draw on data that have been analysed with AI tools, and then papers that are to a lesser or greater extent written by a chatbot. Where on the continuum do we draw the line of ethicality? Alternatively, is it more a matter of transparency, that any use of technology is acceptable so long as it is openly acknowledged? These questions are not intended to be rhetorical: they are practical: as scholars we need to decide what is acceptable/ethical and what is not. When we have decided we can enact and enforce policies. But first we need to have the conversation.

In closing, I see this as simply the latest incarnation of disruption: ChatGPT is the forerunner of a new wave of AI chatbots and other tools that has the significant potential to disrupt current processes. We have already seen disruption in a variety of industries; indeed, we use such disruptive examples in our teaching and if we teach digital transformation then we will be still more familiar with the idea. Why shouldn't the academic production of knowledge also be disrupted? If we want to have any control over this disruption, we need digital leadership and a conversation about acceptable and ethical behaviour. But be sure, we can't stop digital transformation. We may at most hope to guide it.

2.2.3. Contribution 11

2.2.3.1. ChatGPT: the digital transformation challenge for organisations just became harder - Paul Walton. Many organisations are struggling to scale up the implementation of AI and realise the benefits it offers (Fountaine, McCarthy, Saleh, 2021). The introduction of ChatGPT (used as shorthand in this article for ChatGPT itself and similar products) amplifies the difficulties of AI as a "consummate bullshitter" (Mollick, 2022). ChatGPT is impressive and fluent but not always right. The issue can't be ignored—the technology industry's commitment (Tiku, De Vinck, Oremus, 2023) means that ChatGPT will be available more widely and will be included in other products.

So how can organisations take advantage of its strengths and mitigate the risks? ChatGPT can help people be more creative and productive but only if organisations can transform to address the issues of trust and the commoditisation of AI in a way that manages the psychological risks.

ChatGPT has emerged just as AI has already created a headache for organisations caused by four factors:

1. Growth. The implementation of AI in business processes is growing fast (De Cremer, Kasparov, 2021)— the rapid introduction of new technologies (like ChatGPT) means that competitive pressures for organisations are mounting.
2. Risks. Because AI is fundamentally different from previous technologies, there are new and different risks, many based on ethical concerns (Blackman, 2020), that are easily triggered (perhaps through "artificial stupidity or other causes" (Bossman, 2016)). The risks are large, including the potential of reputational, compliance or financial damage.
3. Urgency. The problem cannot be deferred. An ethical approach to AI needs to be designed in and cannot be retrofitted (Floridi et al., 2018).
4. Transformation difficulty. Because of the complexity of the transformation requirements in implementing AI at scale, many organisations find it hard to progress beyond proof-of-concept activities (Fountaine et al., 2021).

ChatGPT makes these trends more immediate and amplifies the challenges starting with trust. As Sandel says (Pazzanese, 2020): "Part of the appeal of algorithmic decision-making is that it seems to offer an

[12] https://www.zdnet.com/article/can-ai-detectors-save-us-from-chatgpt-i-tried-3-online-tools-to-find-out/?ftag=TREc64629f&utm_email= 536ccc3-ce686324e956fda1e31b2c675839fb26b05bf781412a35aa499bcabf2&utm_campaign_id= 5931351&utm_email_id= 20d3cd8d51774a2658232222a4-c9a255797b5bc5bd45d2444786acc9f4c2b7d2&utm_newsletter_id= 92316&medium=email&source=iterable

[13] https://www.npr.org/sections/money/2023/01/17/1149206188/this-22-year-old-is-trying-to-save-us-from-chatgpt-before-it-changes-writing-for

objective way of overcoming human subjectivity, bias, and prejudice,… but many of the algorithms … replicate and embed the biases that already exist in our society". Because ML uses data that reflects the biases of society, "bias is machine learning's original sin" (Weinberger, 2019). Pinker (2022) frames it elegantly: "Knowledge is acquired by formulating explanations and testing them against reality, not by running an algorithm faster and faster. Devouring the information on the Internet will not confer omniscience either: Big Data is still finite data, and the universe of knowledge is infinite."

The scope of ethical issues raised by AI is wide-ranging (West, 2018). Numerous sets of principles for ethical AI have been documented (over a hundred and fifty sets of guidelines are documented in the global inventory (Algorithmwatch.org, 2020)) but with common ground, for example in the EU principles (EU High-Level Expert Group on AI, 2019).

In its current invocation, ChatGPT violates several of these principles. It is based on ungoverned information that isn't always reliable and it doesn't communicate the reliability of that information. So, it is easy to see that there may well be difficulties with the following principles:

- privacy and data governance—including, for example, GDPR regulations and the "right to forget";
- transparency—including the need for explainability (Bundy et al., 2019) which would impact its use in governance, compliance (e.g., demonstrating adherence to regulations), legal questions (e.g., about intellectual property) or customer interaction;
- accountability—how can an organisation be accountable for information derived from ChatGPT used by staff under these circumstances? How can it avoid fraud or criminal activities?

ChatGPT makes organisational governance more difficult because it extends the use of AI outside knowledgeable data science teams. It is available to developers through programming languages (e.g., Python) or cloud services (e.g., Amazon Web Services, Microsoft Azure, Google). In addition, so-called "no code" or "low code" technologies enable AI to be used, in a similar way to Excel and Access, directly by "business technologists" (including "citizen developers" and "citizen data scientists") who are not professional developers. Because it is so easy to use by anyone, ChatGPT takes this trend even further.

This means that the problem of managing AI risks in organisations has unprecedented scale. It has expanded from a (relatively) small team of knowledgeable professionals to orders of magnitude more people without any experience of the risks or the governance required.

How can AI at this scale be controlled? Following existing models for digital development (UK Government Digital Service, 2019) and in line with the EU principles, the need for high levels of human control has been argued by Shneiderman (2020), amongst others. He argues for processes and interfaces that exhibit the "high levels of human control AND high levels of automation" that can also increase human autonomy (Bernstein et al., 2022). But the application of this approach at scale is daunting—how can controls catch the wide range of risks in time to mitigate them?

In addition, ChatGPT amplifies the psychological risks associated with AI (and with information processing more generally). As Kahneman (2011) points out, thinking rigorously requires effort and instead people often rely on instinctive thinking that ignores the quality of information. ChatGPT plays directly to this tendency—it cuts out much of the hard work and produces seemingly impressive output. Why bother rigorously assessing the detail when the result looks good?

This is just part of a wider question: how should AI and people work together to take advantage of the best that each can offer (Bernstein et al., 2022). AI offers the potential for automating some work and letting people focus on higher value, more creative activities. This is a key opportunity for ChatGPT—it can easily give people access to ideas and knowledge (Agrawal et al., 2022) just as it already being used to enhance the productivity of software developers, writers and other professions.

ChatGPT can also be applied to a long-standing challenge—that of knowledge management. AI has long offered the promise of improving access to organisational knowledge through the use of chatbots, automated document and image analysis, providing explanations (Bundy et al., 2019) or through improved human collaboration. Echoing Lew Platt's anguished cry ("if only HP knew what HP knows" (Sieloff, 1999)), organisations have struggled to make their knowledge readily available. This challenge falls naturally into the domain that ChatGPT inhabits, although organising organisational knowledge in a form that it can access will remain difficult.

ChatGPT can help people be more creative and productive and improve organisational knowledge management. But it amplifies many AI challenges that organisations are already struggling with.

2.2.4. Contribution 12

2.2.4.1. Services marketing and management implications of ChatGPT -Jochen Wirtz. Smart service technologies, both hard and software, in combination with intelligent automation (IA) rapidly become more powerful, cheaper, easier to implement and use (Bock et al., 2020; Bornet et al., 2021). They have the potential to bring unprecedented improvements for the customer service, service quality, and productivity all at the same time (Huang and Rust, 2018: Wirtz et al., 2018; Wirtz and Zeithaml, 2018).

These technologies enable specific service processes (e.g., an address change) and entire service products (e.g., a digital banking service) to be streamlined, simplified, and scaled. Information processing-type services (think of any service that can be delivered on an information counter, over the phone, via email, or on an app) increasingly will be end-to-end (E2E) automated with no frontline employees involved. For example, most Google customers (including its revenue-generating advertising clients) hardly, if at all, interact with human service providers. This allows Google to offer high-value services such as Google Maps, GMail and Google Scholar for free. That is, costs are so low that these services can be advertising funded or offered advertising free for a small fee. In future, we can expect such E2E automated services become the norm for many information-processing type services such as financial services and bookings, but also healthcare and education as marginal costs will be negligible in many cases (e.g., Wirtz, Kunz, Hartley, & Tarbit, 2023; Wirtz, Lin, & Das, 2022).

Even for physical service processes, intelligent automation will dramatically change the customer journey. For example, future hair salons will be able to build innovative solutions that use smart mirrors and AI to analyze a customer's hair and recommend different hair styles. Hair cutting service robots can then execute the chosen cut.

ChatGPT uses an umbrella technology called generative AI which gets closer to achieving artificial general intelligence that allows the technology to understand and learn any intellectual tasks just as humans can. Already today, generative AI is able to generate novel content such as text, images, program code, and even poetry. In contrast, today's chatbots are primitive in comparison. Their development is typically based on pre-existing frequently asked questions (FAQs) cum training data, all powered by still relatively limited technology which tends to make the bot's responses pre-programmed. One can expect that generative AI will be introduced into many existing customer interfaces of other providers in addition to ChatGPT (think of Siri or Alexa in future 'incarnations'). That is, ChatGPT and other general AI systems allow opening-up of chatbots and service robots to move closer to 'general intelligence' and provide service closer to the level of understanding and flexibility as today's human frontline employees.

Moving closer to general intelligence is an important next big step in E2E automation of customer service as is likely to be a gamechanger for many services and these new technologies will bring the digital frontline to new levels, not just in their AI engine, but also in design of the customer interface. For example, already today, Soul Machines, a

developer of what they call 'digital people', allows service firms to tailor their digital workforce to their desired brand image, positioning, and customer preferences (e.g., age, ethnic group, gender). Furthermore, for customers it will be largely indistinguishable whether they are served by a digital service provider or a human employee, and they are likely not to care very much. One can even expect that the instant availably (i.e., no waiting for a customer contact agent to become available), 24/7 service, and in ones preferred language will be preferred by most customers over having to dial into a traditional call centre. Furthermore, the cost implications are significant, and given that we live largely in competitive market economies, these cost savings are likely to be competed away, leading to increasing standards of living.

As we are at the beginning of this technological revolution of customer service, research is needed to understand better the key value drivers of ChatGPT and other generative AI solutions for the service sector. Important research questions include: (1) how to design, operate and continuously improve frictionless, generative AI governed customer journeys; (2) how can this technology guide customers effectively through their journeys and how can it be designed to be customer-error tolerant and (3) to master automated service recovery when needed.

Finally, ChatGPT and other advanced digital front line technology (whether virtual on video or physical as in a service robot) carry serious ethical, fairness, and privacy risks (Belk, 2021; Breidbach & Maglio, 2020; Wirtz et al., 2023). For example, the vast possibilities of capturing data and observing and analysing customers and gaining insights into their lives and psychology are well beyond George Orwell's terrifying scenario described in his classic book "Nineteen Eighty-Four: A Novel" (Wirtz et al., 2023). It is disconcerting that these technologies can result in customers being assessed, predicted, nudged, all often without their consent and awareness (Gawer, 2021). We will need research to understand, manage, and mitigate the risks of generative AI such as ChatGPT and other technologies that get ever closer to achieving artificial general intelligence technology when used in customer service.

2.2.5. Contribution 13: marketing in the world of GPT-3.0 and ChatGPT: Futuristic reflections -Janarthanan Balakrishnan, Rohita Dwivedi, Samuel Ribeiro-Navarrete and Adil S. Al-Busaidi

2.2.5.1. ChatGPT and marketing. Technology has played a crucial role in marketing during the last two decades. AI has extensively contributed to marketing during the previous five years. From automation to analytics, AI has accelerated marketing performance to a greater extent (Dwivedi et al., 2021b). The chatbot is one among them which has gained broader attention from marketing practitioners as well as from academicians (Balakrishnan et al., 2022). Chatbot employs AI architecture to respond to customer queries in a simulated environment (Balakrishnan & Dwivedi, 2021). Like Chatbot, OpenAI has introduced ChatGPT, a sophisticated AI platform that uses language processing models to answer human queries (OpenAI, 2022). The functions of ChatGPT are huge, even incomparable to modern AI technologies. ChatGPT uses Generative Pre-trained Transformer (GPT) architecture which OpenAI also developed. Academicians and Industry professionals are perplexed by the growth and speculation of ChatGPT during the last two months. The recent version of GPT-3 is a sophisticated AI model that can provide ample scope for language translation, modelling, and generative texts (Hughes, 2023). OpenAI made its mark with DALL.E2, a new AI system that can create realistic art and images based on an expected language parameter (OpenAI, 2023). Now, many speculations are traveling around OpenAI, DALL.E2, GPT3, and ChatGPT. The future of ChatGPT mostly remains unknown, but challenges and opportunities lie ahead for businesses. Especially for marketers ChatGPT can offer various opportunities at different stages of the customer purchase journey.

2.2.5.2. Opportunities for marketers. Customer information search and query handling are inevitably present across the stages of the customer purchase journey. Can ChatGPT serve a similar or the same purpose for the customers? The question requires more extensive investigation in the coming days considering on how ChatGPT describes its business model. Table 2 offers perspective insights on how ChatGPT can benefit marketers in various ways. However, harvesting the exclusive benefits of the ChatGPT rests upon its future developments. Table 2 shows eight strategies that can use ChatGPT: building marketing campaigns, content marketing developments, content picture and art designings, services marketing, customer experience, keyword suggestions, marketing research and brand comparison. The table also shows indicative solutions and reflective tactics for every strategy. Indicative solutions explain the operationalization of ChatGPT in the respective marketing strategy, and reflective tactics explain the tactical move marketers should follow to leverage ChatGPT and GPT-3.0 to their fullest potential.

ChatGPT has similar reflections of search engine optimisation and content marketing flavour. However, ChatGPT, to our knowledge, does

Table 2
ChatGPT in marketing strategies.

Marketing strategies	Indicative solutions	Reflective tactics
Building marketing campaigns	ChatGPT might be able to provide suggestions to develop a successful campaign. Example: "Suggest me an effective marketing campaign on Instagram"	ChatGPT is a generative tool which requires precise queries, such as: "Suggest me an effective marketing campaign on Instagram for a bouquet start-up."
Content marketing	ChatGPT can assist in providing appropriate and accurate content for the given query related to a campaign, product, sales page, email, and blog post	However, the preciseness of the query should be more accurate to get creative results.
Content designing	ChatGPT can offer ideas for designing and other improvements	DALL.E2 can be used to design the product creatively as instructed in the query
Chatbot based services	GPT-3 is the next-generation language generative AI which can be used in chatbots for effective query handling	The chatbot should be able to integrate GPT-3 and DALL.E2 to generate appropriate Avatar in the conversations
Customer experience	AI-based experience is well recognised in academic literature. ChatGPT can provide a more enriching experience to the customers	The role of ChatGPT in other immersive technologies will decide how better the experience it can provide compared to the present state of AI experience
Keyword suggestions	ChatGPT can provide keyword suggestions which can assist sponsored campaigns. Apart from regular keywords, ChatGPT allows marketers to test the alternate keywords in the campaign	The search for content and keywords should be narrowed based on the personalised campaign requirements.
Marketing research	ChatGPT can assist marketers in testing content performance (A/B testing), content performance, market statistics, and demographic targeting information.	The research points may be reflective from a data point of the last two to three years. So the recency effect will work in terms of marketing research. While ChatGPT might not be able to perform A/B testing in its current form, it can provide some general testing guidelines, benchmarking content, and statistics.
Brand Comparison	ChatGPT can assist marketers in understanding brand position against rivalries to enhance the existing brand.	ChatGPT could help collect data about other brands (e.g., "compare iPhone and Samsung"; "analyse 7 Ps of Pepsi marketing"). The collected data could be used for different purposes, such as new product development (NPD).

not work same as Google. It has a trained dataset with a 570 GB equivalent size (Theconversation, 2023). Moreover, the learning competence of GPT is expected to grow in the coming days. Unlike other search engines or content curation platforms, ChatGPT can precisely answer queries. Of all the benefits that ChatGPT can provide to marketers, it is paramount that company chatbots and content marketing teams should leverage the fullest potential of GPT-3 and its associated tools. GPT-3 can curate content using sophisticated learning algorithms, which can help marketers arrive at better research results and get more optimised content. Algolia is a content-building platform that uses GPT-3 to better serve customers with search results (Algolia, 2023) and optimise long tail results (Adams, 2023). Marketers could potentially integrate the AI interface (GPT-3) into the chatbot structure to enrich AI-based customer conversation. In the present scenario, most chatbots operate in a simulated environment; when integrated with ChatGPT, marketers may find fruitful customer engagement with a multilevel of data points acquired from the customers. Future ChatGPT models, when followed with proper precision, can alter their avatar positions based on the conversation mood and thus provide customer engagement and experience. Marketers will explore the opportunities of framing brand placements in similar technologies in a sponsored way. Nevertheless, it depends on how OpenAI decides its business model and whether it follows a subscription, premium or freemium model.

2.2.5.3. Challenges for marketers. While ChatGPT and GPT-3.0 look promising for marketers, there are some challenges marketers have to face. ChatGPT can be an effective content curation tool similar to Google. Still, GPT − 3 uses robust database models with AI-based learning algorithms, which indicates that keyword-based content or search engine marketing may not be effective in ChatGPT architecture. Given that the AI pre-trained algorithms are more powerful in the ChatGPT, marketing strategies require a well-defined collaboration with OpenAI. Some companies collaborate with OpenAI to use GPT-3.0 for their tools, such as Algolia, Copy.ai, Replier.ai, Jasper AI, and Quickchat (Bhattacharyya, 2023). Though the adoption of GPT-3.0 will increase in the coming days, the financial and knowledge capital required for its implementation can be huge. The power of ChatGPT and GPT-3.0 may require fewer human efforts compared to the current technology-based marketing environment. This scenario subsequently will question and may conflict with the strategical orientation of marketers and may threaten various traditional marketing principles. Notably, the generative responses provided by ChatGPT are subject to the query raised by users. So an unspecific query may lead to erroneous results, thus extending to brand value degradation. So it will be a challenging task for marketers to build an eco-system where customer queries are answered precisely.

2.2.5.4. Future research directions. After ChatGPT, IS and marketing research may take a new turn on how researchers will look at AI-based performance tools. Future research which involves GPT-3 should focus on investigating the architecture of how organisations can employ GPT-3 and ChatGPT models in the existing state of their business. Primarily, studies should explore how generative AI technologies can benefit marketing in customer services, customer engagement and experience, content curation and development, marketing research, lead generation, commerce, and promotional activities. Research should also focus on knowledge of how customers may welcome this powerful tool in the version of chatbot, or can it replace entirely humans in customer services? Researchers should focus on developing frameworks to integrate ChatGPT with their chatbots to enrich its presence. ChatGPT may not always provide positive sentiment for every product and brand. So beyond looking at the benefits of ChatGPT, researchers should explore how marketers may perceive ChatGPT as a threat. Besides concentrating on the text queries, future research should also focus on the role of pictures and arts in generative AI frameworks. Future studies may also explore the effects of AI-generated marketing-related content on society. For example, the interplay between AI-generated content and AI safety might be investigated to find the impact of misaligned AI on users consuming AI-generated content. Overall, the use and challenges of ChatGPT mostly remain unexplored. Presently researchers perceive the future of ChatGPT based on the existing knowledge of reflective AI. With ChatGPT yet to evidence a series of developments, researchers should enhance the available knowledge in the area of IS.

2.2.6. Contribution 14

2.2.6.1. ChatGPT in banking services – Emmanuel Mogaji, Mousa Ahmad Albashrawi Sriparna Basu and Sangeeta Khorana. ChatGPT is an emerging technology set to change the landscape of conversation agents (Thorp, 2023); ChatGPT is said to build on the prospects of the chatbot, making conversation more human, answering questions, generating ideas, and suggesting solutions. It has been considered to shape journalism, law and marketing with its content-creating strategies (Ng et al., 2022; Kelly, 2023). It is not surprising to see businesses evaluating how they can integrate this technology into their operations. This piece, however, aims to explore the prospect of ChatGPT in financial services (Lucey & Dowling, 2023). Banks have always been known to accommodate technology and transform their operations (Abdulquadri et al., 2021); from the time of online banking to open banking and even chatbots and Robo advisors and investors, banks have always adopted technology (Soetan et al., 2021; Mogaji & Nguyen, 2022) and not surprising to see many banks closing their physical branches and either adopting financial technology (fintech) to streamline operations (Bonfim et al., 2021; Nguyen & Mogaji, 2022) or converting into digital banks. It would not be surprising to see how ChatGPT can be integrated. However, it is imperative to recognise that banks operate in a highly regulated sector and technology adoption is often strategically explored (Vives, 2019; Czarnecka & Mogaji, 2020). In light of this background, this piece contextualised retail financial services across three strands – financial services marketing, provision and requisition as a spectrum of interaction between the consumers and the bank. Each strand is subsequently discussed while highlighting the prospects and implications of ChatGPT.

3. Prospects and implications of ChatGPT in banking services

3.1. Financial services marketing

One of the bank's primary responsibilities is to introduce financial services to customers, either their existing consumers or their prospective customers (Soetan et al., 2021). Banks can process a lot of information based on their engagement with customers and then be able to offer them relevant products and services. AI has been tremendously deployed in this area of banking to understand consumers' needs and be able to target them with necessary products effectively (Mogaji et al., 2020a; 2020b). Here the bank is asking consumers – come bank with us. There are tremendous opportunities for ChatGPT at this point, as banks can use it for their back-end operations, data analysis and marketing financial services without direct engagement with the customers (Northey et al., 2022; Sheth et al., 2022). There are possible applications for developing and implementing marketing communication strategies, understanding consumers' needs and creating personalised customer offers (Mogaji et al., 2020a; 2020b; Omoge, Gala, & Horky, 2022). This technology can be used for content creation, integrating emotional appeals through human conversation feel in marketing campaigns. Considering the high regulations in the sector of financial service, there are significant implications for the claims being made by ChatGPT. These limitations suggest that marketing communications may not solely rely on ChatGPT; human involvement would still be needed to verify the trustworthiness of the insights and personalised offers. There

is also a possible need to declare the source of information – has this campaign been auto-generated by an AI machine? Therefore, marketing should take advice in the context of that knowledge. Banks would be expected to invest in the infrastructure, exploring their technical capabilities and human resources to integrate it into existing digital transformation strategies (Abdulquadri et al., 2021; Diener & Špaček, 2021).

3.2. Financial services provision

Consumers will always need the banks to provide financial services (Soetan et al., 2021), there will always be reasons to engage - and with these engagements, data are being generated which are beneficial to both parties (Mogaji et al., 2020b). There lies an opportunity for ChatGPT to explore these datasets to inform some banking decisions. At this stage of the engagement, banks are inviting consumers to 'come bank with them', banks need to show some form of understanding, commitment, and awareness about the needs of their customers (Sheth et al., 2022; Omoge et al., 2022). Banks can use ChatGPT technology for their front-end operations to enhance business operations and directly engage with customers. This conversation agent builds on the chatbot's success, which has been well integrated into banking operations; the chatbot is used to enhancing customers' experiences, providing answers to frequently asked questions, and streaming the banking relationship (Abdulquadri et al., 2021; Balakrishnan et al., 2021). Banks can gain insight into their service provision quality, improve their algorithm design and improve customer services (Sheth et al., 2022; Soetan et al., 2021). However, trust in service provision will be paramount (van Esterik-Plasmeijer & van Raaij, 2017) as ChatGPT finds its way into banking operations. It would not be surprising to see consumers questioning their trust in the services and information provided. Could customers make a better decision if and when served by a human? Are customers willing to accept offers made by these technologies? What are the implications of service consumers with vulnerability or the impact of the dark side of this technology on consumers' well-being? Perhaps technology can't be wrong. There are also implications on convenience, promptness of services, and accurate decisions (Mogaji et al., 2022; Ghazwani et al., 2022). Banks would be expected to invest in training staff and educating customers about what's available and what can be done. Since many customers still need to be conversant with the chatbot, banks need to know their customers' needs and how far to push the technology drive (Abdulquadri et al., 2021).

3.3. Financial service requisition

With the growing power of financial technology and the disruption in the sector, many consumers are looking beyond their banks for financial advice and investment options (Northey et al., 2022). Many FinTech companies are not banks but are offering innovative financial products, and the ChatGPT provides an opportunity for these companies to meet the growing needs of consumers. At this stage, consumers are looking beyond their bank and asking – who should I bank with? They are looking for platforms that align with their values and interests. Customers can use various AI-driven platforms provided by fintech companies to get advice from varied sources without directly engaging with any bank (Ghazwani et al., 2022; Mogaji et al., 2022). They do not have to rely on their bank for advice; they can look at other providers as they seek information about where to invest, money management, and different financial needs. With ChatGPT, consumers would be asking, 'where should I invest?', 'Which ethical funds should I invest' or 'when do I invest?' Answers to these questions, as provided by ChatGPT, may influence their decisions. It is, however, imperative to recognise that data to inform the decision and output of the ChatGPT would be important. As consumers rely on this Robo Advisor (Zhang et al., 2021), the data upon which they are trained would be essential to ensure they get unbiased information (Mogaji et al., 2020a; 2020b). Likewise, there would be implications on how banks can positively and ethically influence decisions and advice provided by the chatbot (Northey et al., 2022). Implications on individual investment preferences would also be pertinent – religious, political, and environmental interests could influence investment decisions. How would consumers get information about investment options that align with their ethical, religious or political beliefs (Riedel et al., 2022; Bukhari, et al., 2019)? Who will update and train the chatbot with this information? Where will it be sourced? There are significant implications for financial services providers to ensure that the correct information is provided and made available to the consumers to allow them to make an informed decision (Mogaji et al., 2020a; 2020b). While emerging fintech companies are developing these financial services management tools, allowing customers to ask questions and get financial advice, it is essential to raise awareness as customers need to know what's available (Abdulquadri et al., 2021).

4. Conclusion

The huge befits of ChatGPT have been recognised, and with the amount of investment and interest in this technology, its impact is bound to grow (Dowling & Lucey, 2023; Ng, Haller, & Murray, 2022). Brands must start exploring their prospects. This article has focused on retail banking, providing a reflective insight into the adoption of ChatGPT across financial services marketing, provision and requisition. There are opportunities for managers, practitioners, and policymakers to have a holistic view of this technology; however, it is essential to acknowledge that this is an emerging area for research, and there are opportunities for future research to establish these positions empirically.

4.1. Contribution 15: using ChatGPT in tourism, travel, transport and hospitality industries – Dimitrios Buhalis

Technology and smart tourism diffuse innovations across tourism service ecosystems disrupting legacy operational practices and processes (Buhalis, 2020). AI and ML are emerging rapidly as new technological tools that will further revolutionise the use of technology in the Tourism, Travel, Transport and Hospitality Industries (Buhalis et al., 2019).

Until the launch of the Chat Generative Pretrained Transformer (ChatGPT) as a language model developed by OpenAI designed for generating text-based responses in a conversational manner, AI was only used by technology experts, rather than the general public. In early 2023 ChatGPT gave access to AI and ML learning to the general public, by answering unstructured questions in natural language text. ChatGPT empowers supercharges the generation of coherent and contextually appropriate responses to natural language inputs. This technology will revolutionise search and will transform the nature of access to products and services across industries. Naturally Google as a service was challenged, not only because search is changing by nature, but also because its own AI service underperformed whilst Bing resurfaced with a stronger AI proposition. Google effectively searches for web pages that include key phrases used for search. Google's search algorithm is designed to use keywords and phrases entered by the user to return a list of web pages, images, and other content that match the query. ChatGPT uses a language generation model and the Transformer architecture developed by OpenAI to search across a massive corpus of text data and to amalgamate comprehensive human-like text answers based on the input it receives. It is designed to respond to natural language queries in a conversational manner and can answer questions, summarise information, and generate a comprehensive text. Both technologies can be useful for answering questions although they are designed for different purposes.

Naturally, travellers (demand) and Tourism, Travel, Transport and Hospitality organisations and destinations (supply) are excited about the incredible potential the AI, ML and ChatGPT tools bring into the ecosystem, as illustrated in Table 3.

On the demand side, traveller information is critical for their

Table 3
ChatGPT use in the Tourism, Travel, Transport and Hospitality ecosystem.

DEMAND/Tourists	SUPPLY/Tourism organisations and destinations
Information finding	Concierge services for consumers
Building itineraries	Marketing content text/pictures generation
Searching for specialised services	Menu engineering and recipe development
Eliminating Choice	Fact Finding
Dynamic Itineraries	Identification of resources
Content Sharing	Social media and organisations own web pages

satisfaction. They search for information, construct itineraries, select suitable timetables, and evaluate alternative products and services. Tourism by definition is a hostile industry, as people/customers travel to unfamiliar destinations to cocreate experiences (Buhalis et al., 2019). They consume products and services that meet their requirements in the present context (Buhalis & Sinarta, 2019). Therefore, they need extensive information provided by several organisations and summarised in a meaningful and comprehensive format. They have relied on search engines, such as google, since early 2000 to find information, build itineraries, search for specialised services, eliminate choice and develop dynamic Itineraries (Fig. 2). They had to go through lists of websites in order to then co-create their experience by combining different resources (Fig. 2).

ChatGPT offers the opportunity to combine a range of different resources into a text that provides a comprehensive text answer to their enquiries (Fig. 3). By using ChatGPT, tourists can receive quick and accurate information in natural language to help them plan their trips and make the most of their travel experiences. The high use of innovative digital marketing will have a higher online influence and loyalty particularly for young people (Buhalis et al., 2020). When ChatGPT is combined with voice assistants and AI is combined with contextual real time services it will offer a revolutionary smar customer service (Buhalis & Moldavska, 2022).

On the supply side, ChatGPT can assist Tourism, Travel, Transport and Hospitality organisations with both customer phasing and back-office functions. ChatGPT has a real chance to make an impact in the travel industry through trip planning. By allowing travellers to use AI to create a trip itinerary and find top hotels, the time-consuming process of sifting through numerous options can be reduced to just minutes. Providing concierge services, ChatGPT can assist in answering traveller enquiries by generating information and answers about destinations, and attractions. Providing travel recommendations for events, and activities, hotels, restaurants, and other travel services, as well as providing advice on local customs, visa requirements, and travel tips enhance value-added services. They can assist with booking and reservation inquiries and can provide guests with information about availability and pricing as well as assist with the booking and reservation process. ChatGPT can personalise recommendations for guests based on their interests, abilities, disabilities and preferences. Fig. 4 illustrates some suggestions for a blind traveller to Paris, France. Eventually, it can empower customer-facing bots (Tércio Pereira et al., 2022).

ChatGPT can also create alternative itineraries, routes and transportation options, evaluating alternatives for travel planners, corporate travel companies and agencies and tour operators (Fig. 5). By providing multilingual support, ChatGPT can communicate with travellers in multiple languages, helping to improve the overall experience and increase satisfaction.

ChatGPT can help also Tourism, Travel, Transport and Hospitality organisations to generate marketing content and detailed descriptions for attractions, hotel rooms, facilities, and services as well as develop destination content for use on websites and social media. The generated marketing text, descriptions, website and social media content can be widely distributed to attract more visitors. A very wide range of back-office functions can also benefit from fact-finding enquiries and the identification of resources. Menu engineering and recipe development for example may benefit restaurants and hotels when ChatGPT assists in the development of innovative gastronomy offerings. Fig. 6 illustrates suggestions for Greek gluten-free recipes. Overall, ChatGPT can help Tourism, Travel, Transport and Hospitality organisations to revolutionise customer communication, improve service and enhance the travel experience, streamline operations and have access to knowledge databanks.

The virality of ChatGPT instantly illustrated the tremendous potential of AI and ML. However, it also brought to light that language models like ChatGPT are complex and continuously evolving systems, so there is always room for improvement and further development. A range of issues related to intellectual property and ownership of data was also exposed. There are challenges ahead to improve the system by using more diverse training data, including text from different languages and cultures; understanding a more diverse set of users; providing clearer fallback responses; developing the depth and breadth of information provided; and avoiding confusing or misleading answers. Incorporating more external knowledge sources, such as databases or APIs, user-generated content, and user feedback into ChatGPT's response generation process can help it provide more accurate, in-depth and up-to-date information. Analysing big data faster and incorporating real-time data will assist language models to learn faster and have a bigger impact on the industry (Buhalis & Volchek, 2021; Stylos et al., 2021). Nevertheless, it is evident that this revolutionary technology will be assisting humanity to interact faster, cheaper and more efficiently cocreating value in the future. But it should also be noted that ChatGPT can also be used to generate fake reviews on hospitality and tourism organizations.

4.2. Impact on the academic sector

4.2.1. Contribution 16: generative AI in teaching and research: some preliminary thoughts - Ryan Wright & Suprateek Sarker

The launch of ChatGPT in November of 2022 has caught the attention of all scholars, regardless of discipline. The popular press has also engaged in discussions around the implications of ChatGPT, and, more broadly, on generative AI, highlighting the many potential promises and pitfalls of these systems. As a background, generative AI started gaining traction in 2014 when generative adversarial networks (GANS) were developed and were widely used to create useful outputs such as facial images and noise maps (Creswell et al., 2018). Now, aided by a web interface provided by the company Open AI, the generative AI tools respond to queries in English. Further, these tools have produced answers to complex questions indistinguishable from expert human responses.

As IS scholars who view emergent IT phenomena using a socio-technical perspective (Sarker et al., 2019), offering the world an understanding of generative AI adoption and use, while considering the unintended consequences, is not only consistent with our expertise but is also our responsibility. Consequently, we expect that the IS journals will likely receive many theoretical and empirical manuscripts on generative AI in the near future.

It is our perspective that, ultimately, the application of generative AI in our own work practices will significantly shape the research agenda within the IS and beyond. Our goal here is thus to provide some preliminary thoughts on how IS scholars can start incorporating generative AI into their professional lives, particularly in teaching and research. We will also take a long view of the implications within each of these categories of work. We begin with what most popular press and university guidance has centred on, which is the implications for our teaching.

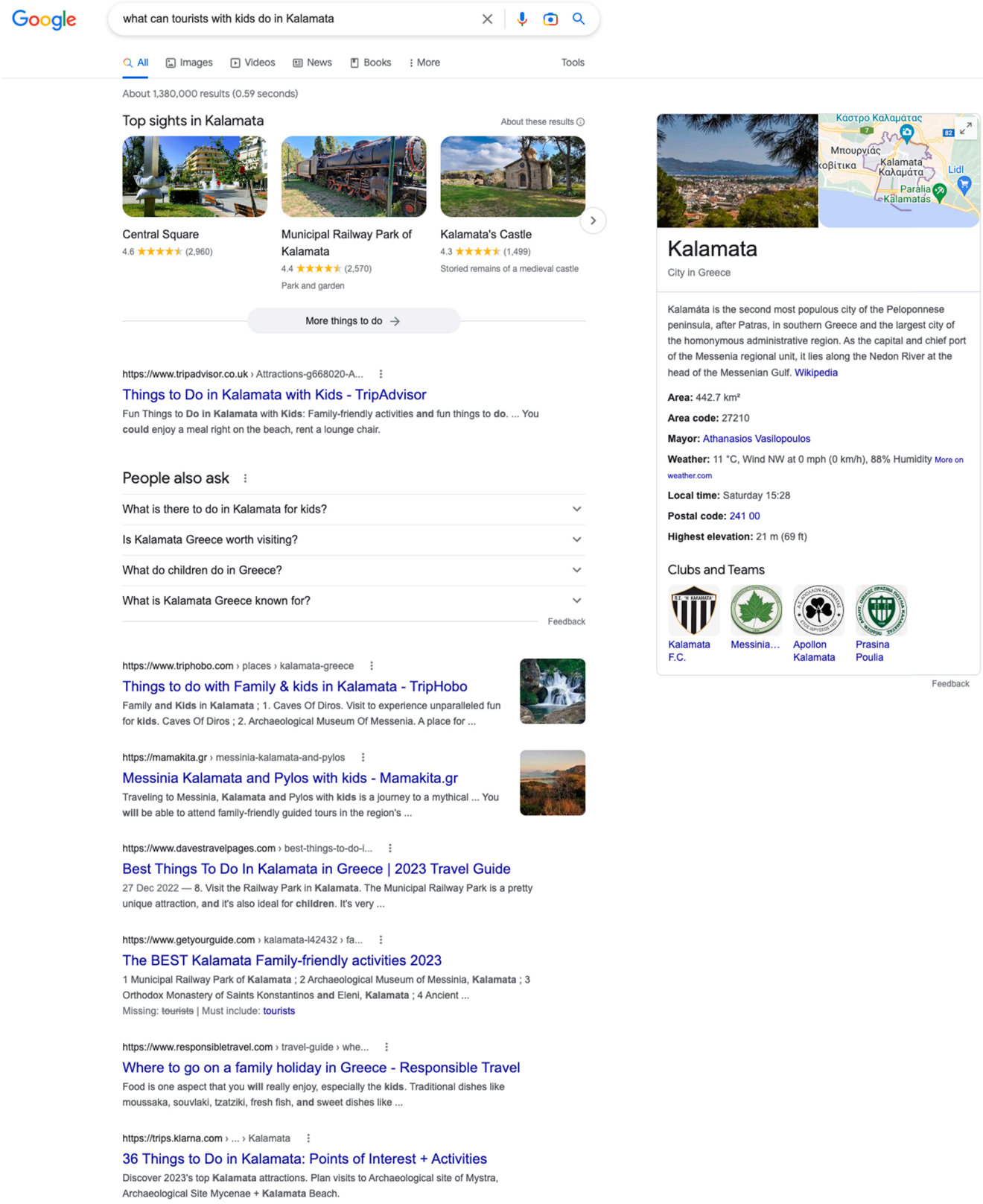

Fig. 2. Google Output: what can tourists with kids do in Kalamata, Greece.

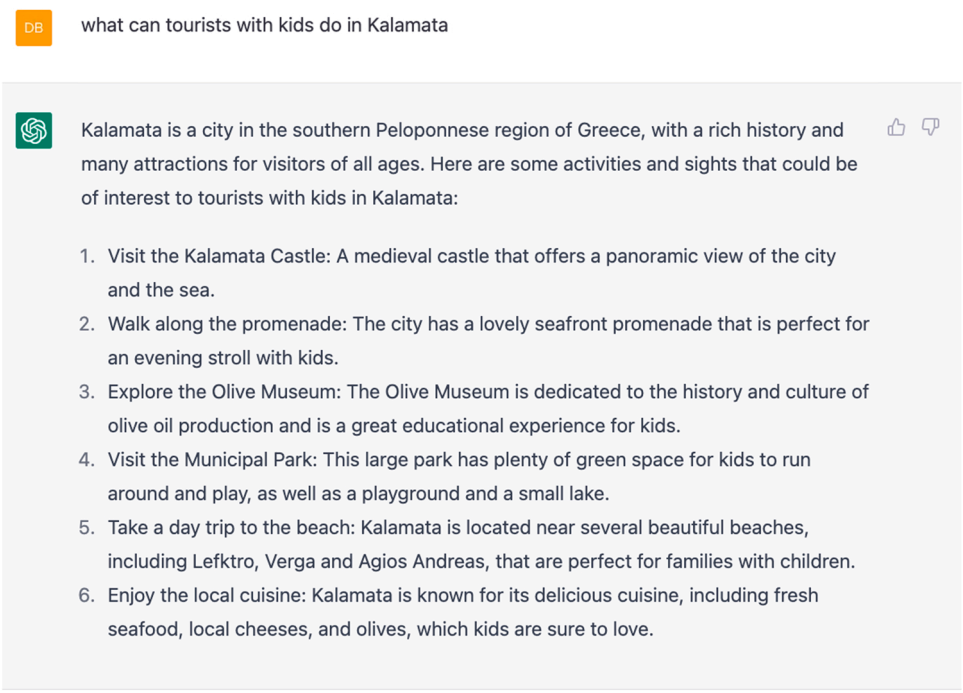

Fig. 3. ChatGPT output: what can tourists with kids do in Kalamata, Greece.

4.2.1.1. Teaching in the era of generative AI. The release of ChatGPT and the commentaries that have followed have caused a great deal of anxiety to many academics. This anxiety is driven partly by the need to maintain academic integrity in university classrooms (Cotton et al., 2023). Noam Chomsky has been quoted as saying that these systems enable "basically high-tech plagiarism" and offer "a way of avoiding learning.[14]" It is clear that there are academic integrity issues do exist (Rosenblatt, 2023), even with tools that can be used to detect generative AI text (see: https://platform.openai.com/ai-text-classifier). However, we argue that closing off the possibilities of using such technologies by pointing to academic integrity issues is a mistake. This technology has the potential to fundamentally change the classroom experience and the knowledge and skills outcomes of our students. Because of the incredible potential offered by generative AI, we offer suggestions that higher education instructors can use to engage deeply in this disruptive technology.

First, it is critical that the mindset used by instructors is that of experience and experimentation. In the IS literature, a helpful framing to this exploration is IT Mindfulness. IT Mindfulness, defined by Thatcher and colleagues (2018), includes four elements: 1) alertness to distinction, 2) awareness of multiple perspectives, 3) openness to novelty, and 4) orientation in the present. Instructors can use this theoretically derived construct to help engage students in exploring technology tools. The use of IT Mindfulness-based training has been shown to improve resistance to job burnout (Pflügner et al., 2021), help identify fake news (Kim & Dennis, 2019), and create more secure online behaviour (Jensen et al., 2017). It will be important to invite students into the conversation and allow them to also apply IT Mindfulness to generative AI in their work practices.

Professor and the student should explore both the applications and the boundaries together, thus allowing the use of this technology in ways that were unimaginable. There have been several papers published on SSRN, arVix and other fast-to-publish outlets that provide high-quality in-class exercises and assignments allowing the student to experiment under the guidance of a professor. For example, an instructor can ask students to use ChatGPT to write an essay on a topic related to the class. Then the instructors would ask students to provide a critique of this essay. An examination of the strength and weaknesses of the essay should help aid in the exploration process (Mollick & Mollick, 2022).

Second, and related, it is important to provide guidance to students on not only the ethical implications of using the technology but also the boundaries with respect to the capabilities. Research has shown that "… trust in a technology is based on what the technology can do for the person, such as giving help and being reliable." (Lankton et al., 2016, p. 210). Assuming this holds, students will trust the technology because of its capability to aid in multiple work practices. It is the professor's role to offer a critical view that allows students to explore and use critical thinking when using technology. Researchers have already provided compelling evidence that generative AI in general and ChatGPT specifically provide biased output (e.g., Chen et al., 2023; Hartman et al., 2023).

We acknowledge that generative AI is one in a line of several technologies that have disrupted the classroom experience for students in higher education. Past disruptive technologies include calculators, email, Google search, statistical packages, etc. Next, we will take this same assumption and apply it to the research process. Specifically, we will provide guidance for research on incorporating generative AI into their research work practices using a simple example.

4.2.1.2. Research in the era of generative AI. As noted, ChatGPT is not the first AI tool to change research practices. Grammarly (www.grammarly.com) is an example of a popular AI tool used to improve academic writing. rTutor.ai (www.rtutor.ai) is an AI chatbot that can generate R code for statistical analysis. Also, Research Rabbit (www.researchrabbit.ai) is an AI tool used to produce literature reviews. Similar to the concerns regarding classroom integrity, researchers have also raised significant concerns regarding content created by ChatGPT (Else, 2023). Our colleagues in finance have provided evidence that ChatGPT can provide significant help in generating high-quality manuscripts (Lucey & Dowling, 2023). Questions have surfaced on attribution and

[14] https://www.openculture.com/2023/02/noam-chomsky-on-chatgpt.html

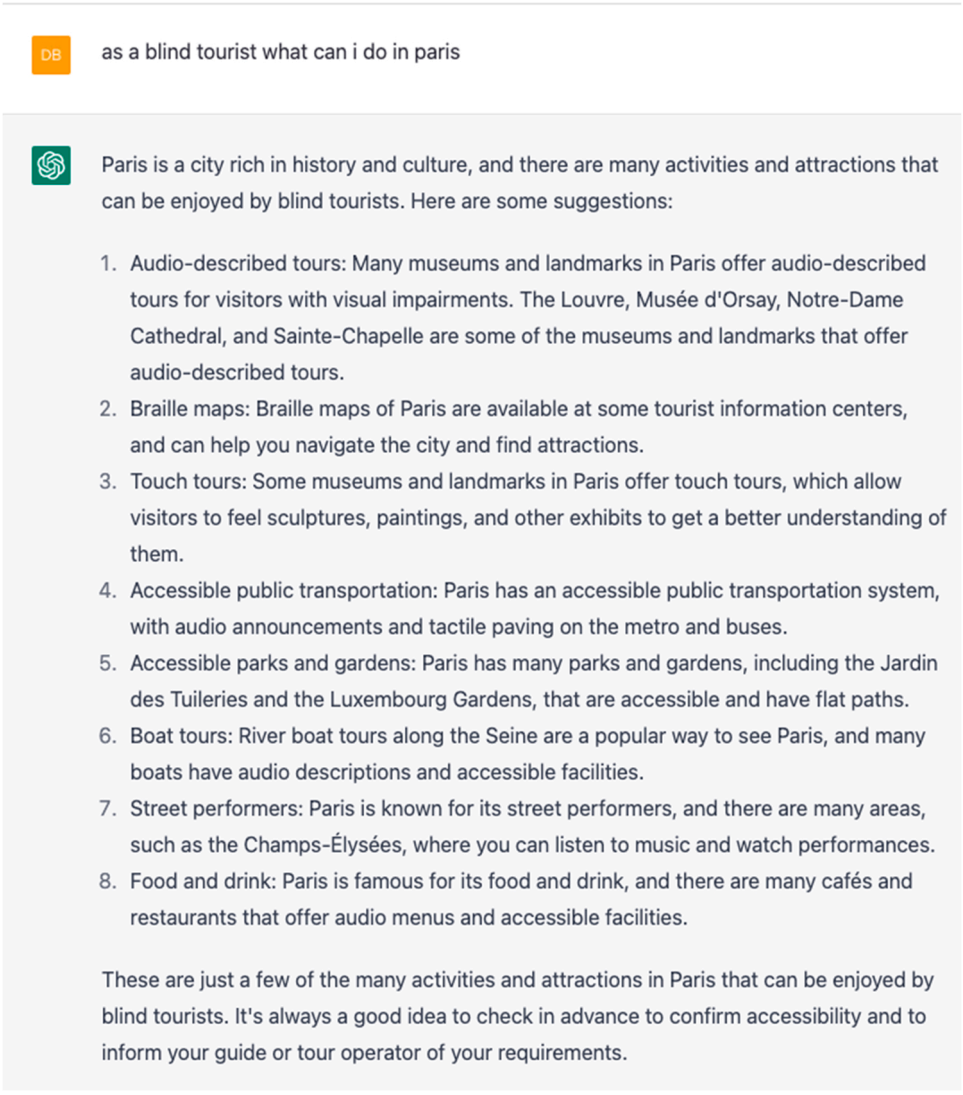

Fig. 4. ChatGPT output: destination information for disabled tourist.

ownership of this text generated by ChatGPT within research manuscripts (Thorp, 2023). At this time, our perspective is that generative AI can offer an acceleration to research similar computer-based statistic packages, and even the Internet search engines. Computer-based packages allowed researchers to run analyses on data that by hand was difficult or even impossible. The Internet has allowed researchers to access material in real-time. Modern research practices have benefited greatly in the speed and quality of research using these tools (Schucany et al., 1972).

The practice of developing research has been well documented by our discipline. We rely on the guidance provided by Watson and Webster (2020) and Webster and Watson and (2002) to examine how generative AI may be utilised to accelerate the development of a literature review and research question. Developing a literature review is a good candidate for evaluation as they are typically the preliminary step in the research process.

> "We contend that a literature review also requires a higher-level synthesis. It typically needs to integrate concepts across domains into a holistic treatment of a subject. The author has to identify what ideas matter and then find a way to coherently link them into a stream that has a clear and relevant expository flow for the intended reader." (Watson and Webster, 2020, pg. 2).

Watson and Webster contend that the literature review process starts with element mapping which surfaces the core relationships between concepts and processes. The element mapping culminates in the coding of each relevant publication. This task is well-suited for generative AI which can develop an element map similar to the ontological map offered by TheoryOn (Li et al., 2020a, 2020b). The generative aspect differs from previous tools as it allows the researcher to reconceptualise the element maps based on their expertise and the insights garnered during the process. Further, generative AI can offer new mapping that is created because it can examine the corpus of the literature, unlike manual database searches.

Watson and Webster state that the goal of the literature review is to provide a meta-analytic and that "the fundamental problem is that knowledge is not encoded, and scholars must rely on the methods of their forebears (reading or scanning many papers) to take a step forward." (Watson and Webster, 2020, pg. 9). Knowledge is now being encoded at a scale never seen before. Because of this process, generative AI can now identify related concepts iteratively with the researcher thus accelerating the research process.

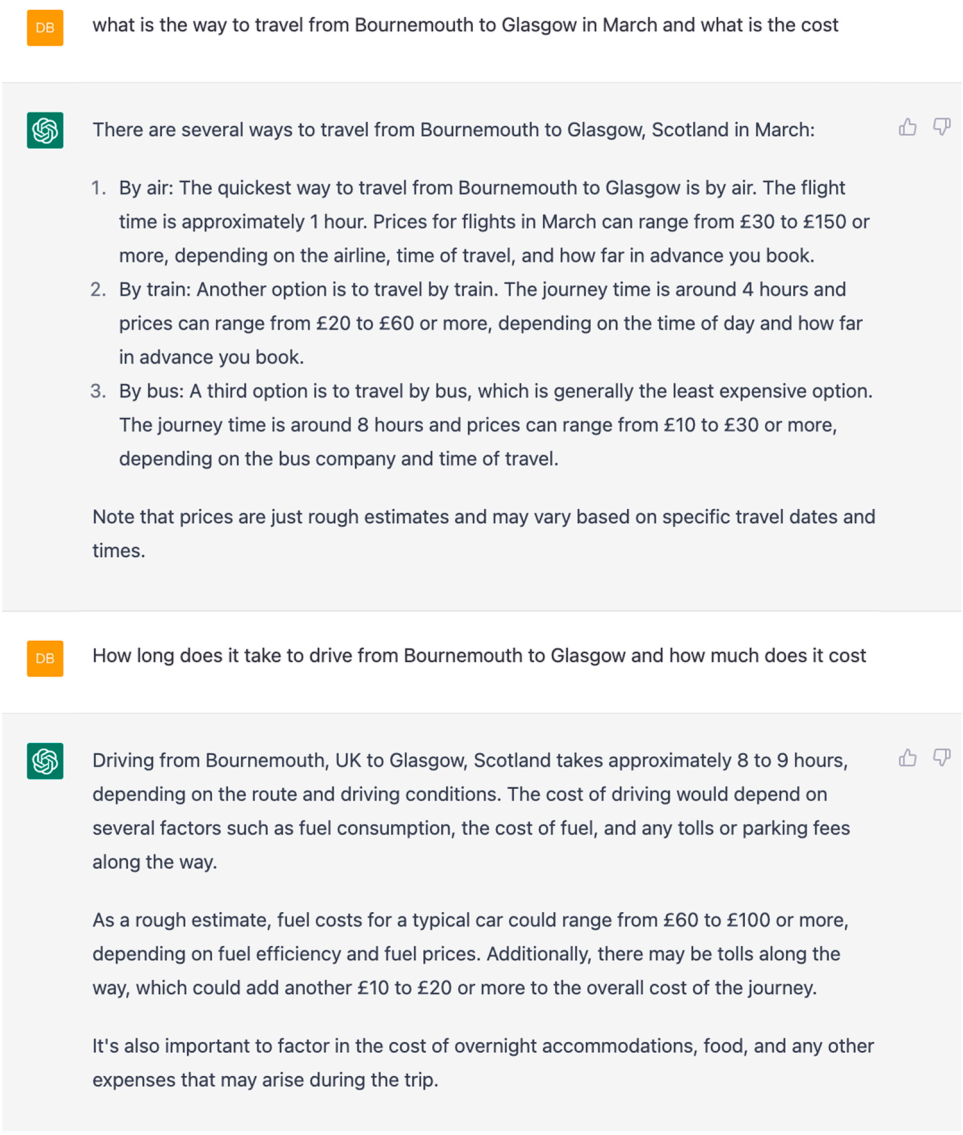

Fig. 5. ChatGPT output: evaluating travel itineraries.

Developing a literature review is one of many steps along the research process that will benefit greatly from generative AI. Analysis of the data including surfacing second-order patterns will certainly also benefit from this technology. The formulation of the discussion and conclusion are also ripe for AI utilization.

4.2.1.3. What's next?. Because the tools are evolving quickly, funded by well-resourced companies such as Google and Microsoft, their capabilities will continue to grow. The ethical guidelines for universities and journals also need to evolve along with the application of generative AI. Some journals have already provided guidance to their authors. For example, in response to authors listing ChatGPT as a contributing author (Kung et al., 2022), Nature has developed guiding principles to help authors with the use and attribution of generative AI text (Nature, 2023). In sum, generative AI does not qualify for authorship but the use of the technology should be documented in the methods section. Other than guidance about attribution, most journals have remained silent. One could imagine in the short term that all journals and conferences will provide guidance to authors on the correct (and incorrect) use of generative AI tools. This is inevitable. Using these tools will allow academics to focus more on the intellectual pursuits that need higher-order skills.

To conclude, we contend that academics must prepare for this new reality using novel classroom experiences and research experimentation, and IS scholars have an important role. Our work in this regard is critical because it can provide leadership for education and research across academic disciplines.

4.2.2. Contribution 17: ChatGPT: the new wave of AI tools in higher education– Siobhan O'Connor

The advent of AI has led to the rapid development of automated software tools such as chatbots. Although these originated in the 1960's with computer programs such as ELIZA (Weizenbaum, 1966), modern day chatbots leverage NLP and ML techniques to analyse and understand text and audio data, enabling them to interact with and respond more quickly and accurately to virtual conversations with human users (Brachten et al., 2021). AI chatbots can appear in many forms such as pop-up virtual assistants on websites, integrated into mobile applications via SMS, or as standalone audio-based devices that can be used at home. They are becoming popular in a range of sectors including higher

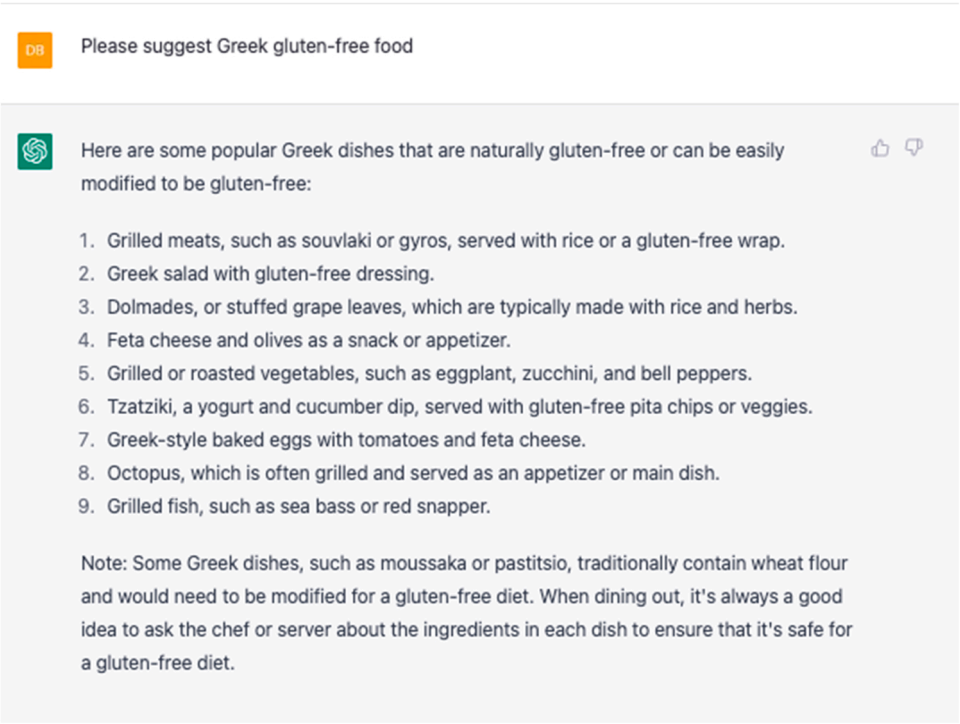

Fig. 6. ChatGPT output: menu creation for restaurants.

education where they are being developed and deployed to answer queries about the availability and accessibility of educational programmes and university services, to help students navigate e-learning resources, and to increase engagement with curricula and provide instant feedback, with a view to improve learning outcomes and the student experience (Okonkwo & Ade-Ibijola, 2021). If well designed and integrated with existing computer systems, AI chatbots may also reduce the workload of educators, administrators, and university management by supporting students which would enable them to focus more on pedagogical research, curriculum development, and innovation in higher education. Examples of commercially available chatbots used in some universities in the United States and United Kingdom include IBM's Watson (IBM, 2023) and Amazon's QnABot (Strahan & Gleason, 2019), while others are under development (EDUBOTS, 2022).

A new AI chatbot called ChatGPT, based on a large language model, was launched by a commercial company, OpenAI, in November 2022 as a follow up to a previously developed chatbot (OpenAI, 2023). It utilises reinforcement learning algorithms to optimise the language model with human feedback, having been originally trained using human AI trainers who generated a range of dialogue that was fine-tuned using supervised learning and ranked to develop a reward model. Reports indicate that the chatbot was trained on a large dataset (40 GB in size) from text on the Internet, equivalent to 133 million pages of text which would take a human being approximately 2200 years to read (Welsh, 2023). Although the inner workings of ChatGPT are not fully transparent, OpenAI do acknowledge some of the limitations of the chatbot and others are actively interacting and experimenting with it to identify more (Else, 2023). The implications of ChatGPT and other types of open AI platforms in higher education are hotly debated. Some argue they could be used to assimilate knowledge quickly which might benefit learning, but these platforms could also be used by students to write assessments and dissertations which raises plagiarism and academic integrity issues (Stokel-Walker, 2022). There could also be long-term repercussions if students choose to by-pass reading about a topic in-depth and critically analysing different facets of it, using ChatGPT for rapid and potentially superficial learning. This could stifle critical thinking, problem solving, and creativity which are key skills to develop as they are needed in many professional careers (O'Connor, 2023).

Similarly challenges with ChatGPT exist in relation to the conduct and reporting of pedagogical research. These types of AI tools could be utilised throughout the research process to pose hypotheses, design experiments, write manuscripts, and understand scientific results (Thorp, 2023), which could be beneficial in resource limited settings where funding and human expertise may be limited. Although this could accelerate educational research by letting automated tools perform many routine research tasks, the responses generated by this chatbot while well written are not guaranteed to be accurate, with some who have used the platform identifying problems with incomplete citations or citations to research studies that do not exist (Kendrick, 2023), highlighting some of the shortcomings of the large language model. While these may be solved in time as the AI model learns more about the nuances of human language and the sources of information on the Internet, the use of chatbots like ChatGPT in educational research poses other ethical issues. Trust and transparency could be challenging if chatbots are used to write scientific research studies (Lucy & Dowling, 2023), privacy and security may be another issue depending on the types of data entered into an open AI platform, as can the design and "persona" of the virtual conversational agent itself as it could unwittingly encourage inappropriate behaviour when interacting with researchers (Okonkwo & Ade-Ibijola, 2021). An example of this can be seen in Microsoft's Tay bot which began to post offensive content on social media when released on Twitter in 2016 (Reese, 2016).

Despite the complexities that ChatGPT presents in higher education, chatbots and other AI tools are becoming more widespread and established, requiring university educators, researchers, and management to adapt to this rapidly changing digital environment. Some solutions are already emerging, with global education software providers such as Turnitin (2023) and Cadmus (2023) developing AI detection capabilities in their existing electronic platforms to help identify content generated by AI tools. However, academic integrity has always been an issue in

higher education. Therefore, educating students about the benefits, limitations, and risks of chatbots and the value of developing a range of knowledge and skills is of upmost importance. More diverse forms of assessment may also be necessary to consider which could include the appropriate use of chatbots, as these tools are likely to be utilised in the future workplace which could enhance students' employability prospects (Centre for Teaching and Learning, 2023). As for pedagogical research, human creativity is needed now more than ever to explore how teaching, learning, and assessment can be enhanced by using ChatGPT and how best to employ AI tools in all aspects of the research process. A human-AI collaboration in higher education is now a foreseeable future. Hence, more funding along with policy changes are also needed to ensure we can develop, test, and apply these sophisticated computational tools to further student learning.

4.2.3. Contribution 18: ChatGPT: the digital transformation of academia is underway - Sven Laumer

At the International Conference on Information Systems in Copenhagen I started to engage in discussions with colleagues about the capabilities of ChatGPT and its impact on academia. Shortly before I already utilised it for various purposes, such as composing a poem for my digital transformation students and referencing it in my knowledge management class. Upon returning home from the conference, I took advantage of the holiday season to experiment with the tool. As a result, I was able to use ChatGPT to draft a brief paper on the responsibilities of IT professionals in promoting sustainability. Based on that experience and my discussions, I wanted to write my comment for this editorial. However, I always had to postpone it because some new examples of the power of ChatGPT emerged or new posts on why ChatGPT is the end of humankind or at least academia were published.

From an academic viewpoint, it has been demonstrated, among others, that ChatGPT can pass MBA exams at a business school and write or debug code, indicating the end of traditional programming methods. It is also expected to revolutionise the way we search for information and produce academic texts that were previously written by students or academics (Else, 2023).

With ChatGPT having demonstrated its ability to write text, making it a useful tool for students and academics, a debate has begun in academia about whether AI, specifically ChatGPT, should be banned from academic use. Some universities have implemented policies prohibiting AI in college essays and requiring students to declare that they have not used AI in their theses. Others have emphasised the opportunities for schools and university. To gain a deeper understanding of this debate, I collaborated with one of my Ph.D. students, Sebastian Schötteler, to conduct a sentiment and topic analysis of Twitter tweets about ChatGPT in academia.[15] Our analysis revealed 1490 tweets with a negative sentiment, indicating a high level of user resistance. The topics covered included plagiarism by students and academics, fake text and studies, fake content, cheating, and legal implications.

The current debate around ChatGPT in academia is reminiscent of the reactions that have been studied for years under the term "user resistance". This type of research has been conducted to better understand why individuals are hesitant towards technology and to help organisations promote its adoption. It has been concluded that user resistance is largely driven by the changes that new IT introduces to individuals' work systems (Laumer et al., 2016). The debate surrounding ChatGPT in academia follows a similar pattern, as it is triggering a transformation in academic work systems, much like other technologies have done in other fields that have been studied for user resistance (e.g., taxi drivers' resistance to UBER).

Despite the current resistance to ChatGPT in academia, it is crucial that we acknowledge its increasing availability and use by individuals. The digital transformation of academia has already begun, and as history has shown us, resistance to change is common in any industry undergoing a technological shift. However, I believe it is essential for us to embrace this change and use ChatGPT to stimulate a discussion about the fundamental principles of academia. Our community has previously advised and researched other industries during their digital transformations, emphasizing the importance of staying competitive and focusing on core competencies. Now, it is our turn to do the same. By taking advantage of ChatGPT, we can reevaluate our own practices and impacts for societies.

My experience with ChatGPT while writing a short paper has taught me a valuable lesson. The tool demonstrated better English writing skills than I possess as a non-native speaker. It effectively brought together arguments to discuss the role of IT professionals in promoting sustainability. However, it was only able to write the text based on text it was trained on and did not have the capability to conduct research or perform a literature analysis. Nevertheless, I would expect that this will be one of the first capabilities of similar tools in the future.

This experience highlights several important aspects. Firstly, it requires human intelligence to formulate interesting questions. Secondly, ChatGPT can only provide answers based on previously documented knowledge used for its training. Thirdly, it requires human intelligence to generate the knowledge that can be used to train ChatGPT. And finally, conducting research still requires human intelligence as ChatGPT is not capable of doing so yet.

This shift in focus from text writing to doing research highlights the evolution of academic work. It's important to note that writing text may no longer be a crucial component of scholarly work, as this task can be supported more efficiently by tools like ChatGPT. Text serves as a means to communicate the results of our research in a clear and accessible manner. Many scholars, including myself, have already used tools like Grammarly, spell checks, and professional proofreading to enhance their writing as English is not their native language. With the advent of ChatGPT, research and its dissemination can now transcend language barriers. Superior writing skills in English are no longer the determining factor in reaching a broad audience with our research findings.

ChatGPT allows us to focus on what truly matters in academia - asking thought-provoking questions and conducting research to find answers. The emphasis shifts from the writing that summarises our findings to the findings themselves. This shift represents a disruptive transformation in academia, as text has been a significant medium for scholarly work for many decades.

This triggers my concerns regarding the debate surrounding AI ban policies in academic institutions and journals, particularly with regards to college essays and essay writing in general. I do not comment on the consequences when considering AI as research method (e.g., pattern recognition in data). I hold a similar viewpoint as I have stated previously regarding the use of AI in research. Writing text may not be the most essential skill that we should prioritise in evaluating our students' intellectual abilities. The use of spell and grammar correction tools in word processing software, such as Microsoft Word, is already widely accepted. Banning AI in essay writing would also disallow tools that help people improve their writing, such as Grammarly or DeepL. Interestingly, the ACM SIGCHI has included a Grammarly license in its membership benefits, encouraging researchers to utilise AI in their writing. This highlights the inconsistent approach academic institutions take towards the use of AI. When it comes to college essays, it's more crucial that we teach our students to ask important questions and find ways to answer them. This is the intellectual core that will benefit both the students and society. Therefore, we should place a greater emphasis on teaching critical thinking skills and how to add value beyond AI. It's also important to educate our students on the impact of tools like ChatGPT and similar algorithms on business and society, so they are prepared to live and work in a world where algorithms are increasingly present. This shift requires a significant transformation in our teaching methods as

[15] query = '("chatgpt" AND "academia") OR ("chatgpt" AND "publications") OR ("chatgpt" AND "research") OR ("chatgpt" AND "plagiarism") since:2022–01–19 until:2023–01–19'; replies and retweets were excluded

well.

In conclusion, over the past two months, I have devoted a significant amount of time to studying and reflecting on the impact of ChatGPT on academia. The resistance to this technology that I've observed aligns with the user resistance to IT that has been documented for decades, and it is a clear indication that a digital transformation of academia is underway. This transformation will bring a shift in the significance of text as a medium in research and education, putting the focus back on the core elements of academia: the ability to ask meaningful questions and find answers in a world dominated by algorithms.

PS: A first draft of this text was written by myself, I used Sebastian's input to revise it and finally ChatGPT to optimize the English itself. The thoughts discussed are based on human intelligence, but the text itself is co-authored by ChatGPT.

4.2.4. Contribution 19: how to enhance critical thinking of students, educators and researchers in the ChatGPT era - Giampaolo Viglia

In my career, I have always encouraged critical thinking at university. In fact, memorization is often short-lived and less useful in real life (Aldhafri et al., 2015). For this very reason, the presence of essays allows students to express their ideas and form their opinions in a thorough way.

The advent of ChatGPT - if used in a compulsive way - poses a threat both for students and for teachers. For students, who are already suffering from a lower attention span (Trinidad, 2020) and a significant reduction in book reading intake (O'Connor, 2021), the risk is going into a lethargic mode. For teachers, the ability to think critically is a prerequisite for teaching critical thinking. Only by being very prepared on the topic with the right training, teachers might be able to disentangle the work of a student from the work of an AI bot.

There is a plethora of work showing how students cheat (for a review, see Zhao et al., 2022). However, in my work as an Editor, I have noticed that authors – who also serve as instructors at their own institution – often show similar malicious behaviour, i.e., plagiarism or milder forms, such as paraphrasing entire paragraphs. Additionally, despite being strict with students when it comes to deadlines, they often come up themselves with unreasonable requests for extensions when it comes to submitting a revised manuscript.

For the reasons above, students, educators and researchers should realise that we are in this quantum leap technological change together. It is not time to increase rules and enforcements. It is time to use this advancement to facilitate learning and knowledge, thus stressing the value of independent thinking. I venture to suggest that independent thinking is what makes us being better humans. The race is long, and the ultimate goal is not coming up with a better grade in an essay but to improve our own wellbeing as people. If ChatGBT does everything or many things for students and professors, it may also kill creativity and critical thinking.

4.2.5. Contribution 20: ChatGPT and education – is a symbiotic relationship possible? - Ramakrishnan Raman, Gareth H. Davies and Abbas Mardani

ChatGPT (Generative Pre-trained Transformer) is trained on a massive amount of data and can be fine-tuned for various NLP tasks, including language translation, question answering, and text summarization. Deep learning methods are used by Open AI's ChatGPT, a big language model that produces text that resembles human speech. The Transformer architecture, which was introduced in the paper "Attention Is All You Need" by Vaswani et al., serves as the model's foundation (2017). The model is able to comprehend the context and meaning of the text better thanks to this architecture's usage of self-attention processes to weigh the significance of various words in a phrase. The model can be fine-tuned for various NLP tasks after being pre-trained on a vast amount of text data. The pre-training enables the model to pick up on common language characteristics and patterns, enhancing its ability to handle new jobs with less fine-tuning.

There are several studies and papers that have investigated the use of AI models in providing personalised support to students, automating administrative tasks, and supporting language learners. One area where AI has been applied in education is in providing personalised feedback for writing assignments. For example, a study by Chen et al. (2018) used a neural network model to analyse student essays and provide feedback on grammar and organisation. In terms of automating administrative tasks, AI models have been used to grade assessments, such as multiple-choice tests. For example, a study by Attali and McNamara (2006) used AI to grade essays and found that the model performed as well as human graders. Another study by Burstein (2003) used a ML algorithm to grade short answers and found that it had a high level of agreement with human graders.AI models have also been used to support language learners, particularly in the context of machine translation and NLP. For example, a study by Huang et al. (2018) used neural machine translation to support English language learners in a classroom setting. Another study by Kim et al. (2019) used ML algorithms to provide personalised feedback on grammar and vocabulary for second language learners. In general, these studies and others like them suggest that AI models have the potential to provide personalised support, automate administrative tasks and support language learners effectively. It is important to notice that the effectiveness of these models may depend on the specific task, the dataset and the quality of the training data.

ChatGPT has been used for a variety of NLP tasks, including language translation, question answering, and text summarization. It has also been used in the field of education to support and enhance the learning experience for students. ChatGPT can be used to provide personalised support to students, automate administrative tasks, support language learners, and enhance online education.

However, it is important to remember that the use of ChatGPT and other AI models in education should be done with caution. The ethical and societal implications of the use of such automated tools must be considered before accepting the tools as an assistant for the student in their learning process. There is no transparency in how the model is functioning to generate the results. Hence it has to be considered as a black box AI tool which gives some information for questions that are posed to it. There is no assurance on the correctness of the information given by ChatGPT. Hence allowing students to use it for learning, without proper statuary warning, might cause more harm than good.

4.2.5.1. Opportunities. ChatGPT can be utilised in the educational setting to help and improve students' learning opportunities. There are some potential opportunities for using ChatGPT in education. Some of these include:

Basic Educational Material: ChatGPT can be used to provide basic educational materials, which otherwise is created by searching the internet.

Personalised feedback: ChatGPT can be used to provide personalised feedback on writing assignments, such as essays and research papers. The model can analyse student writing and provide feedback on grammar, organisation, and content.

Automating administrative tasks: ChatGPT can be used to automate administrative tasks such as grading assessments and answering frequently asked basic questions. I can help to free up teachers' time to focus on other aspects of teaching and research.

Language learning support: ChatGPT can be used to support language learners by providing personalised feedback on grammar and vocabulary, and by assisting with language translation in a classroom setting. It can support language learners by giving them extra practice and feedback on their language abilities

Enhancing online education: ChatGPT can be used to enhance online education. It can be used to improve online learning by giving students more tools and resources, as well as by making the learning experiences more interesting and participatory

Individualised Support: ChatGPT can be used to provide one-on-one tutoring for students, by answering questions and providing explanations on various subjects. It may determine the student's comprehension level and offer explanations and tasks that are suitable for them.

The use of AI and NLP models like ChatGPT in education is still a growing field, and there might be other opportunities to be discovered as the technology and the understanding of its capabilities evolve.

4.2.5.2. Challenges. Despite the potential benefits, there are concerns and challenges that need to be addressed when using ChatGPT in education. One of the main challenges is ensuring that the model is providing accurate and appropriate information to students. Additionally, there are concerns about the ethical and societal implications of using AI in education, such as the impact on jobs, privacy, and bias. The challenges for ChatGPT in education include:

Data quality and bias: ChatGPT is trained on a large dataset of text, and any biases or inaccuracies in the data can be reflected in the model's output. For the model to provide accurate and unbiased feedback, it is imperative to use a high-quality dataset that is representative of the question being posed to it.

Interpreting and understanding the model's output: ChatGPT's output is generated based on patterns in the data it was trained on, and it is a challenge to understand how the model arrived at its output. There is no transparency to the mechanism involved in generation of results. This can make it challenging to understand the model's feedback and decide if it is accurate and relevant.

Privacy and security: ChatGPT has access to sensitive student data, such as writing assignments, and it is important to ensure that this data is protected and used in compliance with applicable privacy laws. Another issue is that the ChatGPT could be used to cheat on exams or assignments, either by providing answers to test questions or by generating plagiarised content. Additionally, the model could be used to impersonate students or teachers, or to spread misinformation or disinformation.

Limited explanation capability: ChatGPT can generate human-like text but it doesn't have the understanding or the reasoning behind its output, this can lead to difficulties in understanding the reasoning behind the generated text and the level of confidence of the model in its output.

Human-computer interaction: ChatGPT is not a human, it may not be able to understand the nuances or the context of certain situations, this can lead to difficulties in understanding the student's problems and providing relevant solutions.

Ethical concerns: The use of AI models in education raises ethical concerns, such as the possibility of replacing human teachers and the potential impact on marginalised groups. It is important to consider these concerns and to develop appropriate guidelines and policies for the use of ChatGPT in education.

Overall, ChatGPT has the potential to support and enhance education in various ways, but it is important to consider the ethical and societal implications of using AI in education and to ensure that the model is providing accurate and appropriate information to students.

4.2.5.3. Research questions.

1. How can CHATGPT be used to improve student engagement in online and Offline learning environments?
2. What are the potential benefits and drawbacks of using ChatGPT for automated grading?
3. How can ChatGPT be used to support students with diverse learning needs, such as specific language learners or students with disabilities?
4. How can the personalise learning support and individualised feedback to students given by ChatGPT be evaluated?
5. How does the performance of ChatGPT compare to human teachers in providing explanations and answering questions on educational content?
6. What are the ethical considerations and potential biases in using CHAT GPT in education?
7. How can ChatGPT be used to create interactive educational games and simulations?
8. How can ChatGPT be used to support collaborative learning and peer-to-peer interactions among students and teachers?
9. What are the implications of using ChatGPT for teaching and assessment in higher education?
10. How can the performance and effectiveness of ChatGPT be evaluated and improved in educational settings?
11. What are the policy measures what have to be included in the higher education, which ensure the ethical use of ChatGPT?
12. How can ChatGPT be integrated into existing curriculum to improve student engagement and motivation?
13. Can ChatGPT be used to personalize learning for students with different learning styles?
14. How does the use of ChatGPT in education compare to traditional teaching methods in terms of effectiveness and efficiency?
15. Can ChatGPT be used to assist students in self-directed learning and research?

4.2.6. Contribution 21

4.2.6.1. ChatGPT in the context of education: how to deal with its disruptive effects? - Yves Barlette. OpenAI's ChatGPT was released in November 2022 and caused a lot of buzz for its ground-breaking approach to AI-generated content, managing to produce complex original texts according to the user's question. Concerns were immediately raised about the impact on education. Our students were already used to relying on AI tools to help them in their research or even to cheat on their assessments, homework, essays, master theses, etc. Now, with a much more powerful tool, we can expect increased use of AI-generated texts. ChatGPT has received intense mediatisation, and if some students are still unfamiliar with how to adopt ChatGPT, Microsoft plans to integrate it into Word, PowerPoint, and Outlook will certainly boost it. In addition, other competing solutions exist, and others are being created, such as Google Sparrow, illustrating the strategic importance of such tools for software companies. As a result, faculties are currently facing a tidal wave and are unprepared to deal with its impacts, both in terms of pedagogy and internal policies. Considering this context, we ask what are the current impacts of tools like ChatGPT in the context of education and what can be done to address the use of such tools? Also, should we fight ChatGPT, or should we capitalise on it?

To answer these questions, we first examine the possibilities and

weaknesses associated with ChatGPT. Then we will determine the possibilities of detecting and monitoring its use to prevent fraudulent authorship. Finally, we will examine a few possibilities to capitalise on the use of ChatGPT and identify avenues for future research.

4.2.6.2. Possibilities and weaknesses of ChatGPT. ChatGPT can create essays, arguments, and outlines based on variables defined by the user (e.g., text length, specific topics or scenarios, etc.). For example, ChatGPT can write college admission essays in less than 10 min (Whitford, 2022), and Terwiesch (2023) showed it could even achieve the required coursework for being awarded a Wharton MBA. It can also summarise concepts, historical events, and pieces of text. Moreover, it can add its own details and embellishments, add transitional phrases, fix grammatical errors, and propose higher-level vocabulary and quotes or facts to back up claims. In terms of pedagogy, ChatGPT can provide personalised assistance or tutoring for students who are struggling with some concepts. It can also help teachers create questions for assessments, and based on objectives and other parameters, it can assist with building lesson plans or developing curriculum.

However, we must keep in mind that ChatGPT is "not an entity at all, but rather a complex algorithm generating meaningful sentences" (Mollick, 2022, p.5). As a result, this tool suffers from several limitations; the first one is that ChatGPT has learned everything it is in its database before 2021 and cannot, for the time being, search the internet to fill in information gaps. If ChatGPT's writing is clean, grammatically correct and well structured, it is often too vague and flat, and texts lack heart and soul (Whitford, 2022). In addition, several students with the same inquiries may obtain very similar results. More worryingly, AI is very good at creating "convincing-sounding nonsense, devoid of truth" (Mollick, 2022, p.5). For example, ChatGPT struggles with confusingly worded questions, which can lead to incorrect answers. This kind of conversational agent (CA) offers minimum transparency and often operates as "black box" because it is not able to reveal its underlying decision-making processes (Chandra et al., 2022). Hence, ChatGPT does not explain what it does or how it does it, making the final results inexplicable, and does not list its sources (Bass, 2022) or provide references that support its assertions. For example, language models such as ChatGPT have learnt that humans often support claims with a quote, and the software mimics this behaviour but lacks the benefit of human understanding of ethics and attribution (Bass, 2022). As a result, quotes may be assigned to the wrong author or may even be created from scratch by the AI itself. Therefore, we can question the reliability and credibility of the produced text.

4.2.6.3. Detecting and monitoring the use of ChatGPT and punishing fraudulent use. Being able to identify a work based on or fully created by ChatGPT is important for several reasons. The first one is that such usage can be detrimental to students. It can endanger students' willingness to develop skills like writing and researching, and, above all, a blind usage of ChatGPT does not build critical thinking and problem-solving skills, which are essential for academic and lifelong success.

While ChatGPT can help a student create texts, it can become a fraud when a text is primarily created by ChatGPT and presented as the student's work. However, institutions are not prepared (1) to detect and (2) to punish fraud with ChatGPT. There are no legally valid detection solutions available yet, and for some institutions, internal rules do not take into account fraud based on AI-generated content. Plagiarism-detection tools are becoming obsolete as AI-generated content enhances originality, and therefore cannot be detected as plagiarism. Plagiarism-detection companies are struggling to address this shortcoming, which is a source of inequity between students who are penalised for plagiarism and those who remain undetected. Other actors, such as Microsoft or Google, and even OpenAI, the creator of ChatGPT are working on ways to identify texts generated by the bot. Recently, a student at Princeton University has built an app, GPTZero, to detect such contents, based essentially on the degree of randomness of the text and its burstiness, to gauge whether the writing is complex and varied, as human writing can be (Svrluga, 2023). However, there is a risk of false negatives and false positives; for example, a student may have a particular writing style that resembles AI-generated text. It is therefore, important to find legally acceptable solutions, especially when it comes to punishing or even expelling students who cheat. In addition, internal rules should emphasise that any form of cheating related to content generated by AIs or chatbots is unethical and specify situations leading to punishment. Some institutions already reacted; for example, New York City schools banned access to ChatGPT (Rosenzweig-Ziff, 2023).

4.2.6.4. Prohibit or take advantage of ChatGPT?. The first precaution to protect education from ChatGPT could be to ban it and favour handwritten work instead, which is important for students to acquire writing skills. It is also possible to have students work on computers that are not connected to the Internet, even through a smartphone. However, it seems very difficult to ban the use of ChatGPT, since students can use devices both inside and outside the classrooms. Some experts argue that restricting the technology is short-sighted because students will find ways to use the bot regardless of whether it continues to grow in popularity (Rosenzweig-Ziff, 2023). Moreover, Chatbots and CA such as ChatGPT have the potential to create inclusive learning environments for impaired students (such as lack of resources, disabilities, or learning disorders), with diverse living environments (commuters, family responsibilities, or non-native) and with diverse learning styles (visual, kinaesthetic, or auditory learning) (Gupta & Chen, 2022). It therefore seems more reasonable to adopt the technology, albeit with some adaptations: "If the things that we used to put so much effort into in teaching can be automated, then maybe we should rethink what the actual goals and experiences are that we should work toward in the classroom" (Rosenzweig-Ziff, 2023).

Here are some ideas on how to tackle cheating and capitalise on ChatGPT. First, teachers could ask students to write a traditional essay, then have a brief in-class oral interview with each student asking them to explain the content of the essay, without them seeing it. However, if oral exam answers cannot be generated with AI, oral exams can be very time consuming when teachers are managing classes that contain large numbers of students. Hence, teachers could refine their essay questions to require more complex thought, draw on local and current information that would not be widely available (Svrluga, 2023), require students to make connections between the knowledge and their own experiences, or apply a concept to a unique situation in their writing. Another possibility is to add a self-assessment step to the writing process where students reflect and evaluate their own performance. In addition to content, alternative formats encourage a more authentic assessment: podcast production, peer feedback, debates, interviews are effective alternatives to traditional essays. Asking students to rate and comment on a ChatGPT's answer to a question or to compare a ChatGPT-generated research paper with the original version is also a good way to develop critical thinking skills. ChatGPT can be considered an excellent source of ideas and inspiration to give students a place to start. It can also make information available at students' fingertips, encouraging them to conduct research and double-check their facts. Finally, ChatGPT offers the possibility of human-machine hybrid work. Instead of prompting an AI and hoping for a good result, humans can now guide AIs and correct mistakes. Hence, new kinds of collaboration become possible (Mollick, 2022). To conclude with the advantages of using ChatGPT, teaching students to work with AI and chatbots will prepare them for their future. Teachers can show them appropriate use and ways to leverage the tools for better outcomes.

4.2.6.5. Research agenda. At the school level, faculty members could openly update their curricula to accommodate such technologies in the classroom and use ChatGPT as a co-teacher. However, many schools and

curricula are structured so that teachers do not know how to introduce these advanced and innovative technologies (); hence future studies could find ways or even processes to facilitate this introduction. To address one of the limitations discussed at the beginning of our work, Chandra et al. (2022) highlight the need to build conversational agents (CAs) with not only an "artificial brain" but also an "artificial heart". People perceive a chatbot with higher conversational skills to be both more humanlike and more engaging than a less skilled one (Schuetzler et al., 2020). However, Seeger et al. (2021) showed that designing more anthropomorphic CAs is not trivial. Diederich et al. (2022) conducted a literature review to analyse CA and propose a research agenda to move CA research forward regarding user interaction, context, agent design, as well as CA perceptions and outcomes.

4.2.6.6. Conclusion. The development of AI and automation will threaten an increasing number of jobs (Agrawal et al., 2022; Dwivedi et al., 2021b) and rather than fighting them, the question is rather how we will adapt to these disruptive changes: "The technology is developing very rapidly, possibly exponentially. But people are linear. When linear people are faced with exponential change, they're not going to be able to adapt to that very easily" Kahneman says (as cited in Adams, 2021). We have examined the great impacts of tools like ChatGPT in the context of education and identified some ways to address these implications and capitalise on these tools. Most importantly, we need to teach students how to work with AI and chatbots and prepare them for their future.

4.2.7. Contribution 22

4.2.7.1. The Use of ChatGPT in educational institutions: challenges, opportunities and future scope – Nripendra P Rana, Jeretta Horn Nord, Hanaa Albanna and Carlos Flavian. OpenAI's ChatGPT (Chat Generative Pre-Trained Transformer) has gained an impressive amount of attention and wide discussion across both academia and industries since its launching on November 30, 2022 (Guo et al., 2023). It is a transformative technology as it is trained to learn what humans mean when they pose a question to it. Many users are awed by it's astounding human like ability to chat, answer questions, produce content, compose essays, create AI art prompts, explain art in great detail, script code and debug, take tests, manipulate data, and explain and instruct. This disruptive technology may very well change the way individuals interact with computers as well as their method for information retrieval (Montti, 2022; Ortiz, 2023a, 2023b). In other words, it is a revolutionary AI chatbot technology that makes use of ML and NLP techniques to allow users to chat with a virtual assistant. It can provide a response for almost all tasks using written text. The usage of this application is currently open to the public for free as it is currently under the research and feedback gathering stage (Ortiz, 2023a, 2023b). ChatGPT is a large language model. These models are trained with a very large dataset of conversational text such as chat logs, forums and social media posts to precisely forecast what word comes next in a given sentence which allows it to engage with the users in more realistic natural dialogues (Montti, 2022; Qadir, 2022). The popularity of this technology can be imagined by the tweet from Open AI's chief Sam Altman who noted that ChatGPT attracted more than one million users in the first five days after its launch.

Despite its impressive conversational abilities, this technology has some limitations as well. For example, it is unable to answer questions that are worded in a particular way requiring the user to reword the question in order for ChatGPT to understand it. An even bigger concern is its lack of quality in the responses it provides to questions that seem to be plausible-sounding but hardly make any realistic sense. Finally, it responds to ambiguous questions just by taking a guess rather than asking for any further clarifications, which results in undesirable responses to such questions (Ortiz, 2023a, 2023b). The key reason for ChatGPT to generate prejudiced or even incorrect results is largely due to lack of training data and biases in it that can reflect negatively on the model results (Yang, 2022).

The increasing development of ChatGPT is significantly reshaping the education market and hence raising concerns about what and how to teach the next generations (Zhai, 2022). People are concerned that ChatGPT might replace human intelligence. For example, this technology can be used to efficiently write an article or essay within a few seconds potentially abolishing the need for human intervention (Ortiz, 2023a, 2023b). Others in education fear whether students will learn to effectively write as they will bank on ChatGPT to do this without putting in any effort. But experts feel that the essays generated by ChatGPT can be identified apart from those written by human intelligence due to a few basic flaws of such articles produced by the bot. A report on such essays produced by ChatGPT found that the composed articles were superficial and lacked the proper referencing. Other reports indicated that such articles included erroneous information and were unable to provide a convincing perspective for the readers. The authors tested ChatGPT's ability by giving it a complicated essay question that was asked to Honors Psychology students and found that the bot produced no more than a grade of B- or C+ . ChatGPT could not distinguish the 'classic' article in the field that is being cited by any other article and also kept referring to the same sources over and over again (Hirsh-Pasek and Blinkoff, 2023). This clearly indicates that ChatGPT can demonstrate its intelligence to a certain extent to write the essays and manage to get a passing grade but the writing style and presented content may easily be differentiated from human written content. Hence, there is a need to train instructors to catch such caveats and assess the work accordingly.

Rather than presenting the entire work generated by ChatGPT in response to assignments given by educational institutions, it can rather be used as a tool for intellectual intensification rather than as a tool of plagiarism. Considering the fear of this technology in education, the New York City Department of Education banned the use of ChatGPT on January 3, 2023 across all department devices and networks (Hirsh-Pasek and Blinkoff, 2023). Banning such technology is not the solution for any academic institutions as students can still use it in their own network and devices. Rather than considering this as a hindrance to the students' intellectual development, the instructors should use it as a tool of assistance. The application of ChatGPT and its constructive use to help students complete their assignments should be taught at educational institutions so that the culture of learning from an advanced AI tool such as this can be used in the right way by students rather than making its use as a medium of complete dependence and plagiarism. These tools can provide answers to the questions quickly but they should never be considered as a substitute for critical thinking and problem-solving skills.

The support provided by this technology can rather be considered as an opportunity for students to build further, which would be essential for their academic and life-long success. University instructors can use this tool to teach students how ChatGPT can help them generate concepts and structure for their writing assignments, practice their language skills (e.g., translating the native language into the target language), identify appropriate sources and generate a list of potential research topics, etc. (Qadir, 2022). In essence, teaching students how to use this tool to supplement their research and writing efforts in university education is an opportunity they should be taught. Students should also understand that ChatGPT's generated text or ideas presented as their own can lead to plagiarism and hence they should only be considered informational and as part of the research process when creating papers or completing other required assignments.

Moreover, as this bot is not connected to the Internet and heavily reliant on its data and algorithms, the output of this tool may be misleading or incorrect if the data and algorithms are inaccurate. So the students should always verify the answer that they receive from the bot and check other sources before considering it as a valid response for their questions or assignments. Educational institutions should also have

a clear policy for the extent of use of these tools and to ensure that student data is properly protected from the huge cybersecurity risk (Ortiz, 2023a, 2023b). Academic institutions should make a careful evaluation of required educational tasks and reform them to cultivate students' unique skills that are beyond the capabilities of ChatGPT. As ChatGPT still needs to be trained more to cater to the needs of its role to accurately answer the subject domain's specific questions, integrating this technology to subject learning tasks is critical and warrants further research (Zhai, 2022). Educators need to consider the adjustments to their educational learning outcomes and evaluation criteria to clearly understand the role of technology and students' cognitive skills that they learnt by integrating their knowledge with the effective use of this tool to solve real-world problems. There is arguably considerable agreement that a student in higher education should be openly encouraged to use ChatGPT to create the first draft of their answer or assignment in consultation with their instructor. At this point, their abilities could be assessed to the extent that they would be able to apply critical thinking and problem-solving skills to improve the essay to meet the exact expectations of the set criteria for that assessment (Hirsh-Pasek and Blinkoff, 2023).

Based on the above discussion, it is clear that ChatGPT and other AI tools provide enormous opportunities for students and instructors in higher education. The immense potential of AI tools have opened up massive opportunities for research in this area in order to fully understand the potential of this technology as a method of enhancing the efficiency of teaching and learning while branding the future of the current and upcoming generations. If we want our students to learn how to solve real time problems, we need to come out of the traditional teaching model of simply delivering the one-way theoretical knowledge to students and go beyond that to make tools like ChatGPT a friend in the classroom ecosystem that is not something to fear. It should rather be used to encourage such technology as a medium for transforming practical education. Further, it could be of great help to students as they acquire life learning skills and use them in their future careers to solve actual problems at their workplaces.

Considering the massive potential of this chatbot, it can be effectively used as a potential topic in higher education research in general and business education in particular. At the primitive level, future researchers could explore where this technology falls short in providing accurate information and results. Future researchers can perform literature exploration and a review of information relating to the performance of ChatGPT and compose guidance papers on how to effectively use this technology and where to take caution, avoid over reliance, lack of originality and plagiarism. Future research should also work around developing models and validating them with relevant data on how to assess this technology's effectiveness, performance, and intentions for use by relevant stakeholders. Future researchers could further explore both positive (e.g., engagement, attention, attitude, playfulness, hedonic and utilitarian motivation, excitement, willingness to us, etc.) as well as the dark side (e.g., threat, risk, invasion of security and privacy, escapism, distraction, response delay, irrelevant information, functional failure, etc.) of the use of ChatGPT. In addition, this technology's capability to automatically assess student grades while providing relevant feedback and helping instructors periodically monitor students' progress should be explored. Moreover, ChatGPT's ability to generate text in multiple languages can also help researchers undertake research on assessing students' learning effectiveness and performance subjects in their own native language.

4.2.8. Contribution 23

4.2.8.1. Disrupting higher education and human communication by Language models - Marijn Janssen. Natural Language models, like ChatGPT, are being used more and more due to their impressive performance. ChatGPT stands for *Generative* Pre-Trained Transformer and is developed by OpenAI is a large, pre-trained language model that has gained immense popularity and might be disruptive (Haque et al., 2022). Language models need to invest significant resources into curating and documenting large language model training data with high costs and estimated CO2 emissions. There has been an increasing size of LMs in terms of the number of parameters and size of training data (Bender et al., 2021). Such tools can be used for a variety of applications, such as searching with higher precisions, writing software codes, answering customer inquiries, and creating legal documents. ChatGPT might disrupt the search engine market, and reshape the higher education landscape.

ChatGPT can be helpful in several ways, but it comes with substantial disadvantages, like most new technologies. ChatGPT outcomes are probabilistic. Language model refers to systems that are pre-trained on huge amounts of text to predict the likelihood of a token (which can be a character, word or string) given either the previous context or its context (Bender et al., 2021; Bender & Koller, 2020). ChatGPT can be viewed as a "*Stochastic Parrot*" (Bender et al., 2021). Whereas mathematics results in deterministic outcomes, this type of IA generates the most likely outcome, and this can therefore differ per time. This is not based on logic or reasoning but is calculated based on the probability of the outcomes. Furthermore, this can result in framing bias by telling users what it 'thinks' they want to hear. The mix of human biases and seemingly coherent language heightens the potential for automation bias, deliberate misuse, and amplification of a hegemonic worldview (Bender et al., 2021).

ChatGPT is just the beginning and will likely be followed by other specialised and more advanced tools. We should neither try to ban ChatGPT nor embrace the technology indiscriminately. Like any technology progress, critically appropriate is needed, and experimenting to find ways to take advantage of new technology without having its disadvantages. These kinds of AI tools will likely transform our way of working and, after a while, become common and institutionalised in our daily life. The question is how technology will evolve and how humans and society will adapt (Agrawal et al., 2022).

4.2.8.1.1. Use of ChatGPT in education. ChatGPT and other language model tools can be used to increase productivity and free the scares number of code developers and report writers. ChatGPT can be used by students to create a report for their course or even to provide answers to an exam. PLanguage models can be used to create AI-assisted work, which raises questions if students did their work solely on their own and how ChatGPT should be acknowledged in their work. ChatGPT has officially made its scientific debut with at least four co-author credits (Stokel-Walker, 2023). However, including such tools as authors is discussable, as authors take on legal responsibility for their work and need to give their consent. Only people can be held accountable. Instead, the use of such tools should be explained as part of the research methods, like we refer to Wikipedia and mention the use of tools like Envivo or Atlas.ti.

Language models will change our way of education. On the one hand, the risk is that students' independent thinking and language expression skills might deteriorate and not be practiced by using ChatGPT. The first question is if these skills are still needed, and if positively answered, new ways of developing and practicing these skills need to be developed. On the other hand, students need to develop skills to scrutinise the generated text and code and be critical towards the outcomes. They need to develop skills to investigate whether the information is factual and develop their critical attitude toward the generated text. The use of language models should be explained in their research method to ensure accountability by the authors. Furthermore, the outcomes should be validated and triangulated with other sources of evidence. Although students have been fast in adopting ChatGPT, also lecturers have embraced them. Some courses already provide AI-generated outcomes and ask their students to evaluate and reflect on this. Other courses encourage the use of ChatGPT or other language models in their assignment and ask the students to explain how they

made use of this.

Nevertheless, traditional education remains. Teachers even are not able to recognise reports generated by ChatGPT (O'Connor, 2022). As language model tools are not able to understand what they actually do and if the outcomes make sense, there is a close relationship with misinformation. Language model tools have no real understanding of what they are generating, and they state both facts and falsehoods with the same high level of confidence. The way of providing answers, by providing easy-to-read stories rather than links to resources on the web, might reinforce the *filter bubble*. The latter refers to the risks of showing only certain information putting users in a "bubble" without showing other and diverse viewpoints (Pariser, 2011). That makes it easier for people, because they do not have to gather information from different sites. But, how do you know the information is correct? not biased? Not reflecting a certain worldview? There will still the issues of correctness, bias, criticism and norms. Cultures have different norms, and people can have different views on a situation that might not be expressed. Research suggests that people tend to take the information presented to them by ChatGPT for granted (Krügel et al., 2023). Users might not be aware that other answers might be possible and that the answers are not factual. Who is accountable for providing the correct answer? Such language model tools can be used to direct the behaviour of the public. The risk is that such tools be misused for the sake of manipulating citizens. Also, there is the risk that those in control of language models can manipulate the answers given. No government, company, or person should have sole control of digital filters (Janssen & van den Hoven, 2015) and the resulting information provided.

Language models threaten to take over jobs, people living from checking grammar and English might become less necessary, the tools can be used by villains for writing hacking code or students for cheating report writing. Yet, language models will present many opportunities as well and will likely create new jobs and even new kinds of business models. Language models can make processes more efficient and effective and reduce human labour. Language models can support dyslexic students in this way, making it easier for them to work in certain environments. There might be a battle between students and teachers in using and detecting language model-generated text. Alternatively, embrace ChatGPT for better learning. For this, we should not start with the how question, but with the why question. Similar to the introduction of the calculator or Wikipedia the tools can be integrated into our education. This raises the question of why we educate certain knowledge and skills to our students, and what skills are needed by students. Essential is that they learn to be critical towards the automatically generated answers and be able to analyse them. Also, we need to educate how to take advantage of these kinds of tools without falling into the trap of the disadvantages.

Humans spend too much time on mundane, day-to-day tasks. By automating them, Humans can spend more time on creative and strategic work. People will get to work in more fulfilling roles. Teachers can focus on what matters and those students who need more support. Chatbots have been employed to offer free 24-hour psychological assistance to both medical staff and the public (Liu et al., 2020). A study in Chatbots reveals that personalization, enjoyment, learning, and condition are positively related to user experience and user satisfaction (Zhu et al., 2021) AI-based chatbots have been widely adopted to support and strengthen the quality of services in business industries, such as tourism and insurance (Lokot & Diakopoulos, 2016; Muthugala & Jayasekara, 2019; Androutsopoulou et al., 2019) and can now be used to strengthen education. A sound user interface and easy to use is key for effective use. Also, support for interpretation of the results can help to avoid that results are taken for granted without being looked for evidence. Research is needed on how language models can be used to create value, under what conditions and what it cannot do or what might have negative effects.

Although ML can help improve productivity and provide other advantages, its use also affects our public values. Ethical implications should be considered and ensure that language models are being used in a way that benefits everyone. Not all people might be able to use these kinds of tools or have access to the newest tools. Openness and accessibility and inclusions are societal values that are affected. Research is needed to evaluate the effect on public value and to ensure that these values can be met.

4.2.8.1.2. Next steps. ChatGPT provides a glance into the future, and further developments will likely follow. Like any technology, language models can be used for good or bad. In education, the learning objectives and the way of learning should be reconsidered in a similar way as when the calculator or Wikipedia was introduced. ChatGPT should be viewed as a tool that will be integrated and institutionalised in our daily practices. ChatGPT is not able to valid the accuracy or veracity of the data, but useful as a support. People should develop new skills, and the use of language model tools should be acknowledged in research methods.

Experimentation is needed to understand the full consequences. ChatGPT should not result in a next filter bubble and domination by a single party should be avoided. Among others, the public values of openness, accessibility, and inclusiveness will be affected, and measures need to be taken to ensure that people have access and are able to critically access the outcomes. ChatGPT cannot make a model or draw a business process, however, there are other OpenAI tools, like and DALL-E, that can make drawings. This will likely move forward, and also these fields will be supported by AI tools. ChatGPT will likely be combined with more logical models, like Wolfram Alpha, to understand relationships. The focus in the future will be on Logic and Language Models. Their skills will also improve considerably in the coming years.

4.2.9. Contribution 24

4.2.9.1. ChatGPT and education policy and practice - Tom Crick. The rapid advances in AI technologies have opened new possibilities in various fields and domains, including education (Luckin et al., 2016). The application of AI to learning can be traced back to the pioneers of the field, including John McCarthy (McCarthy, 2007). It has thus been used in various educational contexts and settings for some time (Goldstein & Papert, 1977; Woolf, 1992), primarily for personalised learning and the assessment of student progress (for example, through learning analytics), with varying success (Woolf, 2015; Zhai et al., 2021). But the widespread use and application of AI in education has been increasingly critically evaluated due to concerns about its cost and effectiveness, alongside emerging ethical and privacy considerations (Williamson et al., 2020a; Williamson & Eynon, 2020; Selwyn, 2022). However, the impact of the COVID-19 global pandemic has further accelerated the interest and potential application of digital technologies — and especially AI — in education (Crick, 2021), especially in the context of the digital disruption to learners, practitioners and education institutions and structures (Williamson et al., 2020b; Watermeyer et al., 2021). These wider narratives can also be seen in emerging national and international policy contexts (UNESCO, 2021; UK Government, 2021; Council of Europe, 2022), alongside a renewed focus globally on digital skills, computer science education, and associated national curriculum and qualifications reforms (Brown et al., 2014).

The recent advancements in NLP have enabled the creation of accessible large language models, such as the open-source GPT (*Generative Pre-trained Transformer*) family created by OpenAI,[16] which has further reinvigorated interest in the use of AI tools and technologies in education. The widespread use and application of ChatGPT[17] (*Chat Generative Pre-trained Transformer*), which has been built on top of OpenAI's GPT-3 family of large language models, and has been fine-tuned for transfer learning using both supervised and reinforcement learning techniques (OpenAI, 2022), has the potential to transform the

[16] https://openai.com/
[17] https://chat.openai.com/

way we learn, teach, assess and access information. With ChatGPT gaining more than 1 million users in its first five days since launching in November 2022,[18] and nearly 600 million monthly visits and its total user count exceeding 100 million by January 2023, the impact on education is likely significant. However, the uncritical use of ChatGPT raises several concerns and issues that need to be considered, both at a legal, regulatory and policy level, as well as what this means for individual learners (and indeed, citizens). While the peer-reviewed published academic literature on the use of ChatGPT in education is still emerging at the time of writing, in this section, we will briefly explore its potential uses, as well as some of the key concerns and challenges associated with its deployment and adoption in various settings and contexts.

While ChatGPT has raised visceral fears of learners cheating on homework, various commentators are assessing how its potential as an educational tool outweighs its risks (New York Times, 2023). Moreover, education has been incorporating and reimagining the threats and possibilities of technology for decades (Huang, 2019); AI will likely be no different (Luckin et al., 2016), but will require not only a technological shift but also a mindset and cultural shift (Breen, 2023). One of the most frequently highlighted applications of ChatGPT in education is its potential to provide learners with personalised, on-demand learning experiences. It is feasible for ChatGPT to be easily integrated into educational platforms and systems (for example, virtual learning environments, learning management systems, resource repositories, etc) to provide students with instant feedback and guidance, 24/7 access to relevant course and programme information, and engaging context-specific conversational interactions. This is particularly relevant for learners who are still unable to attend physical classes due to the COVID pandemic, or supports an increasing number of learners who are engaging through remote or hybrid learning. By creating ad hoc interactive and engaging learning materials, ChatGPT-powered conversational agents could simulate real-world scenarios, providing learners with hands-on learning experience, authentic assessment, and fostering critical thinking and problem-solving skills. It could them be used as a virtual tutor by providing students with personalised interactions, feedback and support in real-time. This could help learners better understand complex concepts and overcome learning obstacles. Another potential use case of ChatGPT in education is how it could support language learning, and how it can be programmed to converse in different languages and can help students practice their language skills in real-time. For example, students can engage in conversations with ChatGPT to practice speaking and listening skills, as well as to learn new vocabulary and grammar. ChatGPT can also provide immediate feedback and correction, which could help students to improve their language skills faster and more effectively.

Moreover, ChatGPT can also be used to help practitioners in their learning environments (Ferlazzo, 2023). By trivially providing them with instant access to information, ChatGPT can assist them in answering questions and providing students with additional resources and materials. Additionally, it can be used to create and distribute educational content, such as ad hoc quizzes, games, and interactive lessons, making the process of creating and delivering content much faster and easier. Finally, ChatGPT can automate repetitive administrative tasks, such as grading assignments and providing structured feedback, freeing up practitioner time for more important tasks such as curriculum design, close to practice research, evaluation and student engagement.

However, while the use of ChatGPT in education has the potential to realise some of the potential benefits outlined above, there are widespread concerns about its use and impact. Again, while the peer-reviewed published academic literature on the critical use of ChatGPT in education is still emerging at the time of writing, there are key themes emerging across research, policy and practice. In general, AI, like any other tool, offers many opportunities (Luckin et al., 2016) but also carries with it many threats (Williamson & Eynon, 2020), which make it necessary to take human rights principles into account in the early design of its application. Educators (and learners themselves) must be aware of the strengths and weaknesses of AI in learning, so as to be empowered — not overpowered — by technology in their educational practices (Council of Europe, 2022).

One of the main ethical concerns is the accuracy and reliability of the information provided by ChatGPT, as well as the potential for bias and discrimination. As an AI language model, ChatGPT is trained on large corpora of textual data freely available on the internet, but it is not always possible to ensure that the information provided is accurate and up-to-date, and there is a risk that the model may perpetuate existing biases, stereotypes and discrimination in society. There have been extensive examples of racist, sexist, homophobic, ableist and other discriminatory language making its way into the model and is then generated as output. Large language models can reinforce and exacerbate existing power dynamics; the power structures reflected in the datasets become encoded in the models, meaning that any output reinforces those structures. Because much of the data in the training set might be produced from a predominantly white, male, Western, English-speaking perspective, the data would likely be heavily skewed to reflect those structures. This raises the question of how ChatGPT can be trusted to provide learners with accurate information from diverse and authoritative sources, and what measures need to be taken to ensure that the information provided is reliable. With recent research in the UK highlighting how Instagram, TikTok and YouTube are the top three news sources for teenagers, data and media literacy are increasingly key features of school education so as to counter misinformation and disinformation online (Ofcom, 2022).

ChatGPT can essentially be viewed as an increasingly sophisticated "bullshit generator"; if a generated sentence makes sense to you, the reader, it means the mathematical model has made sufficiently good guess to pass your sense-making filter. This becomes increasingly problematic from an algorithmic governance and transparency perspective if is it able to produce plausible articles of any length or style, or is able to generate working computer code; it means what has been automatically-generated is now becoming harder to spot. This directly links back to concerns regarding "trustworthy AI" (Floridi, 2019) and how it is or is not "citizen-centred" (UNESCO, 2021). Thus, developments in the AI field can deeply impact interactions between educators and learners and among citizens at large, which may undermine the very core of education; that is, the fostering of free will and independent and critical thinking via learning opportunities. Educational professionals need to be made aware of AI and the ethical challenges it poses in the context of education and learning (Council of Europe, 2022), increasing demands for AI-literate learners and practitioners.

In addition to concerns regarding accuracy and bias, there are also more general concerns about the ethics and privacy implications of using ChatGPT in educational contexts, and what policies and regulations need to be in place to ensure that the technology is used securely, ethically and responsibly (Irons & Crick, 2022). As mentioned previously, these types of AI models are reliant on huge amounts of data; some of this data is personal or private, and has been scraped indiscriminately along with other freely available data. Earlier models were shown to output private and identifying information from people in their datasets. Additionally, as models become more and more powerful there is an imperative to supply them with increasing volumes of data; this creates an economic imperative for the large language model creators to collect data in ways which are sometimes unethical or invade people's privacy. Therefore, as learners and practitioners interact with ChatGPT, they will be sharing personal information and data with the AI model, and it is important to ensure that this information is kept confidential and secure, and how this information will be used (and

[18] https://twitter.com/gdb/status/1599683104142430208?lang=en

potentially associated with their account and identity). The use of ChatGPT thus raises important questions about the collection, storage, and usage of learner information, as well as the potential for data breaches and unauthorised access to personally identifying data.

In summary, it is clear at the time of writing that ChatGPT and associated tools and technologies will continue to impact on and disrupt education (Zhai, 2022). While early responses included futile calls to ban them (New York Times, 2023), it is clear that, as with the COVID pandemic, the continued use and adoption requires not only a technological shift, but a mindset and cultural one too (Breen, 2023). We have already seen significant disruption and permanent changes to learning, teaching and assessment over the past few years (Crick, 2021) as we embrace a "new (ab)normal" (Watermeyer et al., 2022); why would we not try and embrace these tools and technologies and use ChatGPT et al. to support innovative practices, assessing "humanness" rather than tests that can be increasingly trivially gamed and automatically solved. But it is clear that the use of AI in education across emerging research, policy and practice requires further critical analysis and evaluation, as well as increased openness, transparency and likely further legal and regulatory grounding (Williamson & Eynon, 2020), ensuring that they are explicitly learner- (or indeed, citizen-) centred (Floridi, 2019).

4.2.10. Contribution 25

4.2.10.1. How does ChatGPT benefit or harm academic research? - Varun Grover

4.2.10.1.1. Human contributor. A number of years ago, in my doctoral seminar for 1st year students, I distributed printouts of seven short papers co-authored with me and each of the seven students in the class. I indicated that I had painstakingly worked on these papers to give them a head start on the publication process. I asked them to take 30 min to review their paper and let me know what they thought. The papers superficially looked credible, but were garbage, generated by SCIGen "a program that generates random Computer Science research papers, including graphs, figures, and citations. It uses a hand-written context-free grammar to form all elements of the papers."1 After review, only 3 of the 7 students identified the nonsensical nature of the papers, 2 were unsure (perhaps because they did not want to challenge the instructor), and 2 indicated that they liked the papers and thanked me.

The technology is far better today, and ChatGPT due to its widespread accessibility is causing some widespread concern. Some journals and conferences have already set up policies that prohibit the use of ChatGPT in the research product. For instance, the International Conference on Machine Learning indicate that "Papers that include text generated from a large-scale language model such as ChatGPT are prohibited unless the produced text is presented as a part of the paper's experimental analysis."

Is this an overreaction? Certainly, the "ability to discern" an AI generated prose from a human generated one increases the diligence needed from our editors and reviewers. Most studies have shown that humans have a difficult time discriminating between AI and human generated text. Machines however (i.e., bot detection AI) however, performs better at discriminating. AI generated writing tends to be less specific, less creative, over generalises specific instances, and has a different writing style (e.g., uses more predicted words) than human writing. AI tools (like GPTZero) have been pretty successful at probabilistically identifying AI generated writing.

However, while there may be legitimate reasons for reacting to this tool, there are just as many reasons to embrace it proactively. ChatGPT is just that, a tool, that can be embraced like other tools (e.g., Grammarly) to improve the quality of writing. For instance, often the review process ends with the tedium of shortening the paper to meet length requirements. Think of alleviating the difficulty in deciding what to cut by using the tool. Or consider the value to authors in feeding a complete paper to the AI tool, and having it write the abstract. Similarly, complex papers could be made more accessible to different constituencies by simplifying the communication of complex ideas. This could facilitate better communication of our work to practice – something often discussed, but rarely done because it takes "extra" effort when the goal of journal publication is met. Non-native speaking researchers could greatly benefit from improving the quality of writing through this tool. The AI could also scrape websites or papers and organise it at a general level that might facilitate data collection (from websites) or a literature review (from papers).

The challenges are also substantial. If our systems (particularly less scrutinous conferences) are not able to discriminate, then it is possible that the mass production of AI bot generated research papers could tax the review system, and challenge the integrity of research. False information is just as much of a potential problem in research as it is in journalism and news. This is because how the AI takes information (based on its training set) and weight certain information could lead to misleading conclusions. The problem may be compounded when it is difficult to untangle the sources of the information and the attribution of credit. Where is the intellectual ownership? Is it with the training set used or with the algorithms, the latter are which are usually a black box behind a wall of corporate control. The lack of transparency can make the governance of the tool very messy.

So, where are we going with this – and what are the solutions? While it would be foolhardy to speculate with high specificity on direction, there are a few general tenets that I feel comfortable in predicting.

- The battle between bots (use of ChatGPT vs. Bot Detection AI) is only a small part of the solution. While we can train models in human text vs. AI generated test, *there will always be a degree of mismatch* as the training sets between the two needs to constantly change as the AI evolves.
- The AI will always get better (through reinforcement learning, bigger and better training sets, access to the Internet) and so fighting this trend will fail – *policies need to be set around transparency*.
- For academic research, the line is between using the Chatbot to improve writing (communication goal) vs. to generate new ideas (innovation goal). *Where that line is drawn between communication and innovation and how policies are articulated is an important professional conversation.*
- *ChatGPT can never partake in co-authorship arrangements* due to its lack of accountability.
- There needs to be *high reflection of ethics in the AI* to prevent automation of misinformation and the spread of false research.

I suspect that similar to most AI, there might be a combination of human and AI complementarity that will produce the best product. ChatGPT as a tool can greatly facilitate research writing and other creative pursuits (like filmmaking, book writing, etc.) - but the open question is how good can it get? The perfect human-AI complementarity may be an elusive ideal that requires ongoing navigation through some delicate ethical boundaries.

I asked ChatGPT to address exactly the same topic by posing the following question to it: "Write a 1000-word editorial on how ChatGPT benefits or harms academic research." The results follow. Compare and enjoy!.

How Does ChatGPT Benefit or Harm Academic Research by ChatGPT (AI Bot).

ChatGPT (AI Bot): *ChatGPT is a state-of-the-art language model developed by OpenAI, capable of generating human-like text based on the input it receives. With its impressive performance, ChatGPT has been applied in various fields, including academic research. In this editorial, we will examine how ChatGPT has impacted academic research and explore both the benefits and harms it has brought to the field.*

On the one hand, ChatGPT has brought numerous benefits to academic research. Firstly, ChatGPT has significantly improved the efficiency of language-related tasks in academic research. For example, researchers can

use ChatGPT to automatically generate high-quality abstracts or summaries of research papers, saving time and reducing the workload of researchers. In addition, ChatGPT can also be used to generate reports, conference papers, and other forms of research output, freeing up researchers' time to focus on more creative and challenging aspects of their work.

Secondly, ChatGPT has also contributed to the democratization of knowledge by making research more accessible to the public. With its ability to generate human-like text, ChatGPT can help to bridge the gap between academic research and the wider public, allowing non-experts to understand complex research concepts and findings in a more accessible and understandable manner. This can lead to increased public engagement with academic research and a more informed and educated society.

Finally, ChatGPT has also opened up new avenues for interdisciplinary collaboration in academic research. By automating language-related tasks, ChatGPT allows researchers from different fields to collaborate more effectively and efficiently. This can lead to the development of new research ideas and methods, as well as increased innovation and breakthroughs in academic research.

However, there are also some harms that ChatGPT has brought to academic research. Firstly, there is the issue of authenticity and reliability of the generated text. Although ChatGPT is highly advanced, it is still an AI model that operates based on patterns and associations it has learned from its training data. This means that the generated text may contain inaccuracies, biases, and other forms of misinformation that can harm the credibility of academic research.

Secondly, there is also the issue of accountability and authorship in academic research. With ChatGPT's ability to automatically generate research output, it is possible for researchers to pass off the work of the model as their own, leading to unethical behaviour and a lack of trust in academic research. This can undermine the integrity of the research community and erode public trust in the scientific enterprise.

4.2.11. Contribution 26

4.2.11.1. ChatGPT, scholarly writing and publishing - Rameshwar Dubey and Denis Dennehy. In this article, we provide critical reflection on ChatGPT in the context of conducting and publishing rigorous, high-quality research. Such reflections are grounded in our training and experience as IS and operations management scholars committed to high quality scholarly research.

Since its release in November 2022, ChatGPT, built on the foundational model GPT-3.5, has received mixed responses and reactions from the scientific community. Yet, it seems that we are again, playing 'catch-up' with this latest technology. On one hand, it can be justified, especially if one followed the Gartner (2022) Hype Cycle for emerging technology, which predicated that such foundational models would take 5–10 years before mainstream adoption would take off. On the other hand, ChatGPT has ignited a much needed public discourse to re-affirm that scholarly writing (and research) is a 'craft' that is developed over time and cannot be replaced with the latest technological 'fashion waves' (Baskerville & Myers, 2009). We do not advocate to follow the approach taken by the New York City Department of Education, blocking access to ChatGPT on its networks and devices over fears it will inhibit a student's ability to build critical-thinking and problem-solving skills. In contrast, we acknowledge that ChatGPT holds much promise in terms of being integrated into academic teaching and learning (e.g., helping students write a programming language).

In short, ChatGPT is an AI-based, pre-trained language model developed by OpenAI that operates in a conversational way to generate text, just like the human being (Haque et al., 2022; Lucey & Dowling, 2023). ChatGPT, unlike any other AI-based tool, has advanced features that make it a cutting-edge tool over other language tools that already exist (Susnjak, 2022). For example, we know that members of the academic community use AI-powered language tools (e.g., Grammarly, Shortly AI, and Jarvis) as they can be useful tools for writers whose first language is not English, or they may have a learning disability such as dyslexia. Essentially using these AI-powered language tools to improve the readability and language of their manuscript. We do not however, cite such tools as a co-author. Scholarly writing is more than just providing a polished manuscript, it is about originality and building on a tradition of accumulative building of knowledge (Metcalfe, 2004). Scholarly writing is not the same as writing for a tabloid newspaper that publishes routine stories (e.g., weather reports, traffic updates), whereby ChatGPT may help journalists to write short news stories (Financial Times, 2023).

Recent studies (e.g., Gao et al., 2022; Bouschery et al., 2023) suggest that ChatGPT can be a useful tool for writing an abstract or even an introduction section. However, in most cases, the text is either poorly paraphrased leading to the distortion of the actual message or content and in some cases, a high level or a considerable amount of plagiarism has been noted. In addition, there is a noticeably absence of scientific evidence to support any claims that AI-based language tools can perform rigorous research (e.g., hypotheses development, data analyses, discussion on the results), apart from assisting researchers to improve to quickly generate text for a manuscript. For instance, in a manuscript that was recently published in a reputable outlet, the authors acknowledged the contribution of ChatGPT to draft the abstract with minimum intervention by the authors (see, Bouschery et al., 2023). Moreover, a minority of academics claim to have used ChatGPT to pass examinations (see, Bommarito II & Katz, 2022). While the latter may not be directly linked to scholarly writing and publication, it does raise a concern that a minority of academics may use ChatGPT to write content, without acknowledging it to publishers, journal editors, or conference organisers.

Indeed, several academic papers have recently been published with ChatGPT as a co-author. While the integrity of such studies is not being questioned, from our perspective, adding ChatGPT as a co-author raises several issues such as copyright, privacy, misuse, bias, and lack of transparency. While these issues are being addressed by publishers who are updating their publication policies, use of ChatGPT as a co-author raises two fundamental concerns about the legitimacy of scholarly research and writing that impacts all disciplines.

First, as a discipline that adopts and adapts theories and theoretical concepts from other disciplines (e.g., sociology, psychology, management) relying on a chatbot raises the issue of fragmented adhocracy (Banville and Landry, 1989; Hirschheim et al., 1996), which previously overshadowed the IS discipline in its formative years. Further, we rely on the virtues of 'good theory' (Popper, 1957) that includes uniqueness, parsimony, conservatism, generalizability, fecundity, internal consistency, empirical riskiness, and abstraction (Wacker, 1998) to make theoretical contributions. Theory is the 'theoretical glue' (Whetten, 1989) that binds the elements of a complete theory that enables us to advance knowledge, which has implications for research, practice, and society. As theorizing and analysing data are key components of IS and operations management research, ChatGPT may not be useful for a myriad of reasons as mentioned throughout this manuscript.

Second, is the 'identity' of the IS discipline (Benbasat and Zmud, 2003; Gill and Bhattacherjee, 2009; Baskerville & Myers, 2009), which includes the fickle nature of IS researchers who follow research fads. The continued success and development of the IS discipline depends on its ability to maintain a strong identity (Benbasat and Zmud, 2003; Sidorova et al., 2008), which we believe includes scholarly writing.

4.2.11.2. Changes to publisher and conference policies. While publishers scramble to update their policies (see excerpts in Table 4 below), the onus remains with all human authors that a breach of these policies will constitute scientific misconduct no different from plagiarism of existing research.

We make a call to the associations of our disciplines (e.g., Association of Information Systems) to update their policies for conferences and the

Table 4
Updated policies of publishers and conference organisers.

Policy Author	Excerpt of updated policy
Taylor & Francis (2023)	Authorship requires taking accountability for content, consenting to publication via an author publishing agreement, giving contractual assurances about the integrity of the work, among other principles. These are uniquely human responsibilities that cannot be undertaken by AI tools. Therefore, AI tools **must not** be listed as an author. Authors must, however, acknowledge all sources and contributors included in their work. Where AI tools are used, such use **must** be acknowledged and documented appropriately.
Springer-Nature (2023)	Corresponding author(s) should be identified with an asterisk. Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript.
Science (2023)	Text generated from AI, machine learning, or similar algorithmictools cannot be used in papers published in *Science* journals, nor can the accompanying figures, images, or graphics be the products of such tools, without explicit permission from the editors. In addition, an AI program cannot be an author of a *Science* journal paper. A violation of this policy constitutes scientific misconduct.
Elsevier (2023)	Where authors use AI and AI-assisted technologies in the writing process, these technologies should only be used to improve readability and language of the work and not to replace key researcher tasks such as producing scientific insights, analyzing and interpreting data or drawing scientific conclusions. Applying the technology should be done with human oversight and control and authors should carefully review and edit the result, because AI can generate authoritative-sounding output that can be incorrect, incomplete or biased. The authors are ultimately responsible and accountable for the contents of the work. Authors should disclose in their manuscript the use of AI and AI-assisted technologies and a statement will appear in the published work. Declaring the use of these technologies supports transparency and trust between authors, readers, reviewers, editors and contributors and facilitates compliance with the terms of use of the relevant tool or technology. Authors should not list AI and AI-assisted technologies as an author or co-author, nor cite AI as an author. Authorship implies responsibilities and tasks that can only be attributed to and performed by humans. Each (co-) author is accountable for ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved and authorship requires the ability to approve the final version of the work and agree to its submission. Authors are also responsible for ensuring that the work is original, that the stated authors qualify for authorship, and the work does not infringe third party rights, and should familiarise themselves with our Ethics in Publishing policy before they submit.
Emerald (2023)	Firstly, because these tools cannot take accountability for such work, **AI tools/large language models cannot be credited with authorship of any Emerald publication**.
International Conference on Machine Learning (2023)	Secondly, **any use of AI tools within the development of an Emerald publication must be flagged by the author(s) within the paper, chapter or case study**. Emerald is updating its author and editor advice accordingly, and these policies come into effect immediately. Papers that include text generated from a large-scale language model (LLM) such as ChatGPT are prohibited unless these produced text is presented as a part of the paper's experimental analysis.

use of ChatGPT in scholarly research and writing.

To conclude, publishing policies will continue to evolve, and new variations of ChatGPT will emerge in the future, the activity for publishing scholarly research is a 'human-centric' process, not 'robot-centric'. This implies that authors are responsible for the integrity and validity of their scholarly work, adhering to contractual agreements with publishers, and upholding the ethical principles of their academic community (i.e., Association for Information Systems). Further, as the rigorous review process of manuscripts is conducted by humans, not robots, then publishers, editors, and conference committees have a responsibility to ensure reviewers are provided with relevant training to help mitigate the threat of technologies (when used unethically) that have the potential to undermine the craft of scholarly writing and the integrity of our disciplines.

4.2.12. Contribution 27: ChatGPT and its potential impact on research and publishing - Savvas Papagiannidis

It is undeniable that the attention ChatGPT has attracted is testament to its advanced capabilities and the insightful responses it can generate, as well as its ability to present and structure them well. It is even more astonishing to experience ChatGPT solving equations and explaining the process while doing so, or writing programming code effortlessly. This is in stark contrast to what users were used to when interacting with chatbots: an underwhelming and very narrow in scope exchange of messages. Using ChatGPT is arguably the first time that users can see so unequivocally the impact that AI can have, evoking a feeling of awe. Such performance has added much fuel to the on-going debate about the impact that AI can have across the board. So far, the debate has felt distant from current practice, but ChatGPT has changed this.

Undertaking research and publishing work is no exception to the above. On the one hand, we can be excited by the opportunities that AI can afford for researchers. On the other hand, ChatGPT has also highlighted how unprepared we were to reach this AI milestone. Research and publication policies will need to be revised in the light of the latest developments. This is not to say that existing policies and practices are suddenly obsolete. Still, they may leave room for interpretation. They were written with different assumptions in mind and did not have to explicitly cover the utilisation of advanced technologies such as AI. In fact, there have already been cases probing the validity of existing policies in these uncharted waters. For example, there have been reports of journal submissions featuring ChatGPT among the authors contributing to the research. Such a development has prompted publishers to react and scramble to regulate the use of AI systems like ChatGPT. One might argue that such policy reviews could have been undertaken much earlier with as many stakeholders across disciplines being involved in the process as possible. Competition among publishing outlets can result in different policies, creating a fragmentary approach that is likely to be confusing and counterproductive. Revised policies or even decisions not to change policies should be clearly communicated to all authors and readers, explaining where publishers stand on AI contributions. Otherwise, we run the risk of demonising the use of a new technology out of fear. Perhaps ironically, ChatGPT could be of help. ChatGPT's response

as to whether it should be listed as a contributing author is very telling of the challenges we are faced with:

> "No, as an AI language model, I cannot be listed as an author on a journal paper. Authorship is generally reserved for individuals who have made a significant intellectual contribution to a work, and it is generally understood that the authors are the ones responsible for the content of the paper. In including text generated by me, the authors take full responsibility for the content and accuracy of the information, and it is expected that they have independently verified the information and made any necessary adjustments."

One could ask what constitutes a significant intellectual contribution by an AI system for the rest of the team to consider adding ChatGPT to the author list. Can ChatGPT actually produce original work and how can this actively be demonstrated? Perhaps before we try to answer this question, we should first debate once more what constitutes original work. Similarly, we should be looking to decompose AI into specific applications and functions and not use it as a blanket term that covers everything.

When it comes to the second part of the ChatGPT answer, if the author has taken full responsibility for the content, accuracy, verification and made the necessary adjustment, then ChatGPT claims that the author owns the work. In such a case how is this different from authors having to use sources appropriately? AI effectively packages knowledge and content we would have needed significant time to deal with. Not to mention that having humans review content produced by AI is not going to necessarily address all potential issues. It is not just AI that can make mistakes and has limitations. Humans do too. If nothing else, limitations in AI can be addressed with future releases.

For the sake of argument, let us assume that future releases of ChatGPT and other AI systems will be capable of producing similar quality to what a human can produce (e.g., ChatGPT already writes believable scientific abstracts, though with completely generated data that can fool human reviewers (Gao et al., 2022)) albeit much faster. Why would it be a problem, if AI was to write the abstract of a paper? It will leave more time for humans to focus on what mattered and invest more time, energy and focus on the main body of the work. After all, we are supposedly not bound by the limits imposed by the training data and we can put our creative flair to use where it matters. This is not to say that writing the abstract is not important. Quite the contrary! Still, despite being an important part of an article and needs the same attention, there is no guarantee that humans will write a good one. Why are we concerned with productivity gains? Or, to put it differently, why were we not concerned with other technologies that made us more efficient. For instance, why were we not concerned with online databases moving away from paper journals and in-person visits to libraries? They made undertaking literature review searches much easier. Not to mention that we happily apply ML among other data science techniques to clustering papers to identify the underlying themes.

If the argument is that AI can help us write better papers, providing a competitive advantage to the author, then any gains are likely to be short lived. Authors relying on AI to produce better research and increase their chances of publishing their work are likely to quickly realise that this is not a feasible or sustainable strategy. If we all have access to the same systems and ask for the same task to be undertaken, e.g., to write a literature review on a given topic, chances are we are all going to get the same or at least a similar outcome, limiting its perceived value and not resulting in the significant contribution one may have aspired to.

Last but certainly not least, one fully appreciates the ethical concerns that come with using AI. It goes without saying that research integrity should not be compromised. Still, this is a human issue, not a technology one. Banning any practice usually has the very opposite result and will most certainly result in a lack of transparency. AI is no exception: just like any other aspect of the research process there has to be transparency in methods, and integrity and truth from authors (Springer-Nature, 2023).

Perhaps, instead of trying to fit AI into our existing practices of undertaking research and publishing it, we may want to review how we go about research more holistically. Fundamental changes to practices that have been established for decades or even longer are not going to be easy to bring about. Neither will it be easy to agree on the principles that will guide such changes. AI can not only support research, but also the peer-review process. For example, beyond assisting with the writing up process it could improve the language used, making a manuscript easier to digest. It could also improve the reliability of plagiarism checks. It could become the de facto reviewer 1 (one suspects that we do not want AI to be Reviewer 2), providing a fast recommendation to editors when it comes to screening papers. Such an automated review could help improve manuscripts before they are even submitted. AI can also summarise and rewrite manuscripts in a non-specialist language for practitioners and the general public, making research more accessible.

Such AI applications could soon be a reality and this time we need to be more prepared. Our abrupt awaking to AI may have done us a favour, not just in helping us better grasp the enormity of the task ahead, but also accelerating the process of coming up with a new set of rules. Questions like those posed above are not theoretical questions that one has the luxury of debating, but rather pressing practical questions of immense significance.

4.2.13. Contribution 28

4.2.13.1. *Magic or fast-food writing? when transformers challenge our epistemic values in teaching and research and our humanity - Frantz Rowe.*

In[19] 2016 Alphago had already triggered some emotions from the general public and alerted us that algorithms that recognize patterns, what we now abusively refer to as AI (Rowe, 2018), could be very impressive and have consequences. Until now, despite being often assessed in our international conferences and journals, most conversational chatbots where not so impressive or were not open to the public for consideration. ChatGenerative Pre-Trained Transformer (ChatGPT), its parents like GPT-3, and its *transformers* cousins open, apparently, a new era because for numerous problems we may think about, including complex ones where answers are not simply dichotomous, ChatGPT often produces very plausible and rather satisfactory answers in the form of human like text. Such problems are at the level requiring high competency – level of university professor – in risk management, mathematics, culture and so on. What is striking is the fluidity of the answers, even if they can look a bit repetitive, may need some corrections, and GPT-3 does not pass important tests (Floridi & Chiriatti, 2020). Notwithstanding the fact that in many industries and occupation text production will be automated (ibidem), at first impression the current generation of "transformers" seems to be largely usable for teaching and research activities and their stakeholders.

Under such dialogue conditions (e.g., responding in a fairly complete and stunning manner to some IS scientific questions we deem complex or triggering positive emotions when dialoguing with a deceased relative (Henrickson, 2023)), playing with ChatGPT, and possibly its siblings, tends to make us believe that technology has magical power in terms of understanding and writing. However, as Dr Faust's tragedy reminds us, belief in magic is tempting but dangerous. Such technology comes with numerous challenges and pitfalls. Let us consider some of them as teachers and as researchers.

As teachers, it already challenges our grading of assignments and exams and, more importantly, it will affect the students learning process. First, we see students succumb to the temptation of submitting

[19] I gratefully acknowledge Ojelanki Ngwenyama, Bertrand Rowe and Raphaël Suire for insightful comments on this short philosophical argument about the labels we use for distinguishing human and ChatGPT capabilities and their evolution if we use the latter.

homework using ChatGPT with or without being transparent about its use. The first issue will be then whether we can detect it. If we have a good knowledge of what each student can produce this might be straightforward. But in some context (e.g., with freshman students), it might be difficult to have an idea about the integrity and capability of each student. Should we systematically defer that detection to anti-plagiarism software? What would be the cost for our institutions and humanity if we decide to do this? And relatedly will this lead to an ever-greater dependency to this technology or to its antiplagiarism winners or both as we continue training them by our own use? All these issues are big ethical issues that are not new, but simply more acute and visible now. Consider that anti-plagiarism software is not necessarily something that detects a fraud but simply the reproduction of some text (Introna & Hayes, 2011). The legitimacy of the reproduction may be different depending on educational culture such that what is admitted as fine in Greece or Egypt is not in the U.K. (Introna & Hayes, 2011). This means that what we would qualify as plagiarism requires a human interpretation that we cannot entirely delegate to a machine. Second, in terms of learning, we have observed in the past that the introduction of certain digital tools (e.g., Calculator; text editing, GPS systems) has had deep impact on our cognition. When we still practice with older tools we retain our past capabilities, but when we don't and use the new tool, our cognition adapts and works differently. With ChatGPT, students may probably lose certain skills like expressing themselves, but also will gain others. Is there a net benefit? What will be the impact if we use it more and more and let it be embedded in our office systems, we don't know. What we generally know however is that the old law of the deskilling by automation applies to much of our digital world. Typically, those who use their GPS more have more difficulty reading a printed map or orienting themselves in nature without using a digital device. Certain types of competencies will be lost.

As researchers we are already experienced in a given topic and can identify relevant questions. Then we can easily ask the AI to provide elements of discourse, part by part, to construct, at least partially, what can look like a decent research paper in IS, sociology or economics. For the moment specialists themselves cannot distinguish abstracts produced by AI from those produced by researchers (Else, 2023). When under pressure to publish or perish, researchers, especially those who are not native-English speakers may be tempted to use it at least for some parts, before submitting to journals publishing in English. ChatGPT is certainly best trained in this language. The problem is again ethical. It is formally different, but is it contesting existing ideas? Is it transparent? At some point submitting papers with such support system, raises issues that go against traditional values we have long defended to identify original research against simple opinion or journalism. Those values revolve around the idea that research publications should propose something innovative and yet relevant, i.e., by definition not made out of what already exists by some non-transparent recombination; originality being about empirical facts (not known before) or analysis (interpretation or critique). To some extent it should be also transparent about how ideas have been derived and articulated from the literature and how the methods have been designed and used in the particular instance of this research. This notably requires that researchers cite their sources of inspiration both in order to demonstrate integrity and to facilitate further research through possible contestation. Something that is currently missing with ChatGPT. Complementary work will have to be performed humanly to make the paper look completely analogous to scientific discourse. While each of its outputs being possibly unique, this fake product will also defeat originality by definition since it cannot reason. It's nothing more than a "stochastic parrot" (Bender et al., 2022) that builds its sentences and discourse from data traces. Some unforeseen combination of text may be innovative and valuable, but the likelihood that it be selected is very low and depends on the quality of data sources and training.

It is important to realise that this parrot does not offer a conversation. It does not understand, does not communicate and that it does not produce knowledge. Comments about its (un)consciousness are just science fiction and all of these is either marketing or poor understanding. It just produces text from digital traces. These traces by themselves do not constitute 'meaningful' scientifically valid and legitimated knowledge. They require a knowing subject to interpret and validate them (Haack, 1979). ChatGPT combines expressions that are currently already circulating relative to a domain and left as digital traces in the babel tower that it searches. It is functionally similar to the algorithm in Searle's Chinese room thought experiment (Searle, 1980) and does not compute meanings (Rowe, 2018). ChatGPT text production resembles what could be at best a kind of disembodied declarative knowledge. In sum this generation of "transformers", is impressive but not intelligent, more harmful, and probably less useful for education and research than current search engines that give us elements to help us discern what may be relevant to our questions.

If we lose the ability to identify the literature background, we lose the capacity to assess the value of the contribution. If the paper is not sufficiently transparent about methods, we lose the ability of assessing the authenticity of research and can be completely misled into wrong directions. Until now for some genres of articles like issues and opinion we could insist on interestingness and to a lesser extent on transparency. ChatGPT could nevertheless provide elements to fabricate "issues and opinion" papers or background sub-sections that simply synthesise what has been already published, and thus feed the scientific publishing industry and editors of lower ranked journals and conferences. If we want to make sure that authenticity is preserved, what ChatGPT and digital transformation of research processes may bring about is to force us to be more and more demanding on transparency to the risk of eliminating the most provocative and interesting research and/or publication because we may have no longer time for it. If, conversely, we admit that scientific discourse can be a hybrid with declared parts being co-produced by the researchers who will still have to ask precise and significant questions to an AI agent, we will also adjust, simply more cooperatively, to the new magic tools for our fast-food publication productivity. What we will gain from them in the long run is quite uncertain. Many disciplines may become totally devalued and publications just considered, independently of their genre (Te'eni et al., 2015), an opinion not regarded as more valuable than another layman opinion. Researchers and the community will have to defend itself again the potential dangers of such technology by asking itself ethical questions related to the framing of the social and ecological dynamics of the problem of introducing magic in our educational, research and production systems. Beyond quality, integrity and reputational issues, a more fundamental issue is that of the impact on human agency and our free will (Kreps & Rowe, 2021). Even if we think it is smart to delegate our writing, since now we have an able slave, and think we still control our slave, we will soon be unable to write and therefore think properly, because any competency is the product of a habitus. This does not necessarily mean that the slave will become our Master, we may only be more dependent on it and have lost some cognitive skills as humans.

Learning is fundamentally acquiring knowing how and related competency. From a philosophical perspective, in this Human-Computer Interaction oriented towards learning, neither agent does learn. The way transformers give answers deprives the knowing subject from knowing how and knowing why they may learn something if they rely on these tools (Ryle, 1945). Knowing that is missing from transformers pseudo declarative knowledge, because transformers cannot themselves reflect on knowing how (ibidem). However, from a pragmatic viewpoint, the more we use transformers like ChatGPT, the more they are likely to get close to providing a correct answer. Conversely, the more users may lose their ability to reflect and discern alternatives, and write in an original way. These tools will improve, while we will regress if we don't cultivate our traditional competencies. Using them and what we cultivate are political, societal and anthropological choices. Beyond difference in weight, research genres are based on epistemic values (e.g., contestation/interestingness, transparency, originality, authenticity). The

epistemic values of teaching and research, that are so deeply embedded in western and eastern societies, are at risk if we don't reflect more deeply about the ethical risks introduced by the transformers, even if they are not intelligent. Beyond our occupations, as academics, we see that we cannot escape the fundamental question: what does it mean to be human, if AI is going to automate our writing, and more insidiously our thinking, while biasing our decision making?

4.2.14. Contribution 29

4.2.14.1. Recommendations for dealing with ChatGPT, Bard & Co. in academic publishing - Paul Jones and Sascha Kraus. The emergence of *OpenAI*'s artificial-intelligence (AI) chatbot "ChatGPT" (Generative Pre-trained Transformer) and *Google*'s recent reaction to it called "Bard" provides a seminal moment for both academic publishing and higher education more generally (Alshater, 2022a, 2022b). For the academic community, it offers a significant challenge to proving the veracity and authorship of an output. ChatGPT threatens the very foundations of the current publishing hierarchy with its reliance on journal quality and reputation.

Although the chatbot has current limitations in constructing independent critical scientific empirical manuscripts and has been guilty of producing some substandard content and even inventing sources/references. The emerging literature suggests that ChatGPT has been used for creating literature reviews and full papers in various disciplines (Adesso, 2022; Aydın & Karaarslan, 2022). However, ChatGPT will undoubtedly evolve significantly in the coming months, because that's the nature of AI: collecting data, learning from it, and improving as a result. Basically, nothing else than the scientific process that we as scholars go through anew with every new research project - only "by hand".

As the news portal of the scientific journal "Nature" has recently reported four scientific studies had already listed ChatGPT as a co-author (van Dis et al., 2023). However, editors of academic journals and other academics widely agree that AI intelligences do not meet the criteria for authorship because, unlike humans, they cannot take responsibility for content. However, the fact that an AI was involved in the development of a scientific article could be mentioned elsewhere, some editors think. For example, a previous version (GPT-3) has already been used to assist the process of a literature review in a management journal, but notably only to sharpen the research question as well as to check the completeness of the results, not to write independent text (Burger et al., 2023) – and the use was explicitly noted in the article. This is a concern and one that must require a seismic and immediate change in publishing protocols that effects all academic disciplines (Biswas, 2023). Furthermore, there are emerging instances of copied manuscripts appearing in journal by plagiarising authors. Whilst plagiarism has always been a threat, the opportunity to cheat has significantly increased with the emergence of ChatGPT and its equivalents. However, currently ChatGPT remains undetectable by plagiarism software. Whilst this situation might change, it is likely that ChatGPT and its equivalent competitors will continue to evolve. Unquestionably there will be an ongoing development war between the chatbot developers and the plagiarism detection software in coming months and years. In the meantime, what can be done to verify the authenticity of academic publishing? As journal editors, we would recommend the following practices be adopted:

1. The academic publishers must unite to condemn the practice of ChatGPT usage and identify a code of practice for the academic community. This code of practice should note that use of ChatGPT or equivalent software is forbidden in any context when in the process of producing an academic output for publishing. All publishers must produce website content to educate potential authors regarding best practice for proving their authorship of an article. Journal publishers that continue to use ChatGPT, or equivalent, must be blacklisted as unethical.
2. The manuscript management systems of the major publishers today almost all already have an integrated automatic plagiarism check. It is imperative that these be supplemented with AI output detectors, which also already exist or are in development.
3. The protocols surrounding journal paper submission must be further refined to enhance the reliability and proof of authorship. For example, authors must sign a license statement noting that ChatGPT or equivalent, has not been used in the development of the manuscript. Secondly, the authors must provide a copy of the study data with their submission. This would be a key source of evidence. This protocol has already been introduced by several publishers although is rarely fully enforced. Academic journals must enforce this practice with consistency. Data used within each paper must be verified and safely stored by the publisher. The challenge in this regard is where authors seek to publish multiple papers from the same dataset. This is perfectly reasonably but will require an audit trail to ensure originality.
4. Could authors who have been previously found guilty of plagiarism have this noted on their publishing record. This is potentially possible by using unique author identifiers like ORCID for example. This might be regarded as an extreme measure so could include time limited offences which drop off the record after a set time period. It would act as an effective red flag for publishers and deter potential plagiarism.
5. Journals that publish systemic and bibliographic literature reviews might be challenged to identify plagiarised copies produced via ChatGPT given the capability of the software to significantly alter original content. The key might be the data metrics e.g., the number of papers evaluated and their source that would be a key to identifying plagiarism in a copy.

In conclusion, journal editorial teams might in the future require greater diligence of manuscript submissions to check their originality and draw on a range of evidence including plagiarism checks, data verification and author track record. Journal publishers must support plagiarism detection software providers and demonstrate increased support to evaluate inappropriate practice. Unquestionably, this technology is here to stay. Moreover, it will continue to evolve, and will not only challenge but even overturn much of what we assume to be known. Thus, it can certainly be considered "disruptive". For journal editors, authors, students and academics, following years will undoubtedly bring significant changes in the use of AI. This, is neither condemnable nor dangerous. On the contrary, opportunities will gradually develop that may make our lives as scientists easier and better. However, as in real life, all this must take place within certain guard rails, so that there are as few accidents and violations of rules as possible, and the latter are also punished accordingly. Our contribution is nothing other than a call for the development of such protocols.

4.3. Ethical issues

4.3.1. Contribution 30

4.3.1.1. ChatGPT and Ethics – 'ChatGPT Doesn't Matter'? - Laurence Brooks. "The rise of powerful AI will be either the best or the worst thing ever to happen to humanity. We do not yet know which". Stephen Hawking (2016[20]).

This often quoted extract from Steve Hawking's speech at the opening of the Cambridge Centre for the Future is a simple but powerful insight into our hopes and fears for AI. For a long time this has been the

[20] https://www.cam.ac.uk/research/news/the-best-or-worst-thing-to-happen-to-humanity-stephen-hawking-launches-centre-for-the-future-of

territory of more academic researchers, but with the Open AI release of ChatGPT into the mainstream use, it has become a lot more real for a lot more people.

In academic circles, ChatGPT has sparked a huge shift in the ongoing debate about students' work and plagiarism. The issue of students cheating the system by 'buying' their pieces of work for assessment submission has shifted to feeding the assessment information into ChatGPT and then adding a few tweaks to what emerges and then using that as their submission. The responses to this range from the outright horror, to calls to make more individual and complex assessment briefs, to a 'well if we can beat them, then let's join them' approach which embraces ChatGPT and makes it and the use of it part of the education process.

Similar issues are being seen in a number of other fields, from politicians (York, 2023[21]) or business leaders' speeches to song lyrics (in a specific style), art, music or writing adverts. While there are a number of ways to understand ChatGPT, one of the key issues with this, as with any AI system, is the ethical viewpoint. A number of studies have now looked at the ethical aspect of ChatGPT from the direction of how ethical it behaves when asked certain questions (Hasselbalch, 2022,[22] Dantas, 2023[23]). On the whole it does seem to be quite good, from an ethical stance, but it somewhat depends on how the questions are framed. However, others have pointed out that the output from the ChatGPT is typically presented in the voice of a middle-class white male (Bjork, 2023). Not exactly a good representation of society and a more inclusive EDI.

There is also the question of how they have tried to make the system more ethical (less 'toxic'), through the use of cheap labour in an African country, to manually tag unacceptable content for the system to learn from (Perrigo, 2023[24]). Again, a not very ethical approach to increasing the ethical stance of the technology.

We could also look at the ethical aspects off chat got from an ethical principles and values perspective, and the questions they generate. These include:

- Irreversibility – how does the inclusion of ChatGPT into society change the relationship between people and between people and technology? How does a technology, such as ChatGPT blur the physical and virtual worlds when it becomes so difficult to tell where a piece of writing has originated from, human or non-human?
- Novelty – the anxiety of missing out. What does it mean for society when so many people turn to ChatGPT to gather their information for them, or equally so many people are in fear of this novel technology (such as can be seen in the educational context).
- Structures of power – given this powerful and potentially influential technology is being produced by a particular organisation (and there are now equal systems being proposed by organisations such as Google, or being bid for by Microsoft) (Walsh, 2023), one has to ask how this affects the power of the actor behind this, as well as who 'wins' and who 'loses' in society?
- Security – a tradition concerns about how secure a system such as ChatGPT is and what is to stop some form of hacking which would intentionally bias some outcomes, for a whole range of reasons, including marketing and political (the 'soft war' approach, Walzer, 2017).
- Fake news and informational inflation – where media content is created without human supervision, then the ability to produce 'fake news' at scale becomes significantly easier and faster. We are already aware of 'echo chambers', online and especially in social media, where specific views are reflected and increased through exposure to only one side of a multi-faceted argument. With the new ability to produce reams of unverified one-sided content, then a false sense of majority opinion could be easily produced.

So where does this leave us. Inevitable, with a flawed technology which operates within a flawed society. As the saying goes, 'you cannot please all the people all the time'. However, this is not good enough to excuse some of the flaws within technologies, including ChatGPT. The first thing is to make people aware of these failings, transparency being one of the key elements in the arsenal to tackle unethical technologies. However, I would also refer to one of the classic papers in the academic digital world, Carr's 'IT Doesn't Matter' (Carr, 2003). Essentially this says that once all organisations have IT, then it won't matter because the advantage has gone. Of course, the response to this (and there have been many) is that rather like water or electricity (which all organisations also all have), it not having them that is important, it is what you do with them that counts. The same may well be true of ChatGPT and it's 'me too' versions which are about to be released. Since these are open access systems, and we all have access to them, it will not be what we use, or don't use, them for, but how we choose to use them. For that, we do need to have our ethical lens very clearly up front, as this will be one way to try and choose a better path.

4.3.2. Contribution 31

4.3.2.1. Good bot or bad bot? On the ethics of ChatGPT- Bernd C Stahl.

ChatGPT is taking the world by storm. There is broad agreement that it has the capacity to change many aspects of private, organisational, and public life. There is currently much discussion of its potential and likely applications and the resulting social impact. This fuels the discussion surrounding the ethical evaluation of ChatGPT. In short, the question is: is ChatGPT a good bot or a bad bot?

This question is quite obviously a rhetorical device and cannot be answered using the binary distinction between good and bad. It is nevertheless an interesting question because it helps us focus our attention on the difficult topic of ethical concerns raised by novel and emerging technologies and innovations such as ChatGPT. Asking whether ChatGPT is good or bad should thus be understood as a way of triggering, structuring, and organising our thinking about the ethics of this technology. This, in turn, will not only inform the debate of the evaluation and governance of ChatGPT itself, but offer an example that can serve to inform our collective reaction to the next innovation arising from the rapidly progressing field of AI.

The eventual uses of ChatGPT and related conversational AI are difficult to predict. This is almost always the case when new technologies are emerging. Research on the ethics of such emerging technologies (Moor, 2008; Sollie, 2009) had therefore spawned a number of methodological approaches aimed at dealing with the specific challenges of this topic area (Floridi and Strait, 2020).

This brief editorial statement only offers the space to outline some aspects of such a prospective ethical analysis. An analysis would have to start with a more detailed understanding of the nature and capabilities of the technology. ChatGPT is a chatbot that utilizes OpenAI's Generative Pretrained Transformer 3 (GPT-3) language model to generate text based on user input. Chatbots are not a new technology. However, ChatGPT seems to surpass previous technology and it has reached a level of sophistication that allows it to provide plausible answers to many questions. It offers a simple interface that allows users to interact with it seamlessly and it produces output that is accessible, relevant, and, for the most part, correct. Its output is high quality with regards to the language used and the content delivered. This makes it difficult to distinguish ChatGPT generated text from human outputs. Human-like quality of text generation then promises many applications across all

[21] https://www.france24.com/en/technology/20230203-chatgpt-use-of-ai-chatbot-in-congress-and-court-rooms-raises-ethical-questions
[22] https://dataethics.eu/testing-chatgpts-ethical-readiness/
[23] https://medium.com/@adilmarcoelhodantas/ethics-in-chatgpt-and-other-ais-ee31ce8e9f09
[24] https://time.com/6247678/openai-chatgpt-kenya-workers/

sorts of fields that require textual input and output. The examples currently most prominently discussed tend to refer to text written in academic environments, be they student essays (Stokel-Walker, 2022) or research papers (Van Noorden, 2022) as well as specific types of text-like outputs like computer programs (Castelvecchi, 2022).

Language is an important part of what makes us human. Changes to the way language is generated and perceived can have profound social and ethical repercussions. In addition, written language constitutes much of our society, our rules, norms, expectations, and routines. Again, changes to this will have results worth considering in detail.

Much of the current discussion of the ethics of ChatGPT focuses on predictable consequences of easy to foresee applications. To take the example of the use of ChatGPT for the creation of student essays, there are (ethical) benefits for those students who struggle with essay writing who may use ChatGPT to construct better arguments or to polish their language to present good essays. Individuals struggling with traditional university essays are often those who did not have the opportunity to practice them, for example because they are from disadvantaged backgrounds or because they are non-native speakers. Helping them would clearly be ethically desirable. This benefit needs to be weighed against the ethical problems arising from the possibility of plagiarism or unacknowledged use of automatically generated text and the threat to traditional university assessment methods. This example is widely discussed, and policies are already being drawn up and implemented to address them, for example in the form of university assessment procedures or journal publication policies.

In this editorial statement I want to argue that we can be more ambitious in engaging with ethical issues of ChatGPT. The literature on ethics of emerging technology has provided many insights into ethical concerns that are likely to arise. To draw on the example of an ethics foresight project that I was involved in (Stahl et al., 2017), past experience suggests that digital technologies are likely to have impacts on individuals, such as privacy, autonomy, treatment of humans, sense of identity, or security. They normally have consequences for society, for example by creating digital divides, affecting collective human identity and the share view of the good life, changing ownership, data control, and intellectual property, impacts on responsibility, possibilities of surveillance, or affecting cultural differences. Further likely ethical issues can be derived from the debate of the ethics of AI, such as biases, discrimination and resulting questions of justice and fairness (Stahl, 2021).

The current discussion of the ethics of ChatGPT has focused on a small sub-set of these concerns, notably those related to authorship and attribution of intellectual property. My plea in this editorial statement is to broaden this debate and undertake a more systematic and comprehensive analysis. Such an analysis would need to cover benefits and downsides. Clearly, a prospective analysis has limitations. We cannot foresee all possible applications of a new technology, nor all positive or negative consequences. However, past research has shown that there is a significant number of recurrent themes in the ethics of emerging digital technology. I am therefore convinced that a rigorous prospective review of the ethics of ChatGPT will help prepare us for predictable outcomes thereby strengthen morally desirable opportunities and avoid undesirable consequences.

4.4. Challenges, opportunities, and research directions

4.4.1. Contribution 32: towards a research agenda for generative AI in education, industry and research - John S. Edwards and Yanqing Duan

This contribution looks at the challenges, opportunities and impact of generative AI in education, industry and research and proposes a research agenda towards addressing the key challenges from a human centred AI perspective. We will concentrate in this contribution on text- and diagram-based generative AI. Uses in the creative arts are beyond our scope here (although worthy of note) as are further improvements in automated translation between languages, where for example automated dubbing of TV shows and films is on the horizon.

Generative AI can be thought of in two ways. One is as the latest evolution of question answering systems, which have been a part of AI for at least 30 years. The other is as a new development that enables computer systems to "write" plausibly in a way that was not possible before. Both of these views are valid separately, but in combination they offer more – a step, perhaps a major one, towards a creativity support system. The opportunities and impact offered by generative AI are mainly new, but many of the challenges are not. The principal challenge for generative AI, as with any computer-based support system, is whether or not the user can rely on it for the intended purpose.

We will look at the three sectors of industry, education and research in turn. We take industry first, as the challenges in that sector also apply to most others.

To help scope out the challenges posed by generative AI, we carried out a small experiment using the ChatGPT generative AI software that is freely available on the web.[25] One of the authors asked ChatGPT the question "What are the disadvantages of generative AI?" on 9 January 2023 and again on 20 January 2023, as part of the same sequence of three prompts. As shown in Table 5, both responses included six specific

Table 5
ChatGPT's responses to "What are the disadvantages of generative AI?".

9 January 2023	20 January 2023
There are several potential disadvantages of generative AI, including:	Generative AI has several disadvantages, including:
1. Quality: Generated content may not be of the same quality as content created by humans. This is particularly true for tasks that require a high level of creativity or nuance, such as writing or art.	1. Complexity: Generative AI models can be computationally expensive and require large amounts of data and computational resources to train.
2. Bias: Generative AI systems can be biased if they are trained on biased data. This can result in generated content that is offensive or inappropriate.	2. Difficulty in assessing quality: It can be challenging to measure the quality of the generated data and to determine whether it is truly "realistic" or not.
3. Legal issues: There may be legal issues around ownership and copyright of content generated by AI. It is unclear how the law would treat content created by a machine, and this could create disputes over who has the right to use and profit from generated content.	3. Lack of control: Generative AI models can sometimes produce unexpected or undesirable results, such as offensive or biased content, due to the limitations of the data and algorithms used to train them.
4. Loss of jobs: In some cases, the use of generative AI may lead to the replacement of human workers, leading to job loss and economic disruption.	4. Risk of misuse: Generative AI can be used for malicious purposes such as deepfakes, creating synthetic images, audio or videos that can be used to spread misinformation or propaganda.
5. Dependence on technology: If an organisation becomes too reliant on generative AI, it may struggle to function if the technology fails or becomes unavailable.	5. Ethical issues: Generative AI raises ethical concerns about issues like privacy, autonomy, and decision-making, as well as potential biases in the data used to train the models.
6. Lack of accountability: It may be difficult to hold AI systems accountable for any errors or problems with generated content, as they do not have the same level of awareness or consciousness as humans.	6. Limited to specific task: Generative AI models are typically specialised for a specific task or type of data, and may not be easily adapted to other tasks or types of data.
	Overall, while Generative AI has many potential applications, it is important to be aware of its limitations and to use it responsibly.

[25] https://chat.openai.com

disadvantages, but they were not the same: for example, legal issues were a heading in the first response but were not even mentioned in the second one. We will return to the significance of these differences later.

Taking this list as inspiration, we offer the following list of the principal general challenges/challenges for industry.

4.4.1.1. Ethical issues. Rapid advances in AI have already raised serious ethical concerns (Duan et al., 2019). These concerns are exacerbated by the rise of generative AI such as ChatGPT. "As a ML model, ChatGPT does not have the ability to understand or consider ethical and legal issues. It is not able to make judgments or decisions based on ethical or legal principles." (Open AI ChatGPT).

4.4.1.2. Risk of misuse. A consequence of this is the risk of misuse, in the production of deepfakes, fake news or other types of disinformation. This also includes misinformation (unintentional misuse), for example where the generative AI's outputs are based on incorrect or inappropriate data.

4.4.1.3. Transparency and explainability. As with many AI systems, generative AI systems function as a "black box". The consequent lack of transparency makes it hard to understand why the system's output is what it is (Elliot, 2022).

4.4.1.4. Bias. "garbage in, garbage out" still rules. The generative AI's outputs will only be as good as the training data on which its learning was based. As with misinformation, simply using existing data may lead to unintentional bias, reproducing past mistakes and human biases.

4.4.1.5. Legal issues (1). there are few specific guidelines for the development of AI systems, and none specifically for the use of generative AI. Nevertheless, automated decision-making is regulated in some jurisdictions, and any use of generative AI in decision-making will have to comply with them.

4.4.1.6. Legal issues (2). generative AI has to be trained on very large amounts of data in order to be effective. Typically, this has so far used data "found" via the internet. It is not clear if industrial use of generative systems trained in this way for profit-making purposes breaches copyright; nor is it clear who owns the intellectual property rights in the output produced by a generative AI system.

4.4.1.7. Loss of jobs. if generative AI is used to produce text and presentations, which it can do very much quicker than humans and 24x7, what happens to the humans who used to do that work?

4.4.1.8. Dependence on technology. if generative AI applications become entrenched in an organisation's operations, there are two risks. First, what happens if the technology goes down? Second, although the generative AI systems may continue to learn "on the job", the human on the job learning that would have taken place may no longer be happening, thus reducing the chances for personal development.

4.4.1.9. Lack of originality. generative AI is, by definition, limited to combining existing information, so any originality will be incremental at best.

4.4.1.10. Effect of culture and personal values. some cultures, some organisations and some people may find it easier to accept the use of generative AI than others. This could lead to a new form of digital divide.

4.4.1.11. Design of prompts. the outputs from a generative AI system depend on the prompts it is given. Some people will find it much easier to devise effective prompts than others. There may be a need for widespread training in this new skill, that might even become as important as numeracy.

Moving on to the opportunities, in the context of industry, the opportunities afforded by generative AI are at present gaining more attention than the challenges. There are immediate opportunities for both customer-facing and internal use. All of them will require the AI's training database to include internal company information as well as generally available information. How this process will be managed is one more specific challenge for industry users and generative AI system providers: SMEs, for example, clearly could not build and run a generative AI system themselves with current technology. At present, those offering freely available generative AI software such as ChatGPT strongly warn against sharing sensitive information.

Generative AI offers a considerable improvement on current chatbots, being more conversational and better able to refer back to previous statements in a "chat" with a user. This is a clear benefit for both customer-facing contact centres and internal processes such as ICT support. Generative AI also offers opportunities to improve several aspects of customer interactions, from producing marketing copy and the early stages of the sales process through detailed interactions customised to each user into the aftersales area and potential longer-term relationships.

Creating computer code is an area where generative AI has already shown its potential.

Inter-departmental presentations are another potential opportunity. Here generative AI may be of specific assistance to people who are good at coming up with ideas but poor at explaining them to others. The ability of generative AI to produce arguments that persuade reluctant recipients has yet to be fully tested though.

One of the authors has discovered the benefits of using ChatGPT for planning trips. It saves a huge amount of time that would otherwise have been spent searching the internet. ChatGPT can filter the content, digest, and summarise the most relevant and useful information. It helps make decisions when selecting hotels, etc.

The impact of generative AI in industry will be considerable, and at present we have not even scratched the surface.

Next, we look at education, where one challenge has leapt to the top of the agenda at both school and university level in the space of a few weeks since the beginning of 2023, and for the moment overrides all others. This challenge is the effect of generative AI on assessments and examinations. This could be seen as either an ethical issue, a legal issue, or a type of misuse. In any form of written assessment except those under invigilated examination conditions, it is always a challenge to ensure that what a student submits is actually their own work. Copying someone else's work or paying someone else to write the submission have been problems for as long as written assessments have existed. The advent of the internet has made it much easier for "essay mills" to operate profitably. With software such as ChatGPT freely available, it is perfectly feasible for a student to use it to write some or all of their assessment. Current anti-plagiarism software such as Turnitin will not detect the use of generative AI, at least in the short term. As may be seen in Table 5, the responses that the AI system gives vary, even when the same prompts are used. Indeed, the two responses in Table 5 appear to be somewhat more different than might be expected from two students who had taken the same class. Eliot (2023) supports this reasoning. Software is already appearing that claims to be able to detect whether a piece of text has been written by a human author or an AI system, such as gptzero.me, but its performance in informal tests by one of the authors' colleagues was unconvincing.

Academics have already begun to experiment with asking generative AI to answer examination papers or assessments at university level. The conclusions are somewhat worrying. Tabarrok[26] reports the generative

[26] https://marginalrevolution.com/marginalrevolution/2023/01/ai-passes-law-and-economics-exam.html

AI software Claude as gaining a marginal pass on a university law and economics exam. Kung et al. (2022) found that ChatGPT performed at or near the passing threshold for all three of the examinations that make up the US Medical Licensing Exam. Terwiesch (2023) gives a detailed investigation of the performance of ChatGPT on the final examination in Operations Management from the Wharton MBA, concluding it would have achieved a passing grade of B or B-.

Apart from abandoning any form of "takeaway" assessment, the remedies to prevent students using generative AI seem to lie in the realms of making assessments more personal to the student's own experience. One of the authors regularly taught a final year class where all the students had done an industrial placement (paid internship) the previous year, and the main assessment was related to the role they had and the organisation they worked for. This is in accordance with the approach suggested more generally by Cooray and Duus, who advocate assessments that showcase a student's specific abilities (20 Dec 2022 blog[27]). As mentioned above, the freely available generative AI software strongly warns against sharing sensitive information, which would make it impossible to use for this type of assessment.

Similar issues apply to education at other levels, though less has been written about them so far.

There is nevertheless an opportunity for students to use generative AI in their learning, and for staff to use it to support their teaching. A generative AI system could, for example, act as a very patient tutor, explaining a concept in a number of different ways. An immediate risk is that, as with textbooks, some students know how to benefit from them and use them to learn, while others can only copy from them verbatim.

The impact on assessment processes and regulations is likely to be considerable. The use of ChatGPT has already been banned in schools in New York City.[28]

Turning to research, at least four academic articles have so far been published crediting a generative AI system as a co-author,[29] though the editor of one of the journals concerned has said this should not have been permitted. Taking the least technical of the four (O'Connor & ChatGPT, 2023), ChatGPT "wrote" the first five scene-setting paragraphs of this editorial article on how generative AI might affect nurse education. All the literature references are in the part written by the human author. ChatGPT is capable of including academic references in its responses, but only when a prompt specifically asks it to do so. GPT-3, its predecessor, was able to include references when specifically asked in the prompts, as in (GPT, Thunström, & Steingrimsson, 2022), but did not include them in responses to further related prompts.

As well as this limitation, the generative AI available at present does not seem to have the capabilities to discover new theories from data or suggest how to test theories, except at the level of standard methodological advice. It can certainly give useful introductions to topics, guiding the human researcher as to which ones to follow up.

The main challenges that apply to using generative AI in research are as follows.

4.4.1.11.1. Ethical issues. from generative AI's lack of judgement or "moral compass". Generative AI is not responsible or accountable for the content it generates, which poses significant challenges as to how to safeguard academic standards and integrity. Is it ethical to use generative AI's content in academic publications without acknowledging sources of data? Is it ethically and legally acceptable to directly use the text generated by a generative AI system in conducting and publishing research?

4.4.1.11.2. Legal issues. Generative AI poses a high risk for intellectual property (IP) and copyright protection. Taking ChatGPT as an example, OpenAI declares that it does not take any responsibility for any infringement of intellectual property rights that may occur as a result of the use of it. This has serious implications on how researchers can effectively avoid the potential IP infringement caused by the use of ChatGPT.

As described above, there have been publications with a generative AI as a co-author, but these are all clearly experimental. Can a generative AI system legitimately be credited as a co-author for academic publications if it is only a tool, not an independent researcher? Is the use of generative AI different from using software for statistical analysis or structural equation modelling? If so, how?

4.4.1.11.3. Transparency and explainability. Quality control of research outputs is of paramount importance in academia. Generative AI functions as a black box, meaning that its outputs cannot be fully scrutinised. This links to the next two issues.

4.4.1.11.4. Dependence on technology. without understanding how the system generates its output, decisions, or predictions, less experienced researchers cannot learn from the process.

4.4.1.11.5. Loss of jobs. with a generative AI system to trawl through the literature, will as many human research assistants be needed in the future?

4.4.1.11.6. Lack of originality. the main criterion for publication in an academic journal is novelty. Generative AI cannot (yet?) match human originality.

The main opportunity for generative AI in the short term, as some of the experimental papers have demonstrated, is as a research assistant for desk research. Generative AI systems are capable of reviewing, analysing, and summarising a huge amount of literature instantly (instantly from the point of view of the user: there will have been a long training time before the system was "launched"). They therefore offer enormous potential for improving the effectiveness and efficiency of desk research.

Journal/conference editors and reviewers may also be able to use generative AI to screen submitted manuscripts in terms of the quality of writing, formatting and referencing, contradictory or inappropriate statements, and so on.

Further down the line, generative AI can be used to analyse qualitative data, subject to dealing with several of the issues indicated above, and that of the security of responses that are often confidential. Meta-analyses and replication studies are two types of research project where generative AI's lack of originality, transparency and traceability may be less problematic.

To conclude this contribution, we consider how to address some of the challenges across all sectors, which may serve as a partial research agenda. We believe that the opportunities should be addressed with caution, and that the greatest potential for generative AI lies in human-AI hybrid performance (Duan et al., 2019).

4.4.1.12. How to make generative AI more responsible and ethical?. There has been growing effort, mainly academic, on developing and implementing responsible and ethical AI for the benefit of humanity. However, it seems there is a very slow progress in making notable practical breakthroughs so far. The rising ethical concern about generative AI is another wake up call for advancing research in this area. For example, AI faces challenges of overcoming bias "that lurks in the undercurrents of the internet and society more broadly." (McKinsey & Company, 2023). This is particular acute for generative AI.

We feel the most important point is that ethical AI is not just the responsibility of the AI developers. Multiple stakeholders can, and must, make positive contributions towards designing and deploying more responsible and ethical AI. Politicians, managers, users, customers and even the general public all have inputs to make from their different viewpoints. Crucially, this requires developers to be far more open (and perhaps more truthful – the lack of openness makes it hard to judge) about what they are doing than some of the industry leaders have been

[27] https://charteredabs.org/dare-to-evolve-re-assessing-assessments-in-business-schools/

[28] See https://www.theguardian.com/us-news/2023/jan/06/new-york-city-schools-ban-ai-chatbot-chatgpt#:~:text=New%20York%20City%20schools%20have,in%20New%20York's%20public%20schools

[29] See https://www.nature.com/articles/d41586–023–00107-z

so far. Researching this requires access.

4.4.1.13. How to minimise the risks and maximise the benefit of generative AI though a human-centred AI approach?. The potential misuse or abuse of generative AI provides another strong motivation for an insistence on human-centred AI development and deployment (Duan, Edwards, & Dwivedi, 2019). The call for "human in control" or at least "human in the loop" is becoming ever stronger and more convincing. In the context of generative AI, researchers should explore how best humans and AI can work together to maximise the opportunities and benefit of generative AI, as well as minimising negative impact and risks.

4.4.1.14. How can generative AI be used to augment human capability?. ChatGPT has certainly impressed educators in terms of its potential for enhancing academic and students' performance (Alshater, 2022a, 2022b). It can be powerful in combination with humans, augmenting their capabilities and enabling them to get work done faster and better (Chui, Roberts, & Yee). How generative AI can be developed and utilised to augment human capacity deserves further investigation across all sectors.

As far as we are aware, there are as yet no generative AI systems specifically intended to make or support decisions. This may require the integration of the generative AI system with other IS, and this area has seen very little research so far.

4.4.1.15. How to enhance generative AI's benefit through personalisation?. Currently openly accessible generative AI systems such as ChatGPT serve as a common content generating tool. Personalisation is an essential criterion for the successful adoption of AI tools (Duan et al., 2012). Many issues related to the challenges and limitations of generative AI can be more effectively addressed by customising the systems at individual and organisational levels. However, personalisation requires a huge amount of time, effort and resources from the end users and the organisations concerned because they need provide reliable data and fine-tune the model to align with their needs, value, ethical principles, and relevant regulations, and do so securely. This is a potentially huge research area.

4.4.1.16. How to deal with generative AI's technical limitations?. We use ChatGPT as an example of generative AI's technical limitations, as it is the one we have been able to use for ourselves. These limitations offer research opportunities.

- Real time automatic data update - One of the major weaknesses of ChatGPT is its inability to consider real-time events and information when generating output. Real-time content creation is still a challenging task that requires more advanced technologies.
- Dealing with imperfect information - How AI can deal with imperfect information is recognised as a significant challenge (Dwivedi et al., 2020). This is particularly evident in the context of ChatGPT.
- Transparency and explainability - It is imperative that generative AI should be designed and developed in a way that can be transparent, explainable, and accountable.
- Integration of generative AI with other systems to augment its overall system performance and capability.
- Development of domain specific generative AI systems that can minimise ethical concerns, discrimination, plagiarism, copyright infringement, etc.

This contribution has offered a general overview on the use of generative AI and a partial research agenda. Can generative AI help in this research? That will be a research topic in itself. ChatGPT gave us some assistance in deciding how to begin this contribution, but except for the content of Table 5, all the writing and thinking is ours.

Recent breakthroughs in generative AI, like the rise of ChatGPT, have demonstrated its exceptional performance of surpassing human beings in information processing and human like content creation. Consequently, there has been a sudden explosion of interest and publications on generative AI. Despite the extensive reports and discussions about ChatGPT, there are numerous contradictory claims, unrealistic expectations, and superficial understanding, especially in terms of its capabilities, benefits, threats, and impact. Some people view generative AI as just as a powerful tool, but others believe that it may be the beginning of an era of the creation of disruptive AI that will eventually destroy humanity (discussion on BBC Radio 4, 26 Jan 2023).

Overall, there are more questions than answers regarding the rise of generative AI. Researchers will have to embrace the evolving challenges as well as opportunities presented to maximise the benefit and mitigate the potentially negative impact of generative AI on society, industry, education and research. Addressing the emerging challenges and impact also provides the opportunity to better prepare ourselves for the emergence of other powerful AI tools in the future.

4.4.2. Contribution 33

4.4.2.1. Use the SACE and ADROIT framework to assess challenges, opportunities, and research agenda related to ChatGPT - Sunil Mithas. When Prof Dwivedi (EIC, IJIM) invited me to write a "two page multi perspective editorial" on ChatGPT, I initially assigned the task to ChatGPT and results were far below my own expectations given the hype that I had seen on social media. Much of what ChatGPT wrote was common knowledge or verbosity without a point of view or original thinking. It pointed to "large computational requirements" as a challenge to deploy for "smaller organisations or individuals" and for "real-time applications such as chatbots." In addition, it acknowledged "tendency to generate biased or offensive text" which can "have negative impacts on society" such as "fake news or deepfake videos, which can be used to manipulate public opinion" and "the displacement of human translators." Yet, it pointed to opportunities such as "create content such as articles, stories, and scripts. This can be particularly useful for content creators, such as writers and journalists…[to] improve language translation, which can facilitate communication and understanding between different cultures." And then it went on to suggest further research opportunities in the above areas "to understand the potential impacts of ChatGPT on society and develop strategies to mitigate any negative effects."

I draw here on my prior research and writings for assessing ChatGPT or technologies similar to it and argue that a sobering and more useful view of ChatGPT will require consideration of the functionalities that it may enable: (1) the ability to sense the environment (*Sense*); (2) the ability to analyse information (*Analyse*); (3) the ability to collaborate with others within or across firms (*Collaborate*); and (4) the ability to

Table 6
The ADROIT Framework for assessing the economic value of AI technologies such as ChatGPT.

Framework component	*Examples*
Add revenues	AI systems can enable firms to grow revenues by scale up their volumes, making better pricing decisions, or through customization.
Differentiate	AI may enable firms to offer personalised products and services for differentiation.
Reduce costs	AI may reduce costs through automation, and even elimination of tasks.
Optimise risk	AI can help to manage risks, but it also creates new risks that are not yet fully understood. Managing such risks will require careful thinking by policymakers as well as managers.
Innovate	AI can enable innovation and rapid new product development.
Transform	AI can help to transform society and lives by empowering marginalised groups and achieve sustainable development goals if managed and regulated thoughtfully (Tang, 2022).

automatically complete tasks (*Execute*).sense, analyse, collaborate, and execute (Mithas et al., 2022). The SACE acronym captures the four functionalities (Sense, Analyse, Collaborate, and Execute) and is a useful starting point for a critical assessment of emerging technologies such as ChatGPT and Metaverse. Applying the SACE framework to ChatGPT, one may ask, will ChatGPT by itself help to "sense" the environment beyond what is possible currently? Can ChatGPT help to "*analyse*" data in more insightful ways given the dismal record of similarly hyped prescriptive and cognitive analytics as IBM discovered? Will ChatGPT enable new possibilities to *"collaborate"* across firms and value-chains by itself? Finally, will ChatGPT enable "*execute*" capabilities to open up new possibilities for delivering new efficiencies in manufacturing, and particularly service sectors such as healthcare and education that some argue are subject to Baumol's disease (Baumol, 2012)?

I avoid the temptation to call ChatGPT as a "disruptive innovations" given my scepticism about the key premises of such labels (King & Baatartogtokh, 2015; Tellis, 2006). Instead, a theory of disruptive debottlenecking can be helpful here by asking if a new technology helps to avoid or overcome tradeoffs that prior generations of technologies too for granted (Mithas et al., 2022). In the end, the business or even societal value of ChatGPT must be assessed in terms of its influence on adding revenues, differentiating, reducing costs, optimizing risks, innovating, and transforming business models and processes from a business and societal perspective as I have argued elsewhere, and shown in Table 6 (Mithas, 2016; Mithas et al., 2022, 2020).

The hype about AI is not new and goes back to Herbert Simon's predictions about AI back in 1960 (Mithas et al., 2022; Simon, 1960). Continuing advances in AI can bring changes to how firms compete, yet such changes often take decades to materialise and not all changes are positive. Firms must develop their AI strategy as part of their overall IT strategy, and competitive strategy with attention to governance and execution issues (Mithas & McFarlan, 2017). It is time to reimagine digital and business strategies at the corporate, competitive and functional levels leveraging opportunities that AI presents, rethink how they create value using AI for the business and its customers, and on how they appropriate some reasonable part of that value among their key stakeholders (Mithas et al., 2020). Although there are good reasons to have a healthy scepticism for hype created by self-serving technology entrepreneurs or uninformed commentators, some aspects of AI do raise fundamental philosophical questions beyond business processes to how such technologies shape human identity. Simon exhorted us to carefully assess the role of technology in rethinking "man's conception of his own identity as a species…a new way of describing his place in the universe" (Simon, 1960, p. 55) and we must bear that in mind as we engage in our roles as educators, and researchers.

4.4.3. Contribution 34: ChatGPT: challenges and opportunities - Margherita Pagani

The advent of ChatGPT (General Pre-Trained Transformer), a highly advanced AI chatbot classified as a large language model, has caused a stir in the technology world. This cutting-edge tool capable of generating convincing and intelligent-sounding text in real time raises concerns about the authenticity of the generated text and the potential for the perpetuation of biases in its training data. Academic stakeholders including journal editors, researchers, and publishers are engaged in discussions regarding the appropriate utilization of AI tools in the publication process and the acceptability of citing AI systems as authors (Stokel-Walker, 2023). Despite these challenges, ChatGPT can potentially transform how we approach education, business, and research. The primary focus of this editorial is to emphasise the significant challenges and opportunities in these three key areas.

In the realm of **education**, conversational AI platforms like ChatGPT and Amelia have the potential to revolutionise the traditional faculty-centred approach by providing 24/7 access to virtual instructors with globally validated knowledge, available in any language and format, and on any device (Wind, 2023). This can transform the role of the faculty into facilitators of learning and implementation. This shift towards a student-centred educational paradigm can prove to be highly beneficial.

In **businesses**, conversational AI can enhance creativity by providing fast, effective, and human-like customer interactions. This can lead to new and innovative ways of customer engagement, automate routine tasks, and provide valuable insights into customer behaviour and preferences (Kietzmann et al., 2018; Ma & Sun, 2020). By freeing up time and resources, businesses can focus on more creative and strategic initiatives such as product development and marketing campaigns (Pagani and Champion, forthcoming). Companies such as H&M, Airbnb, Capital One, and Oracle are also using conversational AI for enhancing customer service, providing personalised recommendations, assisting guests, offering personalised banking services, and providing enterprise solutions. Bank of America uses conversational AI in its customer service operations to automate routine tasks and provide fast and effective interactions with users (Bank of America, 2022). This has helped the bank reduce wait times and improve customer satisfaction. Google uses conversational AI in its Google Assistant platform to provide users with a natural and intuitive interface for accessing information and performing tasks, including data analysis, providing insights into user behaviour and preferences (Google, 2023). The use of conversational AI offers a wide range of potential applications allowing companies to improve customer experience, automate routine tasks, gather customer insights, and drive innovation in their industries.

Despite the numerous benefits in various applications, its usage also entails certain drawbacks that should not be overlooked:

1. One of the major challenges posed by ChatGPT is the *presence of deep fake text*, as demonstrated by a recent study (Else, 2023) that proved the ability of the AI system to write convincing fake research-paper abstracts. To address this issue, there is a need for ongoing research to develop methods for detecting deep fake text. Moreover, addressing the bias present in the model's training data is also crucial. For example, if the model is trained on a dataset that contains gender stereotypes, it may generate text reinforcing those biases.
2. Another significant drawback of ChatGPT is the *propagation of misinformation*. This can occur when the model is fed false or misleading information during its training, leading it to produce inaccurate or unreliable responses. This can have significant consequences, especially in applications where the information provided by ChatGPT is relied upon, such as in the context of decision-making or information dissemination.
3. Another issue is the *lack of awareness of local rules and regulations*. ChatGPT operates on a global scale, and its responses may not be aligned with local laws and regulations. This can result in the dissemination of information that is legally or culturally inappropriate.
4. Finally, the training of ChatGPT on the vast amount of information available on the Internet, which encompasses both good and bad aspects of human behaviour, can result in the *propagation of inaccuracies*. This highlights the importance of monitoring and verifying the information used to train language models, as well as the outputs they produce.

By focusing on ongoing **research** to address the potential risks, we can ensure that this technology's benefits are realized and positively impact society. The key areas of focus should include: (i) developing methods for detecting and mitigating bias, (ii) improving deep fake text detection, (iii) investigating applications in education and accessibility, (iv) exploring the use of ChatGPT in industry, and (v) advancing our understanding of language and human communication.

In conclusion, as the use of generative AI systems like ChatGPT becomes increasingly prevalent in various industries, it is imperative that employees and managers of the future (MoF) acquire a range of human

skills to work effectively and responsibly with these systems. This implies challenges not only to the educational paradigms but also to the curricula that business schools must provide. From critical thinking and digital literacy to creative problem-solving and ethical decision-making, the skills needed to thrive in the AI-powered future are diverse and multi-faceted. Understanding how to manage data, apply interdisciplinary knowledge, and communicate effectively with technical and non-technical audiences are essential skills in this new era. The acquisition of these skills will ensure that individuals are well-equipped to navigate the rapidly-evolving landscape of AI, and can make informed and ethical decisions as they work with these powerful systems.

4.4.4. Contribution 35

4.4.4.1. Moving from prediction to creativity: implications of generative AI on measurement of success - Kai R. Larsen. For the last three decades, ML has primarily focused on predicting and evaluating ML models (e.g., Merhi, 2022). Researchers evaluated algorithms through the efficacy of the model outputs. They assessed a model's predictions based on its ability to replicate patterns seen and extend those to different people, settings, and contexts, examined through cross-validation, holdout, or actual predictive performance. They evaluated the efficacy of an algorithm with metrics such as precision, recall, and the F-measure, generally efficacy validities (Larsen et al., 2020). These validities are still important. However, we need a new class of validities for a new type of AI.

Building on the success of predictive algorithms, recently, a new class of "generative AI" has emerged. These algorithms produce works that we can only initially experience through the five human senses {to keep to the original and popular conception of the senses; \Rosenblum, 2011 #5859}. Recipes through taste and smell, music through hearing, and art through sight. Only touch has *so far* been mostly unaffected. Generative text applications like ChatGPT are sensed through sight and hearing and evaluated against the totality of individual experiences as their outputs are interpreted and understood by the mind. We need new types of validities, which we'll call characteristic validities. These validities evaluate the characteristics of technology artifacts, whether their parts, design, or outputs. Because outputs of generative artifacts, such as ChatGPT, have never existed before and have no existing or (likely) future criterion for direct comparison, humans will assess the artifact performance filtered through their senses and experiences.

Beyond measurement, these generative AIs raise questions about the nature of human creativity. Still, to answer this question, we must assess how we will evaluate the outputs of a generative system. We argue that there is a need for a framework (see Fig. 7) for validating claims about generative AI systems.

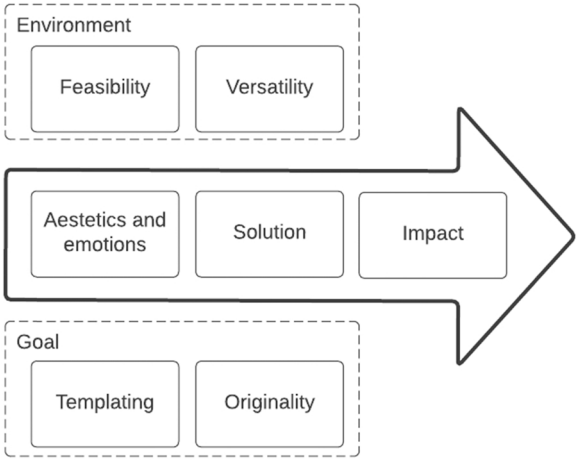

Fig. 7. A framework for evaluating generative AI.

This framework must distinguish between the goals of the artifact, such as **claims of templating** and **claims of originality**. Most human tasks require templates, allowing us to learn a specific style of expression. Templating is about whether an output fits the expectations of a good exemplar of the type of template. Originality is whether humans consider the content of the production unique, insightful, or expressive, whether templated or not.

Claim 1. **Claim to templating**. The generative artifact produces outputs that fit a required template. Such templates include executive memos, tweets, blog posts, presentations, portfolios, scripts, and prototypes. This claim will be evaluated through characteristic validity.

Claim 2. **Claim to originality**. The generative artifact produces original works not previously seen. Work that is innovative and significantly departs from existing concepts and ideas. This claim will be evaluated through characteristic validity.

Further, the framework must consider the environment in which the artifact outputs are employed. Is the artifact flexible enough to produce relevant results for both tweets and executive memos? Does it work for different contexts, such as administrative memos in an automobile company and a non-profit such as Doctors Without Borders?

Claim 3. **Claim to feasibility**. Is the output practical and executable? Is it scalable to real-world applications? Is the work socially responsible? This claim will be evaluated through characteristic validity.

Claim 4. **Claim to versatility**. Can the output be used in multiple ways? Can it be adapted to differing contexts? This claim will be evaluated through characteristic validity.

The outputs may impact human observers, such as engaging emotions like love for a person who shared a generated poem and anger towards the government from a tweet criticizing the functioning of Washington, DC. The output, such as a list of potential ways to improve the bottom line of a bike-rental company, may be claimed as fulfilling the requirement of its user. That is a solution for the problem for which the user engaged the artifact. Finally, the output may have a direct impact on the world, which may itself be measured. For example, an artifact may directly contact all likely voters in a district and argue on behalf of a specific candidate. We may measure the outcome of this action through the election outcome, the amount of political giving from those contacted, or the individual votes for the candidate.

Claim 5. **Claim to aesthetics and emotion**. Some outputs, such as texts designed to convince, music, and paintings, must produce feelings and emotions in the recipient. This claim will be evaluated through characteristic validity.

Claim 6. **Claim to a solution**. Does the generative artifact produce outputs that effectively address a problem or challenge? Humans here evaluate the output in terms of its quality. This claim will be assessed through characteristic validity.

Claim 7. **Claim to impact**. The user may engage the AI, or an independent implementation of the AI will be used in a setting. Such as to generate a tweet or blog post. It is *instantiated* into a system. It, therefore, can create impacts that may be measured, such as likes and retweets. This claim will be evaluated through efficacy validity.

As we further understand how to evaluate generative AI, we may, by extension, start to understand human creativity. As AI evolves in capability *and* creativity, shared researcher understanding of evaluative criteria will be critical to fully understanding ChatGPT and equivalent artifacts.

Table 7
Organisations investing in ChatGPT and similar platforms.

Name of the Organisation	Investment	Expected outcome and strategy	More details
Microsoft	USD 1 billion in OpenAI; Target USD 10 billion investment in OpenAI over the next few years	Microsoft search engine Bing received only approximately ten percent of the total search engine queries in the previous year. Using ChatGPT in the Bing search engine will make its search results superior and attract more users, besides providing tough competition to Google.	https://www.sciencefocus.com/future-technology/gpt-3/ https://www.cnbc.com/2023/01/23/microsoft-announces-multibillion-dollar-investment-in-chatgpt-maker-openai.html
Google	An undisclosed amount of investment by Google in ChatGPT type medical chatbot MedPaLM	MedPaLM, AI-based healthcare platform funded by Google and DeepMind, is an equivalent of ChatGPT in the medical domain. It answers all medical queries based on its large healthcare datasets. This is besides Google's investment in the NLP platform Bidirectional Encoder Representations from Transformers (BERT).	https://analyticsindiamag.com/google-introduces-chatgpt-like-model-for-healthcare/ https://www.techtimes.com/articles/285845/20230104/google-research-and-deepmind-launch-an-ai-based-healthcare-language-model.htm
Meta	An undisclosed amount of investment by Meta in BlenderBot 3.0	Blenderbot is a chatbot which was developed by Meta before ChatGPT was launched. It is improving its chatbot based on consumer feedback, with its latest version being BlenderBot 3.0	https://ai.facebook.com/blog/blender-bot-2-an-open-source-chatbot-that-builds-long-term-memory-and-searches-the-internet/ https://www.wired.com/story/blenderbot3-ai-chatbot-meta-interview/

4.4.5. Contribution 36

4.4.5.1. ChatGPT: challenges, opportunities, impact and research agenda-Neeraj Pandey, Manoj Tiwari, Fevzi Okumus and F. Tegwen Malik. ChatGPT optimally harnesses the power of generative AI, large connected datasets, and how meaning is derived from linguistics using natural linguistic programming (NLP) for engaging with a user. ChatGPT, the chatbot launched by the California-based company OpenAI, can be a substitute for search engines for various queries. It provides specific answers to the queries, and the user can save precious time as s/he is directed to the relevant website or the solution. Search engines like Google (Alphabet), Yahoo, and Bing (Microsoft) face an existential crisis from ChatGPT. Microsoft is collaborating with ChatGPT by investing heavily in its parent company OpenAI (Table 7). This may provide Microsoft's Bing an opportunity to increase its market share in the search engine sector and eventually become more popular than market leader Google.

ChatGPT is perceived as a super being in terms of interactions and responses, if not superior to humans. Organisations that can understand and leverage the power of ChatGPT early would have a first-mover advantage. It would provide organisations insight into how it fits in their business operations and how it may be further be adapted for a specific business task. ChatGPT has joined the bandwagon of new-age technologies like metaverse, which are revolutionizing the workspace with new ways of B2B and B2C client interactions (Dwivedi et al., 2022a, 2022d). With a million users in its first week of the launch, the popularity of the ChatGPT can be gauged from the fact that it is running to its fullest capacity most of the time of the day.

4.4.5.1.1. Opportunities and impact. As digital technology-based platforms like social media, search engine optimization, and service-sharing platforms evolved in the early twenty-first century, a few organisations and sectors were in denial mode. They did not explore its potential for their businesses. We saw such companies losing the growth opportunity as they realised too late its advantages and potential for their business. The same applies to ChatGPT, which has immense potential to impact businesses in highly productive and profitable ways. The sector-wise key opportunities for leveraging ChatGPT are as follows:

Education: ChatGPT would aid progressive new-age teaching-learning processes like flipped classroom formats and blended learning. The ChatGPT will provide basic reading material on the topic, and the student will discuss higher-level analytical and behavioural learnings with the faculty in the class. This would facilitate flipped classroom learning, promoting an active learning process (O'Flaherty & Phillips, 2015). This would be a game changer in the education sector, where the focus can be shifted to practice-oriented training and applied life skills. ChatGPT will also help minimise rote learning and do routine jobs like scoring and checking quizzes, besides being a major input to the blending learning agenda.

Healthcare: ChatGPT and platforms like MedPaLM would provide a boost to digital health initiatives. It would give valuable input to medical and paramedic staff in the primary healthcare centres in remote areas under the supervisor of a trained physician. The augmentation of ChatGPT in healthcare training may reduce the learning cycle time for the participants.

BFSI: ChatGPT will replace routine (non-critical) jobs like customer care, basic financial analysis, and text analytics for customer sentiments in the Banking, Financial Services, and Insurance (BFSI) sector. The audit and advisory services would get boost by accurate analysis, which would help banking executives to focus more on the insight and implications piece of client-interface process.

Hospitality and Tourism: The service providers in hospitality and tourism can provide ChatGPT as a widget on their website. ChatGPT would act as a round-the-clock interactive interface for the customers for providing the travel, food, vehicle, and tourist locations along with their distance. It can enhance customer experience and minimise the manpower cost for service providers.

Research & Development (R&D): ChatGPT would enhance the pace of R&D by providing basic information on the topic in multiple dimensions. It can provides support in the coding and debugging of codes. It would also reduce the probability of duplication of R&D activities that have been publicised.

Legal services: Legal services highly depend on written laws of the land and past judgments. ChatGPT provides advisory and support documents by text-mining legal databases in an efficient manner. This would enhance productivity multi-fold for individuals, regulators, and law firms working in this industry.

4.4.5.1.2. Challenges. Sectors like education, healthcare, IT, legal services, hospitality and tourism are likely to be disrupted by ChatGPT. Despite the several opportunities brought by ChatGPT, there are real challenges that need to be addressed by the stakeholders. Some of the key challenges include:

Digital divide: This has been an issue since the IT revolution. This is going to be further accentuated when the individuals and firms with access and expertise over ChatGPT would have an extra edge in available opportunities and service delivery. How can ChatGPT services be provided where there is little or no internet access? How can ChatGPT

minimise the existing digital divide? These and many more such questions, like ensuring a level-playing field for all communities and ethical dimensions, need to be addressed as we go ahead.

Regulation: ChatGPT provides expert advice to users and is gradually becoming an integral part of our society. However, there have been cases of racial overtones, biased answers (stereotypes) due to the existing database, and questions on the accuracy of medical advice about ChatGPT. It has been banned by many organisations like Sciences Po University in France, public schools in Western Australia, and Stack Overflow as they have yet to figure out how to regulate it for the larger well-being of their stakeholders. There is a need to devise a global protocol for regulations of such generative AI platforms, as such services are available across many countries.

Cultural sensitivity: Like other AI tools, ChatGPT also faces challenges with cultural sensitivity and issues involving empathy. The issues like comments on certain personalities, religious matters, and other delicate issues need to be addressed, as each region may have its sensitivities.

Unemployment and Reskilling: Highly populated countries like China, India, and Brazil have sizeable employable population. ChatGPT is likely to disrupt many industries and automate many routine and repetitive jobs (Agarwal et al., 2022). This would lead to mass unemployment and reskilling requirements.

Cybercrime: Cybercriminals, even with limited coding and IT skills, may become more aware of the hacking tools through ChatGPT. Challenges regarding creating appropriate control on ChatGPT about information dissemination on creating phishing and malware software need to be addressed.

Integrity issues: The ways to identify the actual scriptwriter as compared to text created by ChatGPT have been elusive till now. The black box phenomenon, where we sometimes do not understand the logic behind a ChatGPT answer, is intriguing. The accountability for certain answers on ChatGPT, like in healthcare or mentoring services, remains a challenge that needs to be addressed.

4.4.5.1.3. Research agenda. Generative AI has gained the interest of many investors and organisations. However, these AI-related advancements, including deep learning chatbots like ChatGPT, will never replace humans but would aid in making us more productive and help in achieving higher-order needs. The best results would emerge with appropriate augmentation of technological developments like ChatGPT, metaverse, 3D printing, blockchain, and internet of things (IoT) with human intelligence.

Thus, the scholars working in this domain may explore the following research questions (RQs):

RQ1: What should be the globally accepted regulation standards for platforms like ChatGPT and MedPaLM?
RQ2: What should be the "fair price" for ChatGPT services to individuals and corporations?
RQ3: How can ChatGPT reduce the widening digital divide between persons having and those not having internet access?
RQ4: What are the key markers to identify whether the text is generated by ChatGPT or written by a living person?

4.4.6. Contribution 37

4.4.6.1. ChatGPT: challenges, opportunities, impact and research agenda - Paul Latreille. ChatGPT is an advanced AI chatbot developed by OpenAI. Built on large language models it launched on 30 November 2022 and has attracted unprecedented interest due to its ability to provide detailed, 'conversational' responses to text prompts on a wide range of topics and in a variety of styles, "to answer follow-up questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests" (https://openai.com/blog/chatgpt/). Analysis by Similarweb reported in the Guardian suggests ChatGPT reached 100 million users in the first two months. Both Microsoft and Google are rapidly developing competitor platforms. Others in this volume are more qualified to elaborate on ChatGPT's wider capabilities and limitations; the focus here is on its potential implications for educational practice.

Public interest in ChatGPT is similarly both recent and viral. Google Trends for example (https://trends.google.com/trends/explore?q=chatgpt), documents insufficient data to register searches for the term "ChatGPT" prior to the week 20–26 November 2022, rising to a maximum value of 100 in the most recent week with full data at the time of writing (i.e., 29 January-4 February 2023). Focusing only on the rather nebulous 'Jobs & Education' category (https://trends.google.com/trends/explore?cat=958&q=chatgpt) is revealing: two of the three top 'Related Topics' are "Plagiarism" and "Content similarity detection", while the second and third most frequent 'Related queries' are "ChatGPT plagiarism" and "plagiarism" respectively (with "ChatGPT checker" fifth). This reflects a (arguably *the*) major concern among educators, namely the downside of ChatGPT's potential for students to 'outsource' tasks, for example for-credit essays or personal statements.

A number of implications follow. First, reflecting an existing theme in the literature on academic misconduct/integrity, educators will need to wrestle further with assessment design. At least some existing strategies to 'design out plagiarism' (Carroll, 2007), including the use of "academic custom writing services, essay banks or essay mills, private tutors or freelance workers" (Rafalin, undated: 1) are likely to be less effective against ChatGPT and its counterparts. Some educators/institutions may retreat to the comfort of traditional time-limited, in-person examinations; others may instead "consider innovative formats of assessments, particularly those… [requiring] creativity and… critical thinking" (Zhai, 2022: 10). Given the potential for ChatGPT to change the nature of office-based jobs in the future, part of the change to assessment is also likely to involve an embrace of such technologies (Jisc, 2023), building them into novel forms of 'authentic assessment' and facilitating a new generation of 'digital literacy'. In the short-term however, like COVID, ChatGPT appears to have largely caught institutions off guard and scrambling to adapt to a shifting reality.

One hitherto unmentioned corollary of ChatGPT's ability to author essays is its impact on parts of the assessment ecosystem. For example, it seems likely to prove highly disruptive to the business models of contract assessment-writing services. Currently free, even a paid-for ChatGPT is likely to prove cheaper, offer faster turnaround times and (as it learns) deliver similar quality to existing human services.[30] A second is the impact on plagiarism detection services such as Turnitin. Such services are already gearing up to tackle the threat to academic integrity of ChatGPT (turnitin, 2023). At the time of writing, a student-developed app – GPTZero – can do so with a high degree of accuracy, subject to access to the underlying models (Wilkins, 2023). That may not continue to be the case, at least for AI providers dependent on commercial funding streams. Either way, an 'arms race' seems almost inevitable, at least in the absence of assessment adaptation of the type described earlier.

Much of the discussion of ChatGPT focuses on its negative potential in terms of academic misconduct. However, models of the type represented by ChatGPT also offer a number of affordances that could substantially enhance educational practice and student learning. Firat (2023) for example, points to the ability of AI to provide a personalised and interactive experience in relation to progress, support, feedback and guidance, thereby enhancing learner autonomy, experiences and engagement. Indeed, one could easily envisage a future in which marking of student assignments is primarily undertaken by AI-based systems, providing more detailed and faster feedback on both formative and summative assessments than academic staff. Scalability is a key feature, given massification of higher education globally (Tight, 2019),

[30] An interesting question is the extent to which identical (or very similar) prompts by a cohort of students delivers distinguishably different responses.

and where delivering on promised turnaround times for marking in a drive for higher student satisfaction metrics has exacerbated work intensification. How the academic time freed up is redeployed, is of course, open to conjecture.

Other benefits can easily be identified. In a fascinating article written in conjunction with ChatGPT, Zhai (2022) looks, inter alia, at AI's implications for the future of education. Along with personalisation of learning, tutoring/mentoring and support, and automation of various routine administrative functions, such systems are predicted to permit the development of AI-powered educational games and simulations.

Ultimately, the novelty of ChatGPT renders prediction a risky game, other than that such technologies are here to stay; AI is a genie that cannot simply be put back in the bottle. For educators, two aspects are vital. The first is the need "to reflect on our learning goals, outcomes, and assessments… We should not let our existing approaches remain simply because this is the way we have always done them" (CMS|W, 2023). The second is that such a task will be challenging given pedagogy is likely to be playing catch-up for some time; (further) educational research in this domain is imperative!.

4.4.7. Contribution 38

4.4.7.1. ChatGPT: challenges, opportunities, impact and research agenda – Robin Gauld. For readers of IJIM, ChatGPT will have been a topic of considerable discussion, as well as consuming a lot of time experimenting with and thinking through its implications and applications. This certainly describes my experience. As with others, I have used ChatGPT for everything from developing a new course I will teach later this year, through to solving an obscure question relating to referencing software.

It did a very good job indeed of providing me with a solid foundation for the course. In moments it spun out a course overview and set of objectives as well as an outline of what would be covered through 12 weeks of classes. It generated a very good essay question and when asked wrote a pretty good 1500 word response. It gave me material to use in slides and also a good reading list for the course. All of this was done in a matter of minutes, most of which was me reviewing responses and deciding what to ask next.

Fortunately, the course is one most business schools globally offer, in business ethics, ironically. ChatGPT would have struggled to generate a course on a completely new topic that had never been offered anywhere before. Journalists I know who have been worrying about what it means for their jobs have been relieved to learn from ChatGPT that 'as an AI language model I don't have access to real-time news updates. My training data only goes up until 2021, and I don't have the ability to access current events'. The database for ChatGPT is, therefore, not current. It is not presently likely that the information gathering and analysis involved in many roles will be surpassed by generative AI. Nor is it likely that the work done by humans in using the generated information will be subsumed.

I know school teachers who, at least in my native New Zealand, have taken to ChatGPT like a drug – apparently it has gone viral. Teachers are marvelling and grateful for the way it is able to produce basic lesson plans and cut through other administrative and compliance work – paperwork that has to be submitted to school administrators and government agencies – that takes considerable time to collate. This is time teachers do not have in their busy teaching schedules, and is usually done in evenings and weekends. ChatGPT is freeing them up to focus on what matters – working with our children and their parents.

For basic tasks that an internet search is not able to easily help with, ChatGPT seems to fill a gap. My referencing software question, a genuine issue I was facing where a style I required was actually different from the named style in Endnote, was nicely solved by ChatGPT. I Googled away getting nowhere then thought I would try ChatGPT. To my relief, it solved my problem, telling me the name of the style I needed (a rarely used variation, and plug in). This is the power and opportunity it offers.

With ChatGPT, OpenAI has upped the stakes. Investments in it have grown significantly, and the other big tech companies are working concertedly on their own offerings. As indicated, the opportunities and impact of generative AI are tremendous. For those of us involved in leading and teaching in universities, an acute awareness and embracing of the technologies will be important. Our students will undoubtedly embrace ChatGPT. Through incorporating it in the class and beyond, we must equip them for the workforce of the future. The worst students, of course, will use the technology to cheat. Unsurprisingly, there is now an industry of ChatGPT detection tools emerging, of variable reliability.

The best students, along with their teachers, will find creative ways of working with the technology. We need to think carefully about how to design classes where students actively use ChatGPT in a process of co-curricular and learning design. Should we, as many are suggesting, incorporate aspects of oral examination into classes, or are there other ways of ensuring students are using the technology honestly and productively? There is a potential revolution in terms of class design and pedagogy on our doorstep. We have limited time to think through our responses and must learn from one another in the process.

The research agenda is wide ranging, encompassing every academic discipline, with significant potential to make major gains. Areas such as healthcare and education are obvious where research is needed into how the technology will be most effectively used, what the risks are and what it means for training, work and service delivery. The same with areas such as law where there is considerable scope for assisting with processes of researching and preparing cases. There is going to be a huge demand for research into implications for information gathering, decision-making and services in government and policy making as well as other areas with public impact including for businesses and shareholders. The research community must engage with how ChatGPT is used for research, what key questions need probing, and what the longer-term implications are. This includes a significant new risk to all who use the technology to assist their work – that of cyber trust.

In sum, ChatGPT is a game-changer. The impacts may not be as profound as some predict, but it is clear that as it evolves and we adapt as users, there will be some significant shifts resulting.

4.4.8. Contribution 39

4.4.8.1. Challenges, opportunities, and impact of ChatGPT in the IT industry - Nishith Pathak. OpenAI's GPT-3 (Generative Pre-trained Transformer 3) is a ground-breaking AI language model that has captured the attention of the AI community and beyond. ChatGPT can safely be assumed as a viral sensation that could completely change the way we do things currently. It is probably one of the faster growing technologies that world has ever adopted. It took 3.5 years for Netflix to have 1 million users' adoption. Facebook just took 10 months, Spotify took around 5 months, IPhone took 74 days for the same adoption. You would be amazed to hear that it took just 5 days for world for reaching 1 million users. For some folks – it can be just a writing assistant tool can provide suggestions or even write entire paragraphs based on what you've told it. For others – it can be largest neural network trained with over 175 billion parameters making him one of the most advanced language models in field of NLP. Nevertheless, with the adoption rate and for the first time, it is safe to say that world have ever seen a technology that is going to reduce the gap between Human and robots' machine, revolutionise the way how we interact with computers, making it easier and more natural to communicate with them. Probably sooner or later, one of the versions of ChatGPT would pass Turing Test.

4.4.8.1.1. Challenges to the IT industry. With its ability to perform a wide range of language tasks, from text generation to question answering, with human-like proficiency, GPT-3 represents a major advance in the field of AI. ChatGPT is already creating a lot of buzz in the IT industry and it would not be absurd if I say that ChatGPT is poised to

have a significant impact on the way organisations do business. ChatGPT has the potential to revolutionise the way organisations do business. However, as with any new technology, ChatGPT also presents several challenges that must be addressed before it can be fully adopted and utilised in the IT industry.

First and foremost – the biggest challenge for adopting ChatGPT is on threats to Privacy and Security. The utilization of ML algorithms in ChatGPT results in the processing of a massive amount of data, making it a susceptible target for cyberattacks. The sensitive information processed by ChatGPT can become vulnerable to theft or abuse, posing significant privacy and security threats.

The accuracy of ChatGPT algorithms is dependent on the data they are trained on, which can result in the introduction of biases and discrimination. This can be particularly concerning when ChatGPT is utilised in sensitive domains such as healthcare and civil. As I write this article, I also keep on hearing about ChatGPT generating incorrect results. This would certainly require a rigor check for ensuring about correctness of data.

Despite the swift advancement of ChatGPT, a considerable number of individuals still lack an understanding of how it operates and are wary of relying on it. This reluctance can restrict the potential impact of ChatGPT and impede its widespread adoption.

The implementation and upkeep of ChatGPT technology can be financially taxing, requiring specialised hardware and software as well as trained personnel. This can pose a challenge for smaller organisations or those with limited budgets.

4.4.8.1.2. Opportunities in the IT industry. ChatGPT has the potential to transform the way organisations Operate and drive Innovation. As every company is an IT company now a days, ChatGPT is poised to transform each and every domain. As I write currently, experts and researchers are exploring it's potential to streamline process, improve customer engagement or drive innovation. At a high level, I am trying to summarise some of the quick win opportunities for IT Industry.

One of the first opportunity for IT Industry is to quickly automate repetitive tasks and Improve customer experience. ChatGPT can certainly be an efficient tool to free up human resources and pushing them to handle more complex queries. Most of the IT Industry companies are currently going through attrition of 20% of more. One of the foremost reasons is employees not getting the right work. Automating repetitive tasks would ensure employees focuses on strategic initiative, making their morale high thereby increasing productivity and retention. What makes ChatGPT so unique and popular is that it just gives them one unique answer. This also makes ChatGPT to help organisations to make better decisions by really proving data driven actionable insights. Now the current limitation of ChatGPT is merely it's been trained only till data in 2021 so getting a real time insight would be challenging but this doesn't stop organisations to use ChatGPT to use it for deriving actionable insights.

ChatGPT works as a companion tool for people working in IT Industry. For e.g., being a developer, one can use ChatGPT as a companion tool for developers to help me generating test cases and test data, debugging, and troubleshooting my code and even to some extent writing a code to do a particular task. Similarly, ChatGPT can work as a companion tool for folks working in marketing, Learning and developments, HR, finance and many more. ChatGPT certainly has immense potential to unearth new business potential, generate new revenue streams and above all, be a driver for innovation.

4.4.8.1.3. Impact of ChatGPT in the IT industry. With the advent of ChatGPT, IT Industry has a lot of challenges and opportunities to explore but Industry is also going to be largely affected with the way it operates currently. For e.g., ChatGPT would certainly disrupt and automate lots of tasks thereby, it would also displace lots of jobs. Currently lot of IT companies are generating revenues doing the monotonous business and charging clients on year-on-year revenues for customer support by providing hundreds of resources. ChatGPT would revolutionise the entire spectrum of customer experience. This means creating lot of jobs and tasks but also redefining existing ones especially in customer experience to get started. Slowly and gradually, ChatGPT has potential to affect other Industry and verticals.

I frequently emphasise that those individuals and organisations that adopt technology and AI will eventually surpass those that do not. Therefore, companies and organisation need to incorporate ChatGPT in innovative ways in their offerings providing cutting edge benefits to organisations.

As an author, I acknowledge that ChatGPT presents several challenges, but its potential benefits and impact on the IT industry are significant. From improving customer service and decision-making to enhancing productivity and generating new revenue, ChatGPT holds the promise of revolutionizing the way we live and work in the digital era.

4.4.9. Contribution 40

4.4.9.1. Challenges of ChatGPT - Indranil Bose. It is well-known that ML based AI systems that are used in knowledge work suffer from several challenges (Zhang et al., 2020). ChatGPT as a form of conversational AI, which has caught the attention of millions around the world, suffers from its own share of challenges which can be discussed under the following four headings:

4.4.9.1.1. Security challenges. While the power of ChatGPT to construct prose that is like that of humans has received the admiration of many, it is possible that this same ability can turn out to be extremely dangerous if it falls into wrong hands. ChatGPT has been credited as being able to create very authentic phishing emails that can lure unsuspecting users to click on malicious links that can infect computers with malware (Kulesh, 2022). The powerful ML algorithms powering ChatGPT has the advantage of searching through numerous phishing emails that are available on the Internet and understanding the key features of these emails that make them suitable for social engineering attacks. In the same manner ChatGPT is also able to write malicious code with minimum instructions from hackers who are not even technically savvy to produce such code. It is even able to translate natural language to harmful code. Another security concern for ChatGPT is that it could be used for malicious purposes such as spreading rumours, propaganda as well as misinformation on the Internet by generating believable text. Such information spread on platforms such as social media can result in devastating impacts (Deng and Lin, 2022).

4.4.9.1.2. Technological challenges. While ChatGPT showcases generative AI at its best and is able to mimic human writing it is still not able to fully replicate the display of knowledge depth that is seen in humans. In fact, some have remarked that the software is so impressive not because of its technical prowess but because of its ability to persuade a reader with the use of words or phrases that appear to be authentic (Hendrik, 2022). Educators worry about the uncertain future of written exams and some like the New York City Department of Education have even blocked access to ChatGPT on its networks. However, ChatGPT is still not able to match the intellectual capability of a human exam taker. In fact, in a recent trial run at the University of Minnesota Law School to see how the software fared in an exam for the MBA students, it was only able to pass with a C+ grade (Ortiz, 2023a, 2023b). It is well-known that this software often "hallucinates" and is not able to reliably provide an accurate answer to a question (Chui et al., 2022a, 2022b). This makes it rather unsuitable for repeatable tasks that any AI tool is supposed to excel in. Moreover, since the ChatGPT works on the basis of a large corpus of training data, if that data itself is biased it is unable to recognize the errors in the data. Hence, it is believed that while this tool can gather a large number of ideas in a short period of time, it may not be able to identify which of which ideas are the most innovative. For a task like that one would need to depend on human intelligence (Bouschery, 2023). Moreover, like any AI tool ChatGPT also acts like a black box and does not provide explanations about how it came up with a specific solution (Sun & Medaglia, 2019). For example, it is unable to explain

why it reports 3.2 to the power of 3.3 as approximately equal to 21.73, whereas the actual answer is 46.45 (Azaria, 2022).

4.4.9.1.3. Economic challenges. Although ChatGPT is currently made available as an open-source tool by OpenAI there is no reason to think that it is available for free. Since a response from ChatGPT usually is made up of 30 or more words, it can be estimated that to make ChatGPT produce a response OpenAI is spending at least 1 cent. It is conjectured that OpenAI may be burning a tremendous amount of cash to the tune of US$ 100,000 per day as operating expenses (Indian Express, 2023). However, with the US$ 10 billion investment by Microsoft for ChatGPT and the fact that this software runs on Microsoft Azure, it is unclear what the true cost of running ChatGPT for OpenAI is at this time. Although ChatGPT started as a freely available service, OpenAI has changed its course of action and launched a subscription-based model for accessing ChatGPT that can "chat with you, answer follow-up questions, and challenge incorrect assumptions" at the subscription cost of US$ 20 per month (OpenAI, 2023). Also, taking cue from OpenAI, several scammers and fraudsters have put up fake advertisements on the Internet for subscription to ChatGPT at a monthly service fee of US$ 50 (Agomuoh, 2023). It is reported that numerous people have lost money by falling a prey to this extortion scheme and paying for the free basic service that is offered by OpenAI.

4.4.9.1.4. Ethical challenges. The output that is generated by ChatGPT is often biased due to the inaccurate training data that has been used to enrich its knowledge. It is reported that when asked who could be a good scientist based on race and gender, ChatGPT has favoured people who are white and male as scientists, showcasing a bias against women and non-whites. Moreover, several questions have been raised about the unethical practices followed by OpenAI in gathering training data using low-paid workers in Kenya. Many of these workers have often reported traumatic experience when entrusted with the task of labelling offensive content on the Internet (Agomuoh, 2023). Another ethical challenge related to ChatGPT is whether it could be considered as a co-author in scholarly work, when it has contributed a significant part of the prose of the paper with the use of its training data. A report by Nature has confirmed that since the tool "cannot take responsibility for the content and integrity of scientific papers" it cannot be considered to have made a scholarly contribution (Stokel-Walker, 2023). Finally, ChatGPT poses an ethical challenge of potential job loss for certain professionals such as content writers as well as educators for no fault of their own (Zhai, 2022).

4.4.10. Contribution 41

4.4.10.1. On the challenges and opportunities of ChatGPT - Iris Junglas and Sven-V. Rehm. What is the challenge? Answer: Understanding what ChatGPT truly is.

The most pressing challenge for researchers and practitioners alike in early 2023 has been to understand the novelty of ChatGPT. As with every new technology that enters society, this exercise is a crucial one. After all, only if we truly understand what is new can we unearth the potential value added for organisations and our own lives.

ChatGPT describes itself as "a cutting-edge language model…, designed to generate human-like text based on a vast amount of diverse data." Put differently, it has the ability to generate paragraphs that are eloquently worded based on a short text passage—be it a question or a statement.

For that to happen, at least three things must be in place. First, the system has to be trained, through a process of iterative reconfigurations, to identify words and to recognise how and when words co-occur. Second, it must be trained to propose a set of words that should be used in the output based on the input received. And last, the system has to be trained to arrange those suggested words into grammatically correct sentences. Or, as ChatGPT tells us: "When given a prompt or input text, ChatGPT uses this knowledge to generate a continuation of the text that is coherent and contextually appropriate." At its core, ChatGPT is thus a generative textual engine, trained to rely on words and phrases used previously to describe a phenomenon or event. And unlike our brains, it does not rely on logic, semantic or epistemic models to develop self-reflective positions.

The word "generative" is crucial. As a power generator must have fuel to generate a current, ChatGPT is fuelled by the documents it was trained on. The training process, supervised by human operators who restrict contents and reinforce preferred output patterns, produces the parametrization of the neural network that defines how "the fuel" transforms into actual textual output. In that sense, ChatGPT—as with any other generative pre-trained transformer (or GPT in short)—does not "know" anything. Instead, it eloquently 'regurgenerates'—a cross-over between 'regurgitate' and 'generate'—what has already been written before. It usually does so impressively!.

The fuel analogy also illustrates the limits of GPTs. Although armed with impressive linguistic capabilities, ChatGPT's ability to structure and restructure responses, use and create syllogisms, or argue along different viewpoints is limited by its design and the volume and choice of training materials.

What then is the opportunity? Answer: To experiment with those aspects that are truly novel.

GPTs will come with the option to enhance–or "fine-tune"–specific layers of the linguistically pre-trained neural network. OpenAI has made this option available on ChatGPT through its API, thus providing the possibility to customise any GPT model for a specific domain, such as the legal profession that is drowning in contractual documents. Fine-tuned GPTs can then become products themselves and can be commercialised or integrated with existing services.

Typical use cases include those that entail comparing texts and completing sentences. Summarizing big volumes of text is another, particularly as a first draft, so is answering questions in an elaborated and prolonged format, or pattern matching instructions, such as repair, maintenance or scheduling procedures, along with code excerpts. GPTs might be the intern we were always looking for, taking off the majority of repetitive and grinding work and leaving us with the intellectual bit that is more enjoyable. Instead of combing through Internet search engine results, for example, ChatGPT's successors will offer an easily digestible summary. Provided with text fragments, they can generate alternative formulations, summaries, abstracts, or nifty LinkedIn posts and bios that are a tad more glorifying than we might compose. Used as coding bots, they can help with drafting basic programming modules. As personal trainers, they can design workout plans, and as storytellers, they can concoct a new bedtime story every night.

Further opportunities lie in combining GPTs with analytic modules, for example, for refined statistical analyses, such as topic modelling. In such cases, more complex analyses can be prepared and then offered through the transformer interface in a manner that is accessible to a diverse set of users. Thus, the ability of IT architectures linking GPT with real-time data will become increasingly important.

How does GPT impact our discipline? Answer: On many, many dimensions.

From an IM and IS perspective, GPTs offer a novel interface to make extensive amounts of information intuitively approachable. While some faculty view ChatGPT as a threat, it is an even greater opportunity. Encouraging students to use ChatGPT for summarizing specific topic areas enables them to stir up discussions more quickly, which in turn could help them building up argumentative and critical-thinking competencies.

Students must learn how GPTs are different from other interfaces, such as search engines, and how different techniques of training and fine-tuning can help to create case-specific solutions. This certainly will happen in industry, and our students must be prepared.

Researchers must look into biases introduced by the training data set and the training process. If the dataset is incomplete or biased, so will be its output. Look at the allegations that question the ethics of OpenAI's

training process. Software engineers, and those in charge of training GPT's linguistic capabilities, are the ethical arbiters of our digital tools. As ChatGPT warns us: "While ChatGPT is a powerful tool, it should be used in conjunction with human oversight and judgement to ensure accuracy and ethics." Developing normative design principles for conversational agents are therefore of the essence. Shifting curricula towards evaluating the goodness of data and process, along with putting standards in place will be crucial. The same notions will also have to apply to platform providers who must obey established guidelines before their service offerings can be integrated into existing systems.

Of course, the generative ability of GPT will also find its way into our research studies–writing abstracts, summarizing literature, generating drafts for discussions, or as part of the methods applied. Researchers will have to be explicit about how GPT factored into their studies, and what mechanisms were in place to ensure accuracy and ethics while avoiding bias. Journals, such as this one, will have to re-work their policies accordingly and take a stance on what is acceptable and what is not.

It will not be easy. But as with everything in life that is not easy, it often starts a positive momentum and leads to novel insights.

4.4.11. Contribution 42

4.4.11.1. ChatGPT3: technology development, impact and challenges - Scott W. Cunningham & Mei-Chih Hu

4.4.11.1.1. Technology development. As shown in Fig. 8 below the ChatGPT is an incremental innovation based on ML (or so-called AI). The history of this technology has been very much one of technology push – a technology which until recently has not found its market or application. Its technology adoption trajectory was started from the scientific theory and logic reasoning proposed by the UK scientist Alan Turing in 1950 (Turing, 1950) in an idea and conceptualisation stage (from 1950 to 1969). Fig. 8 is compiled from a variety of different sources (Oppy & Dowe, 2021; ChatGPT, 2023; Oppy et al., 2021; Turning 1950, Turing Test, 2023).

Driven by public R&D funding, ML technology has gone through experimental stages, facing both upward and downward developmental trends for more than four decades (from 1970 to 2013). The stage of applications development was not kicked off until 2014 when the Turning test was successfully passed for the historically first time and ALpha Go AI won the world's chess champion in 2016 to attract substantial investments from both private and public sectors. The OpenAI laboratory was then established in 2015, aiming at training a model called ChatGPT in a dialogue format.

It is evolved from singular text mining technology as GPT 1 in 2018, GPT 2 in 2019 when Microsoft invested US$1 billion in OpenAI, and GPT 3 in 2020 when Microsoft announced actively collaborate with OpenAI. We see the milestone for commercial threshold breakthrough is GPT 3.5. As soon as GPT3.5 was launched in November 2022. it immediately attracted one million users and received enthusiastic responses for potential commercialization opportunity across a range of services such as cloud services, contents creation, ads and promotion, data services, and consulting.

There are a number of features which distinguish ChatGPT3 from the models which came before. These notable features are the volume, parameters, architecture and training regime of the model. These breakthroughs seem to have unleashed a new era of NLP, one which harnesses the sheer recombinatorial power of vast sources of internet data. The first feature noted above is simply the sheer volume of raw data which is

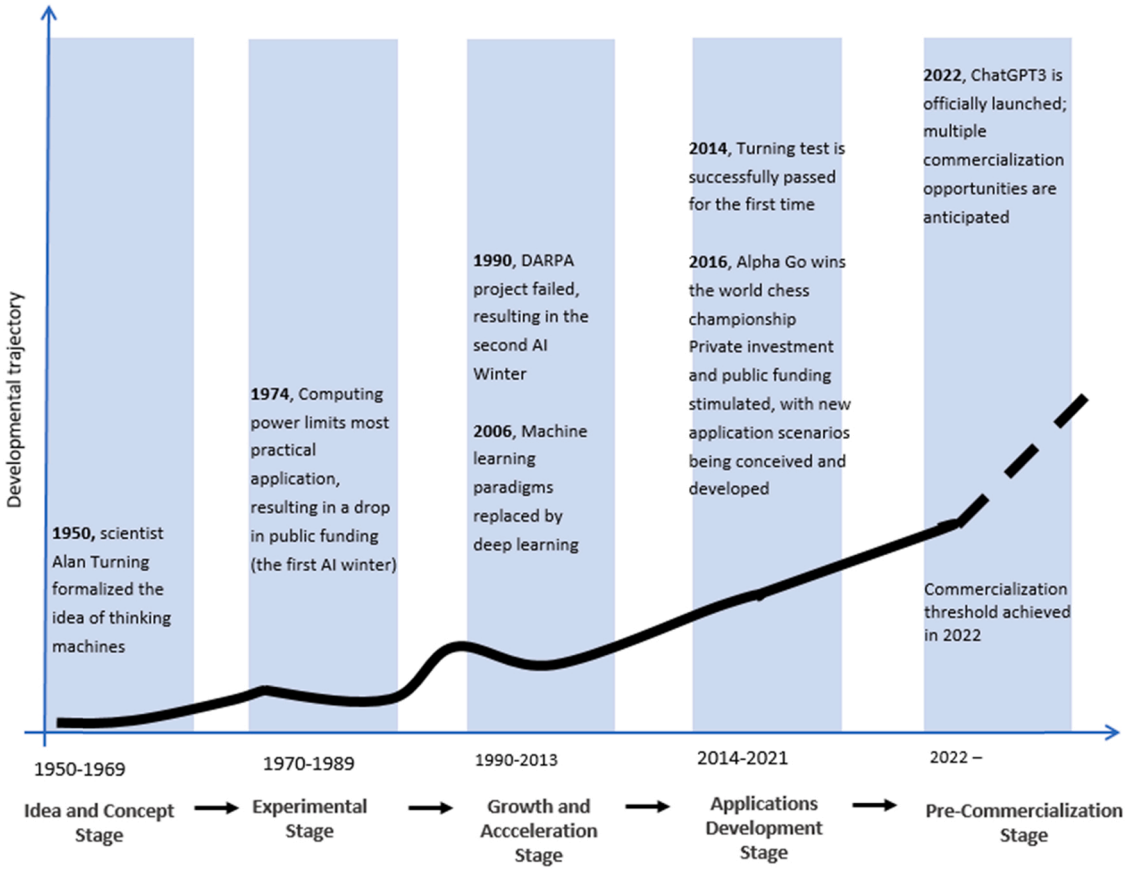

Fig. 8. Key events and developmental trajectory of ChatGPT3.

used in the ChatGPT3 training. Previous researchers have described the "unreasonable effectiveness of big data" – and this certainly applies here. Unexpectedly models such as GPT3 continue to grow in effectiveness with the more data they are given. Another factor distinguishing GPT is the sheer volume of parameters which are used in the learning of the model. Deep learning algorithms are no longer new, but they allow learning to occur layer by layer and over iterations, thereby reducing the computational cost of training large models. This means that we have awaited the sheer processing power of modern computers before these large language models could be fully realised.

Human language is filled with specific cases, specific audiences and specific domains. Learning one model to fit all these cases has proven fruitless. While there may be an underlying logic or grammar to human speech, the specific logics being used can be ambiguous even to human speakers. An additional factor which distinguishing GPT3 from previous models are the specific architectures used in training the model. GPT models are context-specific – they are able to allocate specific parts of the network given the context of the problem. The fourth and final feature that distinguishes ChatGPT3 is the supervised learning used in its creation. ChatGPT3 has been trained by human raters to respond in a clear, interpretable and structured fashion to the queries which it has been provided. This has proven to be an effective co-teaming of human speakers with ML models, resulting in new products and services which neither human nor machine could have produced alone.

4.4.11.1.2. Technology impacts. One core concept behind information economics – perhaps the single core concept – is to consider: Who knows what when? And further how does any given IT change this knowledge across major spheres of economic activity? Information technologies span a bewildering array of technologies and architectures. Their impacts are far-reaching. But the underlying causes of all these impacts is rooted in the capacity to control and access information. Therefore, this can be a useful and unifying framework.

As we will demonstrate below the concept behind the strategic use of information is highly nuanced, and is not easily characterised with a single measure. Information economics presents both a useful framework for gathering impacts, as well as an opportunity to advance and extend a research agenda. Seminal references to core ideas in information economics include those of Eisenhardt (1989), and Laffont and Martimort (2002). There are in fact at least four different measures of the strategic use of information. One author describes these as measures of information quality (Rasmusen, 2014). When the quality of information is degraded, we all lose out. But those strategic actors with access to better quality are net beneficiaries.

The first measure is certainty. Can we be sure that the quality of our decision-making has improved after we have accessed this new source of information? Unfortunately, ChatGPT3 has probably reduced our overall certainty about the world. ChatGPT3 provides notoriously confident – and yet incorrect – answers to questions. The net beneficiaries of ChatGPT3 – at least on this measure – are those able to confirm and warrant the varied sources of information on which we all rely. This includes individuals, including members of the professional class known as "symbolic analysts" (Reich, 1992). But this also includes groups, such as non-government organisations, academic and professional organisations, and national bureaucracies tasked for managing a range of functions central to modern life.

The second measure is completeness. This question asks us whether we can be really certain about who is supplying our information, and the purposes, incentives or intents behind its production. Here again ChatGPT3 has probably diminished the overall quality of information available in the world. The piece in the local newspaper may have been produced by ChatGPT3; that friendly respondent at the end of an internet link may ultimately be a bot; that scientific article ultimately written by machine. The net beneficiaries of this may be application developers who can foresee and deploy new applications of these technologies. And of course, ChatGPT3 and perhaps emerging competitors, who can license the underlying model.

The third measure of information quality is symmetry. What do you know that I do not? Does ChatGPT3 put us on an equal footing? ChatGPT3 is a great leveller. We may all have access to a range of new capabilities, including what may be the most elite capability of all – writing a cogent and well-formed essay. Much of this levelling capability is dependent upon the future institutional structure of access to ChatGPT3. ChatGPT3 is also a powerful device for signal jamming – it can take any particular perspective and multiply and replicate it across channels both narrow and broad. acknowledges these risks. In this sense there are costs to be born for the widespread availability of ChatGPT3 technologies; but they are higher for established gatekeepers of news, media and opinion. ChatGPT3 outputs are pruned and censored to not be hateful or objectionable. Nonetheless the net beneficiaries are those such as OpenAI who control the underlying algorithms of ChatGPT3.

The fourth and final measure of information quality is known as perfection. This quality asks whether we know where we are within any given process or transaction. Ultimately technologies like ChatGPT3 reduce the costs of transacting within a modern economy. Tools such as these will help us by creating a range of ubiquitous personal assistants. Those who can afford widespread access to computing resources, and the know-how to deploy these agents on their behalf will certainly benefit. The technology itself may enable fifth or higher generation computer languages where a range of programming functionality can be described and then auto-filled on command. The programming and skill required to make effective agents seems to have been dramatically reduced, making at least special purpose AI much more readily available for a mass market.

4.4.11.1.3. Management challenges. Having now entered the commercialization stage, urgent problems need to be addressed for ChatGPT3 at all levels. Questions at the micro-level include managing the computational costs of training, but also avoiding fake information and other distortionary sources of information which can corrupt the training. These micro-level issues also require us to ask questions about the boundaries between human and AI. Should we allow ChatGPT3 bots to masquerade as human, or should ChatGPT3 continue to demonstrate clear tells for unwary users that a ML technology is behind the screen?

There are questions at the meso-level as well. AIs like ChatGPT3, but also transformer models which are generating music, videos and graphs are expected to be a source of creative destruction. ChatGPT3 recombines diverse sources resulting in questions about intellectual property, and the appropriate recompense for creative workers. We may increasingly require detection tools to identify and root-out ChatGPT3 produced information and media, resulting in an arms-race of competing technology.

Some commentators are concerned that a range of white-collar jobs – including copywriters, customer service agents, transcriptionists, journalists, secondary school educators, and executive assistants – will find themselves out of a job with the advent of this new technology. It is perhaps of little comfort to those newly unemployed that these jobs have been increasingly hollowed out over the past one or two generations. Confronting the impacts of ChatGPT3 may require that we reconsider how sources of creative or emotional labour are currently being recompensed in the economy. It may also require that we train a range of new professionals better able to co-team with these new technologies. This is perhaps much more of an institutional matter than solely a technological one.

There are also macro-level issues. These macro-level questions are largely one of ethics. Questions of ethics require research and development staff, including engineers and societies, but they also require experts from the social sciences and humanities. Scholars such as philosophers, linguists, policy analysts, and lawyers will increasingly need to be involved. These scholars can help address questions such as how to create new institutions to better govern these technologies, thereby ensuring they do not increase inequality and injustice. We must ask whether these technologies should be limited in application and deployment, and if so how we can verify their absence from important

societal arenas.

4.4.12. Contribution 43

4.4.12.1. ChatGPT: a research agenda - Manju Ahuja. As ChatGPT has taken the world by storm in the last few months, the discussions related to its implications seem ubiquitous. However, much of the discussion in the academic circles has been centred around the educational implications of ChatGPT. This, of course, is a major challenge. At the same time, I believe that we need to consider broader challenges and implications of generative AIs such as ChatGPT, both positive and negative.

At the root of these challenges is the age-old technological determinism question – does technology shape social change and determine our future? After all, who could have predicted how mobile technologies have shaped human behaviour and attention? Not many people can truly say that they control their mobile device usage and behaviour; for most, the devices control their behaviour and attention instead. It is clear that we are at the precipice of another, perhaps even more significant social change phenomenon. An alternate perspective to technological determinism suggests that humans have the power to control and steer the effects of new technologies. Perhaps both perspectives can be in play to some extent. Here, I would like to reflect on a few questions, challenges, and considerations for IS researchers that may inform how we might examine, manage, and govern this phenomenon.

4.4.12.1.1. The experience of writing and reading. Given that the most common form of ChatGPT output is in the form of written text, we need to consider what kinds of writing tasks it might be suitable for and which of these tasks are acceptable for its use? For instance, is it appropriate to use it for copyediting, drafting an initial cut, or generating a finished product? On the positive side, some believe that ChatGPT may become another acceptable writing tool (along the lines of Grammarly and Spellcheck).

If ChatGPT should become an acceptable tool for composition and writing, bigger questions must be addressed. What role would human creativity have in written word? It can be argued that the more compelling pieces of writing are those that draw on human experience and thought. By autogenerating content, are we in danger of losing this essential element of compelling writing, both fictional and non-fictional? Further, what kind of writing is it most appropriately used for? The kind we are least motivated to do? Or might it be used to create novel forms beyond human ability? Further, questions of propriety, acceptable use norms, and copyright questions must be raised, discussed, and addressed.

4.4.12.1.2. Accuracy and verification. ChatGPT is a generative AI tool that utilises language models that combines pieces of information across multiple sources and integrate it into readable written output. Essentially, it is a text predictor; it learns relationships between pieces of text and uses it to predict what should come next. It then paraphrases this content so it sounds like a new piece of writing. This process results in written pieces that can seem credible, but they are not necessarily based on facts. AI technology is not yet ready for generating reliable and accurate results. For instance, a recent report suggested that ChatGPT fabricated a citation for an author that it predicted should be cited, but for an article did not in fact exist.

In the current state of technology, this indicates that verification would need to become an essential next step for any generated written output. This could apply not only to student assignments but also to research articles. We need to consider if journals need to take on the task of checking and verifying submitted articles. Should they, instead, ask for attestation and extent of reliance on ChatGPT for the article content? More importantly, we must consider where the line for acceptable use versus plagiarism would be and who would determine this line.

4.4.12.1.3. Responses to ChatGPT. The approaches to respond to the generative AI phenomenon can range from resistance and neutralization, to integration. Taking the example of classroom instruction and assignments, the first approach might be to forbid the use of ChatGPT. The second approach could entail detection and correction. A third emergent approach is to integrate the tool in instruction by asking students to generate content using ChatGPT and then asking them to critique and improve this text. Each approach has its own merits and risks. We must examine and discuss different approaches that make sense for different contexts.

4.4.12.1.4. Moral and ethical questions. The ethical and responsible use of AI is already a major issue that researchers have been addressing. AI has been known to produce biased object recognition. As an AI system learns from historical data, which may itself reflect human biases, it can further crystalise biased outputs. As the use of ChatGPT becomes widespread, these questions become even more salient. We need to examine which of the issues emanating from predictive AI might also be relevant to generative AI? Which new issues arise with large language modelling AI? It is established that bias correlates with income and geography – could AI, therefore, further increase the social inequities? Of course, we must also explore strategies for mitigating bias.

Unfortunately, while incorporating ethics in educational programs is viewed as an essential remedy, most educational programs tend to pay mere lip service to this content. Further, classroom coverage of issues may not be a complete solution as ethics are entangled with human experiences and motivations, leaving room for violations. We must explore mitigating measures and solutions to address moral and ethical issues involved in generative AI.

4.4.12.1.5. AI for social good. Finally, scholars and practitioners must explore ways of using generative AI for potential socially beneficial purposes. Research related to other breakthrough technologies, including AI, has already begun to do this. Utilizing existing research themes and extending them to generative AI could help us arrive at finding solutions to social ills using generative AI.

The opportunities and challenges related to the use of ethical AI to benefit humanity lie at the intersection of technology, social structure, and human behaviour. This calls for more interdisciplinary research and has implications for educational programs that are inter- and multi-disciplinary in nature.

5. Discussion and implications

5.1. Synthesis and identification of common themes

In this section, we identify the main themes that have emerged from the 43 contributions.

5.1.1. ChatGPT as a productivity enhancing tool

ChatGPT is expected to have a potentially positive effect on productivity (e.g., Contributions 20, 32, 36). It can enable the automation of mundane or repetitive work and allow people to focus on creative and non-repetitive activities (Contributions 11, 39). People can quickly access information and knowledge through a simplified natural language-based information search process using ChatGPT (Contributions 4, 11).

Within the banking, financial services, and insurance sectors, ChatGPT can help increase the accuracy in the audit and advisory services, which means that banking executives can focus on more important tasks (Contribution 36). It can also be used in text-mining of legal databases (Contribution 36), which is of particular benefit to financial institutions required to handle complex regulatory systems (Kshetri, 2023a). In the mid-2010 s, London-based think tank JWG estimated that over 300 million pages of documents related to financial regulations would be published worldwide by 2020 (Alhelal, 2021) and ChatGPT may help extract related information quickly.

In education, ChatGPT can have a positive impact on the productivity of students as generative AI can make the process of learning more efficient (Contributions 20, 32). Moreover, academic authors may develop background sections or first drafts of their papers by gathering information through ChatGPT (Contributions 4, 28).

In many cases, better results could be achieved with AI augmentation or augmented intelligence, which according to Gartner is "a human-centred partnership model of people and AI working together to enhance cognitive performance" (Gartner.com, 2019). This is exactly what Contribution 32 has discussed in the context of generative AI.

5.1.2. Academic sector likely to experience some of the most disruptive effects

Teaching, learning, and academic research are likely to experience some of the most transformative impacts of ChatGPT and, perhaps unsurprisingly, 14 of the 43 contributions in this paper exclusively focused on these (Section 2.3, Contributions 16 through 29).

ChatGPT can be used to improve learning opportunities such as by providing personalised feedback to students (Contribution 20). Since ChatGPT can provide students with basic reading material on the discussion topic, the in-class student-teacher interactions can be used for higher-level analytical and behavioural learning (Contribution 36). Despite the limitations of ChatGPT, such as incomplete synthesis, missing information, or reference errors, students may be able to quickly gain basic knowledge without much effort (Contributions 20, 32).

Several major challenges in the use of ChatGPT may need to be overcome. A significant issue concerns the effects of generative AI such as ChatGPT on assessments and examinations (Contribution 32). Another daunting challenge lies in controlling students' engagement in plagiarism and cheating on assignments, theses and dissertations since ChatGPT is a much more powerful tool compared to the existing tools used for similar tasks (e.g., Contributions 1, 17, 21, 30, 37). For instance, teachers may not be able to recognise assignments that are generated by ChatGPT, which is particularly challenging (Contribution 23). ChatGPT may have a negative impact on students' motivation to learn to write (Contribution 22) and on their independent thinking and language expression skills (Contributions 23, 28).

The impacts of ChatGPT go beyond teaching and learning in academia. Academic articles have already been published using ChatGPT as a co-author (e.g., van Dis et al., 2023). In this regard, a concern that has gained prominence is that AI cannot take responsibility for the content and thus may not meet the criteria for authorship (Contribution 29), and lead to devalued research publications (Contribution 28).

5.1.3. Concerns about job losses

Researchers have long discussed the possibility that machines and robots may replace some of the functions that human workers perform (Chui et al., 2016; Coombs et al., 2021; Dwivedi et al., 2021b). More recently, researchers have expressed concerns that chatbots can increasingly replace human workers (Bates, 2019). Such a concern in the context of generative AI has also been raised (e.g., Contributions 9, 20, 21, 32, 36, 42). This issue is even more salient since ChatGPT is more powerful and sophisticated than an average chatbot. Indeed, when ChatGPT was asked to list "the disadvantages of generative AI", the list in ChatGPT's response included "loss of jobs" with the replacement of human workers (Contribution 32).

ChatGPT might increase the automation potential of some of the jobs that were thought to be less likely to be automated until a few years ago. For instance, a 2016 McKinsey Quarterly article asserted that two categories of jobs in particular had low automation potential: a) jobs related to managing and developing people, and b) jobs involving decision-making, planning, or creative work (Chui et al., 2016). Activities such as writing software code and promotional materials of creating menus were viewed as some of the hardest activities to automate (Chui et al., 2016). This assertion has been challenged by ChatGPT3. Widespread concerns have been raised about the possibility that ChatGPT might replace a range of white-collar jobs such as copywriters, customer service agents, transcriptionists, journalists, and executive assistants (Contribution 42).

5.1.4. The potential of misuse and abuse

Another common theme is that the use of tools such as ChatGPT by some bad actors could lead to undesirable consequences such as misuse and abuse of these tools (Contributions 10, 19, 20, 32). For instance, ChatGPT can be used by nefarious actors to create deepfakes and fake news or engage in other types of misinformation and disinformation campaigns (Contribution 32).

Several contributions have also expressed concerns about the potential misuse of this tool by students (Contributions 10, 19, 20). For instance, some students were reported to be engaged in cheating in exams by using AI chatbots to create answers to exam questions.

5.1.5. Major limitations of generative AI tools

The contributions have stressed that in order to benefit from generative AI such as ChatGPT, their limitations need to be understood (Contributions 3, 20, 22, 27, 29, 31, 32, 38, 40). As noted in Contributions 20, 32 and 38, major concerns of generative AI are related to transparency and explainability since such tools function as a black box and it is difficult to understand the reasoning behind the generated text. Another limitation that must be highlighted is that ChatGPT cannot answer questions unless they are worded in a particular way (e.g., Contribution 22).

A further limitation that was mentioned is related to the lack of updated information. Contributions 32 and 38 have noted that ChatGPT does not incorporate real time data automatically. As stated in Contribution 38, ChatGPT's response to questions that require updated information was that the chatbot's "training data only goes up until 2021" and thus it does not "have the ability to access current events". There are also various types of biases embedded into generative AI such as ChatGPT (Contribution 40).

5.1.6. The lack of regulatory templates

The generative AI industry and market are undergoing major technological upheaval. In situations such as this, the institutional context often fails to provide organising templates and models for action (Greenwood and Hinings, 1993). Such changes may also lead to confusion and uncertainty and produce an environment that lacks norms, templates, and models about appropriate strategies and structures (Newman, 2000). To put things in context, a lack of legislative and regulatory template to adequately deal with issues such as privacy, security, accountability, copyright violations, disinformation, misinformation and other forms of abuses and misuses has been a theme of contributions in this paper (Contributions 11, 21, 32, 36). When ChatGPT was asked to list "the disadvantages of generative AI" by the authors of Contribution 32, ChatGPT's response included "legal issues around ownership and copyright of content generated by AI". Contribution 36 has suggested that governments have not yet figured out how to regulate the use of tools such as ChatGPT.

5.2. Future research directions

Throughout this paper, the contributors have raised many important questions regarding the opportunities, challenges, and implications of generative AI such as ChatGPT. Consolidating these together with the discussion in the previous section, we summarise research questions requiring exploration into three thematic areas: knowledge, transparency, and ethics; digital transformation of organisations and societies; and teaching, learning, and scholarly research (Table 8).

Research is required to explore how generative AI will affect knowledge acquisition and transfer for individuals, teams, and organisations. Investigating ways to enhance transparency and reduce bias of technologies such as ChatGPT is also critical. As noted above, regulations, moral guidelines, and ethical codes have not yet (fully) developed around generative AI such as ChatGPT (e.g., Contributions 32, 43). The present work opens new areas of research in terms of how such institutions evolve over time. Scott (2001) proposed three institutional

Table 8
A roadmap for future research.

Thematic areas	Research questions
Knowledge, transparency, and ethics	• Does ChatGPT challenge assumptions in research and lead to a paradigm shift likely to be associated with the introduction of disruptive applications? • Does ChatGPT remove the stickiness of knowledge transfer between and across individuals, teams, and organisations? • What role do AI-powered language tools such as ChatGPT play in hybrid, distributed knowledge intensive projects? • What techniques can be developed to enhance the transparency of generative and AI models to facilitate explainability? • How can we assess the accuracy and verify texts generated by ChatGPT? • What biases are introduced in ChatGPT by the training dataset and the training process? • What ethical issues does the use of ChatGPT create across industries and sectors? • How can we apply and assess responsible and ethical policies, practices and regulations in the diffusion of generative AI applications? • How can frameworks (e.g., SACE, ADROIT) be used to support the ethical use of ChatGPT and similar technologies in academia and industry? • What is the impact of consolidating risk management frameworks and ethics perspectives on ChatGPT adoption?
Digital transformation of organisations and societies	• How can AI-powered language tools facilitate the digital transformation of industries (e.g., travel, tourism, finance, marketing)? • What new business models can be created using AI-powered language tools to create economic value? • Under what conditions can AI play a role in generating new innovations? • What are the optimal ways to combine human and AI agents in various domains and tasks to maximise the opportunities and benefits while minimising the negative impacts? • What are the implications of worker displacement by generative AI, and who is responsible for mitigating these and how? • What are the use cases of AI-powered language tools such as ChatGPT in terms of enhancing our daily lives and interactions with people? • How can AI-powered language tools be used to support people with disabilities? • Are there contextual conditions (e.g., organisational culture, national culture) that shape how individuals and groups may use AI-powered language tools? • How can we use AI-powered language tools to address global grand challenges (e.g., Sustainable Development Goals)? • What are the roles of societal contexts and associated ethical and moral judgement issues in shaping the meaning and the outcomes of ChatGPT?
Teaching, learning, and scholarly research	• What are the appropriate ways and processes to introduce tools such as ChatGPT in curriculum design? • How do conversational technologies make teaching and learning more effective? • Can ChatGPT provide an enhanced student learning experience? If so, what is the view and experience of students? • How can ChatGPT and other AI-powered conversational tools support students with disabilities? • How can we assess the effectiveness of ChatGPT in terms of student performance and intention to use? • What are the long-term benefits and challenges of using ChatGPT in the context of teaching and learning? • What are the dark sides of ChatGPT in the context of teaching and learning? • How can ChatGPT be used to develop critical thinking and problem-solving skills of students and researchers? • How can the academic community broaden the discussion and advance its understanding of ChatGPT and other AI-powered conversational tools? • What is the long-term impact of ChatGPT on scholarly writing and research? • What is the role of human creativity when ChatGPT is used in scholarly writing? • How can the academic community better respond to emerging, disruptive technologies that may pose threats to practices of teaching, learning, and research?

pillars: (i) regulative; (ii) normative and (iii) cultural-cognitive, which relate to "legally sanctioned", "morally governed" and "recognizable, taken-for-granted" behaviours respectively (Scott et al., 2000, p. 238). Prior research has also suggested that building a regulative system (e.g., regulations to govern ChatGPT) is the first stage of institution formation, followed by formation of normative institutions and then cognitive institutions (Hoffman, 1999). In future empirical work, scholars also need to compare and contrast ChatGPT and other major innovations in terms of the pattern of the evolution of various types of institutions.

Another stream of much needed research is to explore the effects of digital transformation of organisations and societies. ChatGPT is likely to transform several corporate functions. In marketing, for instance, generative AI can help improve customer interactions (Contribution 32), content marketing (Contribution 13), marketing communications (Contribution 14), and marketing campaigns (Contributions 3, 34). In finance, ChatGPT can help financial services providers to streamline and simplify financial service processes (Contribution 12) and provide better financial services (Contribution 14). We anticipate that the impact of ChatGPT will vary across activities and functions. In this regard, research needs to examine the activities and corporate functions that are most likely to be transformed by generative AI such as ChatGPT, and the consequences on workers, customers, and organisations. In addition, generative AI may have many use cases across groups and communities, such as supporting older or disabled people. Research is needed to examine appropriate deployment of such technologies for different groups in society.

Regarding institutional evolution around generative AI, some have called for actors such as academic publishers to act as an institutional change agent and develop a code of practice (a kind of informal institution) for the academic community to make responsible use of ChatGPT (Contribution 29). In this regard, a related future research topic could be how institutional change agents theorize such changes (e.g., Kshetri & Ajami, 2008). Note that theorization - or the development and specification of abstract categories and the elaboration of chains of cause and effect - is an important process through which institutional change agents facilitate the diffusion of new ideas (Greenwood et al., 2002, p. 60). Theorization helps provide rationales for the practices to be adopted and thus increases the chance of acceptance of the practice (Strang & Meyer, 1993). Two key elements of theorization are framing and justifying. Framing focuses on the need for change and justification is value of the proposed changes for concerned actors (Greenwood et al., 2002; Maguire et al., 2004). Researchers thus could look at how various institutional change agents frame and justify the need for change in institutions related to generative AI.

Finally, there are numerous fruitful avenues for research related to

the application of generative AI such as ChatGPT for teaching, learning, and research, from examining the role of these technologies in curriculum design and supporting students' learning to finding where the balance lies in ensuring students and researchers continue to produce creative and novel work.

5.3. Research propositions

In this section, we offer propositions based on the various perspectives on generative AI tools, their impacts on a wide range of social, political, organisational, and economic issues, and the challenges and opportunities provided by these tools as discussed above.

5.3.1. ChatGPT's potential to replace some tasks performed by knowledge workers

Experts have called for research on the domains that are likely to be affected by generative AI tools such as ChatGPT along with the disruptions they cause (Contribution 1). One area likely to experience significant disruptions is the domain of knowledge work. Estimates suggest that 41% of a knowledge worker's time is spent on activities that can be performed by others (Birkinshaw & Cohen, 2013). The advancements in AI make it possible for tools such as ChatGPT to handle such tasks (Contribution 4). For instance, ChatGPT can be used to perform structured and repetitive tasks required by knowledge workers including software developers and report writers (Contribution 23). Generative AI tools such as ChatGPT also help provide human-like customer interactions both efficiently and effectively (Contribution 34), which are especially important in improving the quality of customer service (Contribution 12). Therefore,

P1. : Generative AI tools such as ChatGPT can be used to replace some of the tasks performed by *knowledge* workers.

5.3.2. ChatGPT's use in augmenting the capabilities of knowledge workers

The augmentation of human intelligence is a key mechanism enabled by generative AI tools such as ChatGPT (Contributions 5, 7, 32, 38). Future research can investigate the roles of generative AI tools in enabling human augmentation (e.g., Contributions 7, 9, 32). Since generative AI tools can enable humans to solve complex problems by augmenting their intelligence and capabilities, they can complete work faster and achieve their goals more efficiently (Contributions 5, 32; Licklider, 1960). For instance, in the context of healthcare in remote areas, generative AI tools such as ChatGPT can be used to provide valuable input to medical workers that can enhance their performance (Contribution 36). Overall, while chatbots have been used for human task augmentation for some time, ChatGPT takes this to the next level by enabling functionalities that were not possible with previous generations of chatbots (Contribution 7). Therefore,

P2. *Generative AI tools such as ChatGPT can boost productivity by augmenting the capability* of *knowledge workers.*

5.3.3. ChatGPT as a powerful manipulation, misinformation, and disinformation tool

Experts have emphasised the importance of research that identifies the best way to minimise the negative impacts of generative AI (e.g., Contribution 32). In order to achieve this, we first need to understand the potential negative effects of generative AI tools such as ChatGPT. In this regard, a concern that has received a great deal of attention is the potential misuse or abuse of generative AI. The worry is that negative effects of deepfakes, fake news, or other types of disinformation and misinformation are amplified by such generative AI tools (Contributions 32, 34). Generative AI tools such as ChatGPT can make deception and manipulation more powerful and dangerous compared to existing tools (Kshetri, 2023b). For instance, when researchers asked ChatGPT to create disinformation about a range of topics such as vaccines, COVID-19, the January 2021 insurrection at the U.S. Capitol, immigration, and China's treatment of its Uyghur minority, the tools did so effectively (Klepper, 2023). Such misuse of generative AI tools can be used to manipulate citizens (Contribution 23). Therefore,

P3. *Compared to previous AI tools, ChatGPT is likely to emerge as a more effective manipulation, misinformation and disinformation tool.*

5.3.4. ChatGPT's performance and the underlying data and training models

The performance of ChatGPT in generating text may be considerably influenced by the data and the training models used (e.g., Contribution 2). ChatGPT's effective performance when asked to create disinformation related to COVID-19 (Klepper, 2023) could be attributed in part to the data repositories on which ChatGPT was trained. It is possible that ChatGPT could have struggled with generating disinformation had its operations been based on datasets that did not include disinformation. Since ChatGPT was based on GPT-3 that relied on 175 billion documents of various types in the public domain (Perrigo, 2023), which also contain disinformation or reports of disinformation, it can be conceded that data and training models influence ChatGPT performance. While there are significant challenges in verifying information produced by ChatGPT since it can generate different answers for the same question asked at different times, it would be helpful to find ways to empirically test ChatGPT performance when the data and training models vary. Therefore,

P4. *Data and training models underlying generative AI tools such as ChatGPT may influence its overall performance.*

5.3.5. ChatGPT's misuse and abuse when formal and informal rules are lacking

The social and institutional contexts associated with generative AI such as ChatGPT could be a significant area for future research (Contribution 7). The nascent stage of formal and informal institutions surrounding ChatGPT has been a key theme in this paper. ChatGPT's own response to "What are the disadvantages of generative AI?" included the lack of legal clarity related to ownership and copyright of content (Contribution 32). This would create disputes regarding the right to use and profit from generated content. Similarly, the lack of informal institutions such as ethical guidelines could also foster misuse and abuse (Contribution 32). The lack of well-developed formal and informal institutions around generative AI such as ChatGPT could mean that violators are less likely to face sanctions and legally acceptable solutions may not exist to penalise students who engage in cheating or plagiarism (Contribution 21). Publishers and universities have made forays into outlining expected behaviours around ChatGPT for researchers and individuals (e.g., Contribution 26). Therefore,

P5. *The lack of formal and informal rules can increase the possibility of abuse and misuse of generative AI tools such* as *ChatGPT.*

5.3.6. ChatGPT as a source of ethical dilemmas

Due to its text generative capabilities, ChatGPT can be preferred and used by stakeholders in different industries. In the education sector, students have reportedly used ChatGPT to generate answers to exam questions whereas instructors have used ChatGPT to develop course content (e.g., Contributions 7, 18, 38). The need to identify the boundaries to guard against ChatGPT misuse and abuse becomes important as ChatGPT finds greater acceptance in different spheres. For instance, there may not be an effective way to reliably detect if an essay submitted by a student or a paper submitted by a researcher was generated using ChatGPT and whether it should be considered plagiarism (Contributions 21, 28). In such cases, it may be useful to determine who serves as gatekeepers or enforcers of ChatGPT use and help resolve ethical issues. Therefore,

P6. *Compared to prior technologies, generative AI tools such as ChatGPT are likely to pose greater ethical dilemmas for several stakeholders.*

5.3.7. ChatGPT's superior, subjective, and deceptive intelligence

Unlike traditional tools that may rely on pattern matching and information retrieval algorithms, generative AI tools such as ChatGPT are driven by learning algorithms that build intelligence. Due to its access to a vast data trove, ChatGPT has the capability to grow in intelligence without cognitive limits that burden humans although it is dependent on human supervision to some extent. Without such interventions, ChatGPT can be equally good at generating both accurate and erroneous text (e.g., Contributions 23, 42, 43) with no easy way to assess it. Left unchecked, ChatGPT may learn and build intelligence that may not be necessarily objective or accurate. For instance, ChatGPT references non-existent scientific work when generating text on particular topics, but it is not possible to inform ChatGPT of such errors. Therefore,

P7. *Compared to prior technologies, generative AI tools such as ChatGPT may possess superior, subjective, and deceptive intelligence.*

5.3.8. ChatGPT's potential for multiple roles in business and society

Differing from traditional tools that typically helped make sense of existing data, generative AI tools such as ChatGPT generate new data. Combined with its capability to understand and generate natural language of humans, ChatGPT may mimic humans and play significant roles in business and society (e.g., Contributions 2, 5, 13, 22, 23). The extent to which ChatGPT outperforms humans in creative thought would be an empirical question, but it is clear that it can synthesise disparate data, summarise overall directions, and produce convincing descriptions (cf. 3.3.4 on good data and training models). Even if ChatGPT may not be accorded the status of a decision-maker within business and society, it seems entirely possible that it can trigger creative thoughts among humans due its ability to present synthesised summaries from different perspectives that humans may not have considered. Perhaps, ChatGPT can play different roles such as champion or devil's advocate in ideation and creation processes. Therefore,

P8. *Compared to prior technologies, generative AI tools such as ChatGPT with its natural language capabilities may play significant roles in business and society.*

5.3.9. ChatGPT's niche as superhuman or specialised agent

Since a significant goal of AI is to mimic human intelligence, the question of ChatGPT's niche in society needs serious consideration. AI models can possess general or specialised intelligence (e.g., Contribution 9), both of which are common in our societies. Humans possess general intelligence on a wide array of topics as well as specialised intelligence in narrow domains or disciplines. In terms of implementation, the difference between general and specialised AI systems could be the data and training methods used (cf. 3.3.4). However, what should be the niche for ChatGPT? Is it good to have a superhuman know-it-all system or one that is more restricted with specialised knowledge? Humans tend to attach some importance to specialty (e.g., we do not ask for medical advice from insurance agents) as do organizations that have invested in specialisation (e.g., the various functional departments). Even in specialised niches, training ChatGPT based on data may not be complete since training databases typically include outcomes and steps but not the lived experiences of specialised humans. Therefore,

P9. *Generative AI tools such as ChatGPT have the potential to be superhuman or specialised agents as dictated by data and training methods.*

5.3.10. ChatGPT's capabilities and responsible use

Technologies have traditionally addressed problems and provided solutions; generative AI tools such as ChatGPT are no exception. However, technologies have been subjected to both intended and unintended use (e.g., social media helps connections but also facilitates cyberbullying) and resulted in both intended and unintended consequences (e.g., nurturing friendships but also envy and bitterness). Technologies have often disrupted existing ways (e.g., iPod disrupted how we consumed music) and resulted in new ways (e.g., artists can release music for sale online). Likewise, ChatGPT promises conversational natural language dialogue based on supervised pre-training on a closed albeit large dataset. As has been already discussed, ChatGPT has been applied for both positive (e.g., help solve a problem) and negative (e.g., cheat on an exam) purposes. There is a clear need to engage in responsible use of ChatGPT since it possesses unique capabilities that can be exploited or misused. Therefore,

P10. *Similar to various tools in history, generative AI tools such as ChatGPT promise unique capabilities but require responsible use.*

5.4. Implications for practice and policy

ChatGPT was estimated to have 100 million monthly active users in January 2023, less than two months after the app was launched. According to the Swiss multinational investment bank and financial services company UBS, ChatGPT is the fastest-growing consumer application in history (Hu, 2023). The rapid diffusion of generative AI tools such as ChatGPT has important implications and consequences for practice and policy.

In order to drive competitive advantage, it is imperative for organisations to use ChatGPT as a productivity-enhancing tool. In many cases, organisational changes are needed to realise such benefits. For instance, in the context of the education sector, emphasis should be placed on updating the curricula in schools and universities to accommodate generative AI tools such as ChatGPT in the classroom (Contribution 21, Shrivastava, 2022). In light of the many benefits of this tool noted above, academic institutions should revisit the complete ban on the use of ChatGPT. It is important for instructors to engage deeply in ChatGPT so that the tool can be incorporated into instructional activities to benefit students (Contribution 16).

It is also crucial to develop criteria to evaluate outputs of generative AI so that such tools can be employed to benefit organisations (Contribution 35). In addition, organisations may be required to combat resistance to change from employees (Contributions 8, 43). At the same time, it is also important to take measures to minimise the potential negative impacts of such tools. For instance, cybercriminals can use ChatGPT as a hacking tool (Contribution 36), which can victimise companies. They should thus develop new capabilities to fight new types of cybercrime generated and facilitated by such tools.

In order to optimise the benefits of generative AI such as ChatGPT, it is important to take into account the various limitations of this tool such as the lack of originality (Contribution 2) and vagueness of the output (Contribution 21). A further limitation, as mentioned earlier, is that it was trained on a database before 2021, which means that it cannot search the internet to provide up-to-date information about a topic. In many cases, convincing answers have been frustratingly difficult to find with ChatGPT (Contribution 22). It is important to educate students and other users about these and other limitations of ChatGPT so that they can benefit from this transformative innovation. It is also crucial to make sure that students have a clear understanding of how generative AI tools differ from other tools such as search engines (Contribution 41).

Legal systems to govern AI are not well developed in most countries. In general, in nascent and formative sectors such as generative AI, there is a lack of developed networks of regulatory agencies (Kshetri & Dholakia, 2009). As a consequence, there is no stipulated template developed for organising institutional actors' behaviours (Greenwood & Hinings, 1996). Industry bodies and trade and professional associations can provide some degree of institutional co-ordination in order to overcome the existing regulatory gaps (Kshetri, 2018). These entities can help create norms, informal rules, and codes of behaviour and penalise noncompliance with social and economic sanctions (North, 1990). The importance of developing a code of practice for the academic community that offers specific guidelines for using ChatGPT in academic publishing is crucial (Contribution 29).

At the national level, it is the responsibility of governments to enact regulations that balance the needs of protecting users from abuse and misuse of generative AI while ensuring that technology companies are not discouraged from investing in this transformative innovation. For instance, it is reported that the EU's AI Act has targeted "high risk" applications of AI, which means that AI must comply with the strictest requirements. A new proposal categorises AI systems generating complex text such as chatbots as "high risk". Some analysts are concerned that such regulations may discourage the generation and use of such systems (Grady, 2023). It is critical to assess the societal value of ChatGPT, which is especially important for enacting new regulations to govern such tools (Contribution 33). Moreover, given the global nature of tools such as ChatGPT (Contribution 34), it is important for different jurisdictions to work together to develop more globally accepted regulations (Contribution 36).

AI practitioners need to engage in serious introspection regarding the capability and reliability of generative AI tools such as ChatGPT. Since ChatGPT relies on several moving parts including data, training models, and human input, there are opportunities to inject bias into the system. As the system matures over time through reinforcement learning, text generation may also be biased or favour specific perspectives (e.g., Getahun, 2023; Hamilton, 2022; Heikkilä, 2023). Different ways to safeguard against such biases should be determined and applied by AI practitioners; failing this, AI tools such as ChatGPT may be considered suspect. For instance, AI trainers providing human feedback during the training phases need to take neutral and objectively true positions such that the reinforcement learning are not unnecessarily biased. OpenAI's own description of ChatGPT acknowledges certain types of biases in training data such as trainers preferring longer answers that look more comprehensive (OpenAI, 2023a). Further, OpenAI claims to use moderation policies around disallowed use of ChatGPT that could also be biased even after conceding restrictions to curb activities that are illegal, high-risk, or abusive (OpenAI, 2022, 2023b). AI practitioners need to devise methods to evaluate the extent to which new text generated by ChatGPT is biased.

Users in any profession (e.g., students, software developers) have the opportunity to apply ChatGPT in both positive and negative ways. It is helpful to recognise that ChatGPT may not always be accurate or know all the relevant answers needed by users. OpenAI's own description of the tool acknowledges that ChatGPT may "guess what the user intended" rather than asking clarifying questions to clear ambiguities and also generate "plausible-sounding but incorrect or nonsensical answers" - both of which raise questions about credibility (OpenAI, 2023a). More importantly, OpenAI agrees that there is "currently no source of truth" for the ChatGPT models, which is a significant self-indictment of the tool's capabilities (OpenAI, 2023a). Would that stop users from accepting ChatGPT generated text as the final answer? Would that reduce users' reliance on ChatGPT for information and knowledge? Would that be enough for users to discontinue use of ChatGPT? The potential for manipulation, misinformation, and disinformation are high with new ChatGPT text not based on responsible use. To some extent, the burden of appropriate ChatGPT use resides with the users as with any other technology.

6. Concluding thoughts

ChatGPT undoubtedly is among the most transformative AI tools developed in recent years. It presents significant opportunities as well as challenges for organisations, societies, and individuals. Generative AI can offer a major boost to productivity in various settings, but such tools also present a number of practical, ethical, moral, and policy challenges. For instance, the challenges with ChatGPT in the education sector are well recognised due to the lack of well-developed guidelines and ethical codes around generative AI. A critical practical challenge that regulators face is that they cannot penalise perpetrators with legal sanctions when such tools are deliberately misused or abused. Thus, it is imperative to enact new laws to govern these tools. Their global nature means that international coordination is also needed to maximise the benefits of tools such as ChatGPT.

References

Abdulquadri, A., Mogaji, E., Kieu, T., & Nguyen, P. (2021). Digital transformation in financial services provision: a Nigerian perspective to the adoption of chatbot. *Journal of Enterprising Communities: People and Places in the Global Economy, 15*(2), 258–281.

Adams, M. (2023), "How AI search unlocks long tail results", Available at: ⟨https://www.algolia.com/blog/ai/how-ai-search-unlocks-long-tail-results/⟩.

Adams, T. (2021). Daniel Kahneman: 'Clearly AI is going to win. How people are going to adjust is a fascinating problem'. *The Guardian*. ⟨https://www.theguardian.com/books/2021/may/16/daniel-kahneman-clearly-ai-is-going-to-win-how-people-are-going-to-adjust-is-a-fascinating-problem-thinking-fast-and-slow⟩.

Adesso, G. (2022). GPT4: The Ultimate Brain. Authorea Preprints.

Agomuoh, F. (2023). The 6 biggest problems with ChatGPT right now. *Digitaltrends* (Available online) ⟨https://www.digitaltrends.com/computing/how-to-use-openai-chatgpt-text-generation-chatbot/⟩.

Agrawal, A., Gans, J., & Goldfarb, A. (2022). ChatGPT and How AI Disrupts Industries. *Harvard Business Review*. December 12, 1- 6. Retrieved from ⟨https://hbr.org/2022/12/chatgpt-and-how-ai-disrupts-industries⟩.

Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections. *Psychology & Health, 26*(9), 1113–1127.

Akter, S., McCarthy, G., Sajib, S., Michael, K., Dwivedi, Y. K., D'Ambra, J., & Shen, K. N. (2021). Algorithmic bias in data-driven innovation in the age of AI. *International Journal of Information Management, 60*, Article 102387.

Aldhafri, S., Alkharusi, H., & Al Ismaili, A. (2015). Predicting English test anxiety: how memorization and critical thinking function? *Theory and Practice in Language Studies, 5*(6), 1159.

Aleksander, I. (2017). Partners of Humans: A Realistic Assessment of the Role of Robots in the Foreseeable Future. In *Journal of Information Technology, 32* pp. 1–9). SAGE Publications Ltd,.

Algolia, 2023, "Index your world, put it in motion with our powerful search API", Available at: ⟨https://www.algolia.com/products/search-and-discovery/hosted-search-api/⟩.

Algorithmwatch.org, 2020, April, AI Ethics Guidelines Global Inventory. Retrieved from ⟨https://algorithmwatch.org/en/ai-ethics-guidelines-global-inventory/⟩.

Alhelal, H. (2021) Rome Wasn't Built In A Day. January 22, ⟨https://www.sigmaratings.com/knowledge-center/rome-wasnt-built-in-a-day⟩.

Alshater, M., 2022a, Exploring the role of artificial intelligence in enhancing academic performance: A case study of ChatGPT (December 26, 2022). Avaiable at SSRN. Retrieved from ⟨https://ssrn.com/abstract=4312358⟩ or http://dx.doi.org/10.2139/ssrn.4312358.

Alshater, M., 2022b, Exploring the Role of Artificial Intelligence in Enhancing Academic Performance: A Case Study of ChatGPT (December 26, 2022). Available at SSRN: ⟨https://ssrn.com/abstract=4312358⟩ or http://dx.doi.org/10.2139/ssrn.4312358.

Alvesson, M., & Sandberg, J. (2011). Generating research questions through problematization. *Academy of Management Review, 36*(2), 247–271.

Araujo, T. (2018). Living up to the chatbot hype: The influence of anthropomorphic design cues and communicative agency framing on conversational agent and company perceptions. *Computers in Human Behavior, 85*, 183–189.

Ashok, M., Madan, R., Joha, A., & Sivarajah, U. (2022). Ethical framework for Artificial Intelligence and Digital technologies. *International Journal of Information Management, 62*, Article 102433.

Attali, Y., & McNamara, D. S. (2006). Automated essay scoring with e-rater V.2. *Journal of Technology, Learning, and Assessment, 4*(9), 1–17.

Aydın, Ö., & Karaarslan, E. (2022). OpenAI ChatGPT generated literature review: Digital twin in healthcare. In Ö. Aydın (Ed.), *Emerging Computer Technologies, 2* pp. 22–31). İzmir Akademi Dernegi.

Azaria, A. 2022. ChatGPT usage and limitations. HAL Open Science hal-03913837.

Baird, A., & Maruping, L. M. (2021). The Next Generation of Research on IS Use: A Theoretical Framework of Delegation to and from Agentic IS Artifacts. *MIS Quarterly, 45*(1).

Balakrishnan, J., & Dwivedi, Y. K. (2021). Role of cognitive absorption in building user trust and experience. *Psychology & Marketing, 38*(4), 643–668.

Balakrishnan, J., Abed, S. S., & Jones, P. (2022). The role of meta-UTAUT factors, perceived anthropomorphism, perceived intelligence, and social self-efficacy in chatbot-based services? *Technological Forecasting and Social Change, 180*, Article 121692.

Balakrishnan, J., Nwoba, A., & Nguyen, N. (2021). Emerging-market consumers' interactions with banking chatbots. *Telematics and Informatics, 65*, Article 101711.

Bank of America (2022) Bank of America's Erica Tops 1 Billion Client Interactions, Now Nearly 1.5 Million Per Day retrieved on the web at: ⟨https://newsroom.bankofamerica.com/content/newsroom/press-releases/2022/10/bank-of-america-s-erica-tops-1-billion-client-interactions–now-.html%20October%2012⟩ October 12.

Baskerville, R., & Myers, M. (2009). Fashion waves in information systems research and practice. *MIS Quarterly, 33*, 647–662.

Bass, D. (2022). OpenAI Chatbot So Good It Can Fool Humans, Even When It's Wrong. *Bloomberg com*. ⟨https://www.bloomberg.com/news/articles/2022-12-07/openai-chatbot-so-good-it-can-fool-humans-even-when-it-s-wrong⟩.

Bates, M. (2019). Health care chatbots are here to help. *IEEE Pulse* (Volume: 10)(Issue: 3). May-June Page(s): 12 - 14.

Baumol, W. J. (2012). *The Cost Disease: Why Computers Get Cheaper and Health Care Doesn't*. Yale University Press,.

Belk, R. (2021). Ethical issues in service robotics and artificial intelligence. *The Service Industries Journal, 41*(13–14), 860–876.

Bellegarda, J. R. (2004). Statistical language model adaptation: review and perspectives. *Speech Communication, 42*(1), 93–108.

Bender, E.M., & Koller, A., 2020, Climbing towards NLU: On meaning, form, and understanding in the age of data. Paper presented at the Proceedings of the 58th annual meeting of the association for computational linguistics.

Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?. *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency, Canada* (pp. 610–623). New York, NY: ACM,.

Bengio, Y., Ducharme, R., & Vincent, P. (2000). A neural probabilistic language model. *Advances in Neural Information Processing Systems, 13*, 1–7 (available at) ⟨https://proceedings.neurips.cc/paper/2000/file/728f206c2a01bf572b5940d7d9a8fa4c-Paper.pdf⟩.

Bernstein, E., Lee. M.Y., Minnaar, J. (2022, December 12) How Companies Are Using Tech to Give Employees More Autonomy. Retrieved from ⟨https://hbr.org/2022/01/how-companies-are-using-tech-to-give-employees-more-autonomy⟩.

Bhattacharyya, S. (2023), "Commercial applications of GPT-3 that are already live", Available at: ⟨https://analyticsindiamag.com/commercial-applications-of-gpt-3-that-are-already-live/⟩.

Birkinshaw, J., & Cohen, J. (2013). Make Time for Work that Matters. *Harvard Business Review, 91*(9), 115–120.

Biswas, S. (2023). Chat GPT and the future of medical writing. *Radiology* (Available at) ⟨https://pubs.rsna.org/doi/full/10.1148/radiol.223312⟩.

Bjork, C. (2023). ChatGPT threatens language diversity. More needs to be done to protect our differences in the age of AI, available at ⟨https://theconversation.com/chatgpt-threatens-language-diversity-more-needs-to-be-done-to-protect-our-differences-in-the-age-of-ai-198878⟩.

Blackman, R. (2020, October 15). A Practical Guide to Building Ethical AI. Retrieved from ⟨https://hbr.org/2020/10/a-practical-guide-to-building-ethical-ai⟩.

Bock, D. E., Wolter, J. S., & Ferrell, O. C. (2020). Artificial intelligence: disrupting what we know about services. *Journal of Services Marketing, 34*(3), 317–334.

Böhm, S., Carrington, M., Cornelius, N., de Bruin, B., Greenwood, M., Hassan, L., & Shaw, D. (2022). Ethics at the centre of global and local challenges: Thoughts on the future of business ethics. *Journal of Business Ethics, 180*(3), 835–861.

Bommarito II, M., & Katz, D.M. (2022). GPT Takes the Bar Exam. arXiv preprint arXiv: 2212.14402.

Bonfim, D., Nogueira, G., & Ongena, S. (2021). "Sorry, We're Closed" Bank Branch Closures, Loan Pricing, and Information Asymmetries. *Review of Finance, 25*(4), 1211–1259.

Bornet, P., Barkin, I., & Wirtz, J. (2021). *Intelligent Automation: Welcome to the World of Hyperautomation*. World Scientific Books,.

Bossman, J. (2016, October 21). Top 9 Issues in Artificial Intelligence. Retrieved from ⟨https://www.weforum.org/agenda/2016/10/top-10-ethical-issues-in-artificial-intelligence/⟩.

Bouschery, S., Blazevic, V., Piller, F.P. (2023). Augmenting Human Innovation Teams with Artificial Intelligence: Exploring Transformer-Based Language Models. https://doi.org/10.1111/jpim.12656.

Brachten, F., Kissmer, T., & Stieglitz, S. (2021). The acceptance of chatbots in an enterprise context – A survey study. *International Journal of Information Management, 60*, Article 102375.

Breen, P. (2023). Don't fear ChatGPT: education will always trump technology. Available at ⟨https://www.timeshighereducation.com/blog/dont-fear-chatgpt-education-will-always-trump-technology⟩ Accessed 10.03.23.

Breidbach, C. F., & Maglio, P. (2020). Accountable algorithms? The ethical implications of data-driven business models. *Journal of Service Management, 31*(2), 163–185.

Brown, N. C., Sentance, S., Crick, T., & Humphreys, S. (2014). Restart: The resurgence of computer science in UK schools. *ACM Transactions on Computing Education, 14*(2), 1–22.

Buhalis, D. (2020). Technology in tourism-from information communication technologies to eTourism and smart tourism towards ambient intelligence tourism: a perspective article. *Tourism Review, 75*(1), 267–272.

Buhalis, D., & Moldavska, I. (2022). Voice assistants in hospitality: using artificial intelligence for customer service. *Journal of Hospitality and Tourism Technology, 13*(3), 386–403.

Buhalis, D., & Sinarta, Y. (2019). Real-time co-creation and nowness service: lessons from tourism and hospitality. *Journal of Travel & Tourism Marketing, 36*(5), 563–582.

Buhalis, D., & Volchek, K. (2021). Bridging marketing theory and big data analytics: The taxonomy of marketing attribution. *International Journal of Information Management, 56*, Article 102253.

Buhalis, D., Harwood, T., Bogicevic, V., Viglia, G., Beldona, S., & Hofacker, C. (2019). Technological disruptions in services: lessons from tourism and hospitality. *Journal of Service Management, 30*(4), 484–506.

Buhalis, D., Parra-López, E., & Martinez-Gonzalez, J. A. (2020). Influence of young consumers' external and internal variables on their eloyalty to tourism sites. *Journal of Destination Marketing & Management*, 15. https://doi.org/10.1016/j.jdmm.2020.100409

Bundy, A. et al. (2019, November 28). Explainable AI, Retrieved from ⟨https://royalsociety.org/topics-policy/projects/explainable-ai/⟩.

Burger, B., Kanbach, D. K., & Kraus, S. (2023). The role of narcissism in entrepreneurial activity: a systematic literature review. *Journal of Enterprising Communities: People and Places in the Global Economy*. https://doi.org/10.1108/JEC-10-2022-0157

Burstein, J. (2003). The E-rater Scoring Engine: Automated Essay Scoring With Natural Language Processing. In M. D. Shermis, & J. Burstein (Eds.), *Automated Essay Scoring: A Cross-Disciplinary Perspective* (pp. 113–121). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Cadmus (2023). Identifying and Mitigating Risks of AI in Authentic Assessment Practices. Available at: ⟨https://www.cadmus.io/blog/identifying-and-mitigating-risks-of-ai-in-authentic-assessment-practices⟩.

Cain, S. (2023). "'This song sucks': Nick Cave responds to ChatGPT song written in style of Nick Cave". *The Guardian*. January 17, 2023 ⟨https://www.theguardian.com/music/2023/jan/17/this-song-sucks-nick-cave-responds-to-chatgpt-song-written-in-style-of-nick-cave⟩.

Carr, N. G. (2003). IT Doesn't Matter. *Harvard Business Review, 81*(5), 41–49.

Carroll, J. (2007). *A Handbook for Deterring Plagiarism in Higher Education (2/e)*. Oxford: Oxford Centre for Staff and Learning Development, Oxford Brookes University,.

Castelvecchi, D. (2022). Are ChatGPT and AlphaCode going to replace programmers? *Nature*. https://doi.org/10.1038/d41586-022-04383-z

Centre for Teaching and Learning. (2023). *Four lessons from ChatGPT: Challenges and opportunities for educators*. University of Oxford, (Available) ⟨https://www.ctl.ox.ac.uk/article/four-lessons-from-chatgpt-challenges-and-opportunities-for-educators⟩.

Chakravarti, A. (2023). Even ChatGPT believes it can never replace human writers as it lacks creativity, emotions and sensitivity. *India Today*. Retrieved January 31, 2023, from ⟨https://www.indiatoday.in/technology/features/story/even-chatgpt-believes-it-can-never-replace-human-writers-as-it-lacks-creativity-emotions-and-sensitivity-2324174-2023-01-20⟩.

Chandra, S., Shirish, A., & Srivastava, S. C. (2022). To Be or Not to Be …Human? Theorizing the Role of Human-Like Competencies in Conversational Artificial Intelligence Agents. *Journal of Management Information Systems, 39*(4), 969–1005.

ChatGPT, 2023, January 29, In Wikipedia. ⟨https://en.wikipedia.org/wiki/ChatGPT⟩.

Chen, W., & Wellman, B. (2004). The global digital divide–within and between countries. *IT & Society, 1*(7), 39–45.

Chen, Y., Jensen, S., Albert, L. J., Gupta, S., & Lee, T. (2022). Artificial Intelligence (AI) Student Assistants in the Classroom: Designing Chatbots to Support Student Success. Retrieved January 31, 2023, from *Information Systems Frontiers*. https://doi.org/10.1007/s10796-022-10291-4.

Chui, M., Hall, B., Mayhew, H., & Singla, A. (2022a, December 6). The state of AI in 2022—And a half decade in review. Retrieved February 8, 2023, from ⟨https://tinyurl.com/33j62ssd⟩.

Chui, M., Roberts, R., & Yee, L. Generative AI is here: How tools like ChatGPT could change your business. Retrieved from ⟨https://www.mckinsey.com/capabilities/quantumblack/our-insights/generative-ai-is-here-how-tools-like-chatgpt-could-change-your-business?stcr=738AC24D41C14C898CCA8FCF18A6796F&cid=other-eml-alt-mip-mck&hlkid=e76a5e48b167490195bf9af698176a19&hctky=10062436&hdpid=3eaef69d-9337–4776-9522-e13af67ae1a5#/⟩.

Chui, M., Roberts, R., & Yee, L. (2022b). Generative AI is here: How tools like ChatGPT could change your business. *Quantum Black AI by McKinsey* (Available online) ⟨https://www.mckinsey.com/capabilities/quantumblac/our-insights/generative-ai-is-here-how-tools-like-chatgpt-could-change-your-business⟩.

Chui, M., Manyika, J., & Miremadi, M. (2016). Where. Machines Could Replace Humans—And Where They Can't (Yet). McKinsey Quarterly. *July McKinsey com*.

Coch, L., & French Jr, J. R. (1948). Overcoming resistance to change. *Human Relations, 1*(4), 512–532.

Cockburn, I.M., Henderson, R., & Stern, S. (2019). The Impact of Artificial Intelligence on Innovation: An Exploratory Analysis. Chap. 4 in The Economics of Artificial Intelligence, edited by AK Agrawal, J. Gans and A. Goldfarb.

Coombs, C., Stacey, P., Kawalek, P., Simeonova, B., Becker, J., Bergener, K., & Trautmann, H. (2021). What is it about humanity that we can't give away to intelligent machines? A European perspective. *International Journal of Information Management, 58*, Article 102311.

Cooper, R. B., & Zmud, R. W. (1990). Information technology implementation research: a technological diffusion approach. *Management Science, 36*(2), 123–139.

Cotton, D.R., Cotton, P.A., & Shipway, J.R. (2023). Chatting and Cheating. Ensuring academic integrity in the era of ChatGPT. edarix.org.

Council of Europe (2022). Artificial intelligence and education: A critical view through the lens of human rights, democracy and the rule of law. Available at ⟨https://rm.coe.int/artificial-intelligence-and-education-a-critical-view-through-the-lens/1680a886bd⟩ Accessed 10.03.23.

Cranefield, J., Winikoff, M., Chiu, Y. T., Li, Y., Doyle, C., & Richter, A. (2022). Partnering with AI: The case of digital productivity assistants. *Journal of the Royal Society of New Zealand*. https://doi.org/10.1080/03036758.2022.2114507

Creswell, A., White, T., Dumoulin, V., Arulkumaran, K., Sengupta, B., & Bharath, A. A. (2018). Generative adversarial networks: An overview. *IEEE Signal Processing Magazine, 35*(1), 53–65.

Crick, T. (2021). COVID-19 and digital education: A catalyst for change? *ITNOW, 63*(1), 16–17.

Czarnecka, B., & Mogaji, E. (2020). How are we tempted into debt? Emotional appeals in loan advertisements in UK newspapers. *International Journal of Bank Marketing, 38*(3), 756–776.

Dattathrani, S., & De', R. (2022). The Concept of Agency in the era of Artificial Intelligence: dimensions and degrees. *Information Systems Frontiers*, 1–26.

Davenport, T. H., & Ronanki, R. (2018). Artificial intelligence for the real world. *Harvard Business Review, 96*(1), 108–116.

De Cremer, D., Kasparov, G. (2021, March 18). AI Should Augment Human Intelligence, Not Replace It. Retrieved from ⟨https://hbr.org/2021/03/ai-should-augment-human-intelligence-not-replace-it⟩.

Deng, J., & Lin, Y. (2022). The benefits and challenges of ChatGPT: An overview. *Frontiers in Computing and Intelligent Systems, 2*(2), 81–83.

Diederich, S., Brendel, A. B., Morana, S., & Kolbe, L. (2022). On the Design of and Interaction with Conversational Agents: An Organizing and Assessing Review of Human-Computer Interaction Research. *Journal of the Association for Information Systems, 23*(1), 96–138.

Diener, F., & Špaček, M. (2021). Digital transformation in banking: A managerial perspective on barriers to change. *Sustainability, 3*(4), 2032–2042.

Dowling, M., & Lucey, B. (2023). ChatGPT for (finance) research: The Bananarama conjecture. *Finance Research Letters*, Article 103662 (In press. Available at) ⟨https://www.sciencedirect.com/science/article/pii/S1544612323000363⟩.

Drucker, P. F. (1999). Knowledge-worker productivity: The biggest challenge. *California management review, 41*(2), 79–94.

Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda. *International Journal of Information Management, 48*, 63–71.

Duan, Y., Ong, V. K., Xu, M., & Mathews, B. (2012). Supporting decision making process with "ideal" software agents–What do business executives want? *Expert Systems with Applications, 39*(5), 5534–5547.

Dwivedi, Y. K., Hughes, L., Baabdullah, A. M., Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, M. M., & Wamba, S. F. (2022a). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 66*, Article 102542. https://doi.org/10.1016/j.ijinfomgt.2022.102542

Dwivedi, Y. K., Hughes, L., Kar, A. K., Baabdullah, A. M., Grover, P., Abbas, R., & Wade, M. (2022b). Climate change and COP26: Are digital technologies and information management part of the problem or the solution? An editorial reflection and call to action. *International Journal of Information Management, 63*, Article 102456.

Dwivedi, Y. K., Hughes, L., Cheung, C. M., Conboy, K., Duan, Y., Dubey, R., & Viglia, G. (2022c). How to develop a quality research article and avoid a journal desk rejection. *International Journal of Information Management, 62*, Article 102426.

Dwivedi, Y. K., Hughes, L., Wang, Y., Alalwan, A. A., Ahn, S. J., Balakrishnan, J., & Wirtz, J. (2022d). Metaverse marketing: How the metaverse will shape the future of consumer research and practice. *Psychology & Marketing*. https://doi.org/10.1016/j.jbusres.2022.113420

Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., & Wang, Y. (2021a). Setting the future of digital and social media marketing research: Perspectives and research propositions. *International Journal of Information Management, 59*, Article 102168.

Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., & Williams, M. D. (2021b). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management, 57*, Article 101994.

Dwivedi, Y. K., Hughes, D. L., Coombs, C., Constantiou, I., Duan, Y., Edwards, J. S., & Upadhyay, N. (2020). Impact of COVID-19 pandemic on information management research and practice: Transforming education, work and life. *International Journal of Information Management, 55*, Article 102211.

Dwivedi, Y. K., Wastell, D., Laumer, S., Henriksen, H. Z., Myers, M. D., Bunker, D., & Srivastava, S. C. (2015). Research on information systems failures and successes: Status update and future directions. *Information Systems Frontiers, 17*(1), 143–157.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review, 14*, 57–74.

Eliot, L. (2023, January 22 2023). Generative AI ChatGPT Is Going To Be Everywhere Once The API Portal Gets Soon Opened, Stupefying AI Ethics And AI Law. Retrieved from ⟨https://www.forbes.com/sites/lanceeliot/2023/01/22/generative-ai-chatgpt-is-going-to-be-everywhere-once-the-api-portal-gets-soon-opened-stupefying-ai-ethics-and-ai-law/⟩.

Ellington, A. J. (2003). A Meta-Analysis of the Effects of Calculators on Students' Achievement and Attitude Levels in Precollege Mathematics Classes. *Journal for Research in Mathematics Education, 34*(5), 433–463.

Elliot, B. (2022). Why is ChatGPT Making Waves in the AI Market? Retrieved from ⟨https://www.gartner.com/en/newsroom/press-releases/2022–12-08-why-is-chatgpt-making-waves-in-the-ai-market⟩.

Else, H. (2023). Abstracts written by ChatGPT fool scientists, 423-423 *Nature, 613*(7944). https://doi.org/10.1038/d41586-023-00056-7.

Elsevier, 2023, The Use of AI and AI-assisted Technologies in Scientific Writing. ⟨https://www.elsevier.com/about/policies/publishing-ethics⟩ (accessed 20th Feb, 2023).

EU High-Level Expert Group on AI, 2019, April 08, Ethics guidelines for trustworthy AI. Retrieved from ⟨https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai⟩.

Ferlazzo, L. (2023). 19 Ways to Use ChatGPT in Your Classroom. Available at ⟨https://www.edweek.org/teaching-learning/opinion-19-ways-to-use-chatgpt-in-your-classroom/2023/01⟩ Accessed 10.03.23.

Financial Times, 2023, Daily Mirror publisher explores using ChatGPT to help write local news. ⟨https://www.ft.com/content/4fae2380-d7a7–410c-9eed-91fd1411f977⟩ (accessed 20th Feb, 2023).

Firat, M. (2023). How Chat GPT Can Transform Autodidactic Experiences and Open Education?.https://doi.org/10.31219/osf.io/9ge8m (last accessed 09/02/2023).

Fire, M., & Guestrin, C. (2019). Over-optimization of academic publishing metrics: observing Goodhart's Law in action. *GigaScience, 8*(6), 1–20.

Floridi, L. (2019). Establishing the rules for building trustworthy AI. *Nature Machine Intelligence, 1*(6), 261–262.

Floridi, L. et al. (2018). AI4People's Ethical Framework for a Good AI Society: Opportunities, Risks, Principles, and Recommendations. Retrieved from https://www.eismd.eu/wp-content/uploads/2019/03/AI4People's-Ethical-Framework-for-a-Good-AI-Society.pdf.

Floridi, L., & Chiratti, M. (2020). GPT-3: Its nature, scope, limits, and consequences. *Minds and Machines, 30*, 681–694.

Floridi, L., & Strait, A. (2020). Ethical Foresight Analysis: What it is and Why it is Needed? *Minds & Machines*. https://doi.org/10.1007/s11023-020-09521-y

Fountaine, T., McCarthy, B., & Saleh, T. (2021). Getting AI to Scale. *Harvard Business Review*. May-June 2021. Retrieved from ⟨https://hbr.org/2021/05/getting-ai-to-scale⟩.

Gao, C.A., Howard, F.M., Markov, N.S., Dyer, E.C., Ramesh, S., Luo, Y., & Pearson, A.T. (2022). Comparing scientific abstracts generated by ChatGPT to original abstracts using an artificial intelligence output detector, plagiarism detector, and blinded human reviewers. bioRxiv, 2022.2012.2023.521610. doi:10.1101/2022.12.23.521610.

Gartner, 2022, Hype Cycle for Artificial Intelligence (AI). ⟨https://www.gartner.com/en/articles/what-s-new-in-artificial-intelligence-from-the-2022-gartner-hype-cycle⟩ (accessed 20th Feb, 2023).

Gartner.com (2019). Top Trends on the Gartner Hype Cycle for Artificial Intelligence, 2019, ⟨https://www.gartner.com/smarterwithgartner/top-trends-on-the-gartner-hype-cycle-for-artificial-intelligence-2019/⟩.

Getahun, H. (2023). ChatGPT could be used for good, but like many other AI models, it's rife with racist and discriminatory bias. *Insider*. ⟨https://www.insider.com/chatgpt-is-like-many-other-ai-models-rife-with-bias-2023-1⟩ Accessed: 24 FEB 2023.

Ghazwani, S., van Esch, P., Cui, Y., & Gala, P. (2022). Artificial intelligence, financial anxiety and cashier-less checkouts: a Saudi Arabian perspective. *International Journal of Bank Marketing, 40*(6), 1200–1216.

Gill, G., & Bhattacherjee, A. (2009). Whom are we informing? Issues and recommendations for MIS research from an informing sciences perspective. *MIS Quarterly, 33*, 217–235.

Goertzel, B., & Pennachin, C. (2007). *Artificial General Intelligence*. Berlin: Springer-Verlag,.

Goldstein, I., & Papert, S. (1977). Artificial intelligence, language, and the study of knowledge. *Cognitive Science, 1*(1), 84–123.

Google (2023) Google Assistant, retrieved on the web at ⟨https://newsroom.bankofamerica.com/content/newsroom/press-releases/2022/10/bank-of-america-s-erica-tops-1-billion-client-interactions–now-.html%20October%2012⟩.

GPT, Thunström, A.O., & Steingrimsson, S. (2022). Can GPT-3 write an academic paper on itself, with minimal human input? Retrieved from Online: ⟨https://hal.science/hal-03701250v1⟩.

Grady, P. (2023). ChatGPT Amendment Shows the EU is Regulating by Outrage, February 13, ⟨https://datainnovation.org/2023/02/chatgpt-amendment-shows-the-eu-is-regulating-by-outrage/⟩.

Greenwood, R., & Hinings, C. R. (1993). "Understanding strategic change: The contribution of archetypes". *Academy of Management Journal, 36*, 1052–1081.

Greenwood, R., & Hinings, C. R. (1996). Understanding radical organizational change: bringing together the old and the new institutionalism. *Academy of Management, 21*, 1022–1054.

Greenwood, R., Suddaby, R., & Hinings, C. R. (2002). Theorizing change: the role of professional associations in the transformation of institutionalized fields. *Academy of Management, 45*(1), 58–80.

Guan, C. , Wang, X. , Zhang, Q. , Chen, R. , He, D. , & Xie, X., 2019, May, Towards a deep and unified understanding of deep neural models in nlp. In International conference on machine learning (pp. 2454–2463). PMLR, available at ⟨http://proceedings.mlr.press/v97/guan19a/guan19a.pdf⟩.

Guo, B., Zhang, X., Wang, Z., Jiang, M., Nie, J., Ding, Y.,. & Wu, Y. (2023). How Close is ChatGPT to Human Experts? Comparison Corpus, Evaluation, and Detection. *arXiv preprint arXiv:2301.07597*.

Gupta, S., & Chen, Y. (2022). Supporting Inclusive Learning Using Chatbots? A Chatbot-Led Interview Study. *Journal of Information Systems Education, 33*(1), 98–108.

Hamilton, I. A. (2022). "Don't worry about AI becoming sentient. Do worry about it finding new ways to discriminate against people". *Insider*. ⟨https://www.businessinsider.com/ai-discrimination-bias-worse-problem-than-sentience-2022-6⟩ Accessed: 24 FEB 2023.

Haque, M.U., Dharmadasa, I., Sworna, Z.T., Rajapakse, R.N., & Ahmad, H. (2022). I think this is the most disruptive technology": Exploring Sentiments of ChatGPT Early Adopters using Twitter Data. arXiv preprint arXiv:2212.05856.

Heikkilä, M. (2023). How OpenAI is trying to make ChatGPT safer and less biased. *Mitosz Technology Review*. ⟨https://www.technologyreview.com/2023/02/21/1068893/how-openai-is-trying-to-make-chatgpt-safer-and-less-biased/⟩ Accessed: 24 FEB 2023.

Hendrik, E., 2022, I get your excitement about ChatGPT, but … Available online: ⟨https://www.hendrik-erz.de/post/i-get-your-excitement-about-chatgpt-but⟩.

Henrickson L. (2023) Chatting with the dead: the hermeneutics of thanabots, Media, Culture & Society 1–18.

Hiatt, J. (2006). ADKAR: a model for change in business, government, and our community: Prosci.

Hill, J., Ford, W. R., & Farreras, I. G. (2015). Real conversations with artificial intelligence: A comparison between human–human online conversations and human–chatbot conversations. In *Computers in Human Behavior, 49* pp. 245–250). Elsevier,.

Hirschheim, R., Klein, H. K., & Lyytinen, K. (1996). Exploring the intellectual structures of information systems development: A social action theoretic analysis. *Accounting, Management and Information Technologies, 6*, 1–64.

Hoffman, A. J. (1999). Institutional evolution and change: Environmentalism and the US chemical industry. *Academy of Management Journal, 42*(4), 351–371.

Hu, K. (2023) ChatGPT sets record for fastest-growing user base - analyst note,February 2, ⟨https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023–02-01/⟩.

Huang, M. H., & Rust, R. T. (2018). Artificial intelligence in service. *Journal of Service Research, 21*(2), 155–172.
Huang, P.-S., Wang, C., Huang, S., Zhou, D., & Deng, L. (2018). Towards neural phrase-based machine translation. In International Conference on Learning Representations.
Huang, R. (2019). *Educational Technology: A Primer for the 21st Century*. Springer Nature,.
Hughes, A. (2023), "ChatGPT: Everything you need to know about OpenAI's GPT-3 tool", Available at: ⟨https://www.sciencefocus.com/future-technology/gpt-3/⟩.
https://newsroom.taylorandfrancisgroup.com/taylor-francis-clarifies-the-responsible-use-of-ai-tools-in-academic-content-creation/.
IBM (2023). Watson Assistant case studies. Available at: ⟨https://www.ibm.com/products/watson-assistant/case-studies⟩.
International Conference on Machine Learning, 2023, ICML 2023 Call For Papers. ⟨https://icml.cc/Conferences/2023/CallForPapers⟩ (accessed 20th Feb, 2023).
Introna, L. D., & Hayes, N. (2011). On Sociomaterial Imbrications: What Plagiarism Detection Systems Reveal and Why It Matters. *Information and Organization, 21*(2), 107–122.
Irons, A., & Crick, T. (2022). Cybersecurity in the Digital Classroom: Implications for Emerging Policy, Pedagogy and Practice. *Higher Education in a Post-COVID World: New Approaches and Technologies for Teaching and Learning*. Emerald Publishing,.
Janssen, M., & van den Hoven, J. (2015). Big and Open Linked Data (BOLD) in government: A challenge to transparency and privacy? *Government Information Quarterly, 32*(4), 363–368.
Jena, L. K., & Goyal, S. (2022). Emotional intelligence and employee innovation: Sequential mediating effect of person-group fit and adaptive performance. *European Review of Applied Psychology, 72*(1), Article 100729.
Jensen, M. L., Dinger, M., Wright, R. T., & Thatcher, J. B. (2017). Training to mitigate phishing attacks using mindfulness techniques. *Journal of Management Information Systems, 34*(2), 597–626.
Jisc (2023). Does ChatGPT Mean the End of the Essay as an Assessment Tool? Available at: ⟨https://www.jisc.ac.uk/news/does-chatgpt-mean-the-end-of-the-essay-as-an-assessment-tool-10-jan-2023⟩ (last accessed 10/10/23).
Kabudi, T., Pappas, I., & Olsen, D. H. (2021). AI-enabled adaptive learning systems: A systematic mapping of the literature. *Computers and Education: Artificial Intelligence, 2*, Article 100017.
Kahneman, D. (2011). *Thinking, Fast and Slow*. New York: Farrar, Straus and Giroux,.
Kar, A. K. (2016). Bio inspired computing–a review of algorithms and scope of applications. *Expert Systems with Applications, 59*, 20–32.
Kelly, C., 2023, ChatGPT might change advertising — but it won't revolutionize it. [Online] Available at: ⟨https://www.marketingdive.com/news/chatgpt-AI-marketing-advertising-revolutionize/641649/⟩ [Accessed 31 1 2023].
Kendrick, C. (2023). The Efficacy of ChatGPT: Is it Time for Librarians to Go Home? *Scholarly Kitchen* (Available at) ⟨https://scholarlykitchen.sspnet.org/2023/01/26/guest-post-the-efficacy-of-chatgpt-is-it-time-for-the-librarians-to-go-home/⟩.
Kietzmann, J., Paschen, J., & Treen, E. R. (2018). "Artificial Intelligence in Advertising: How Marketers Can Leverage Artificial Intelligence Along the Consumer Journey. *Journal of Advertising Research, 58*(3), 263–267.
Kim, A., & Dennis, A. R. (2019). Says who? The effects of presentation format and source rating on fake news in social media. *Mis Quarterly, 43*(3), 1025–1039.
Kim, H., Shin, D. K., Yang, H., & Lee, J. H. (2019). A study of AI chatbot as an assistant tool for school English curriculum. *Korean Association For Learner-Centered Curriculum And Instruction, 19*(1), 89–110. https://doi.org/10.22251/jlcci.2019.19.1.89
Kim, S., Wang, Y., & Boon, C. (2021). Sixty years of research on technology and human resource management: Looking back and looking forward. *Human Resource Management, 60*(1), 229–247.
King, A.A., & Baatartogtokh, B. (2015). How useful is the theory of disruptive innovation? available at ⟨http://sloanreview.mit.edu/article/how-useful-is-the-theory-of-disruptive-innovation/⟩. MIT Sloan Management Review, Fall, 77–90.
Kissinger, H. A., Schmidt, E., & Huttenlocher, D. (2021). *The Age of AI: and our Human Future*. Hachette UK,.
Klepper, D. (2023), It turns out that ChatGPT is really good at creating online propaganda: 'I think what's clear is that in the wrong hands there's going to be a lot of trouble. January 24, ⟨https://fortune.com/2023/01/24/chatgpt-open-ai-online-propaganda/⟩.
Kotter, J. P. (2007). *Leading change: Why transformation efforts fail. In Museum management and marketing* (pp. 20–29). Routledge,.
Kreps, D., & Rowe, F. (2021). Free Will in Philosophy and in IS research: where do we stand and where do we want to be? ICIS 2021 Proceedings. 5.
Krügel, S., Ostermaier, A., & Uhl, M. (2023). The moral authority of ChatGPT. arXiv preprint arXiv:2301.07098.
Kshetri, N., & Ajami, R. (2008). "Institutional Reforms in the Gulf Cooperation Council Economies: A Conceptual Framework". *Journal of International Management, 14*(3), 300–318.
Kshetri, N., & Dholakia, N. (2009). Professional and trade associations in a nascent and formative sector of a developing economy: a case study of the NASSCOM effect on the Indian offshoring industry. *J Int Manag, 15*(2), 225–239.
Kshetri, N. (2018). Informal institutions and Internet-based equity crowdfunding. *Journal of International Management, 21*(4), 33–51.
Kshetri, N. (2023a). "Regulatory technology and supervisory technology: Current status, facilitators and barriers". *IEEE Computer, 56*(1), 64–75.
Kshetri, N. (2023b). ChatGPT in developing economies. *IEEE IT Professional, 25*(2) (*forthcoming*).
Kulesh, S. (2022). Why ChatGPT can be dangerous for every Internet user. *The Times of India* (Available online) ⟨https://timesofindia.indiatimes.com/toirreporter/author-sourabh-kulesh-479259193.cms⟩.
Kundalia, N.D. (2023, January 30). ChatGPT and the future of writing. *Hindustan Times*. Retrieved January 31, 2023, from ⟨https://www.hindustantimes.com/books/chatgpt-and-the-future-of-writing-101675090609362.html⟩.
Kung, T.H., Cheatham, M., & Medenilla, A. (2022). Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models. *bioRxiv. Published online December, 20*, 2022–12.
Kushwaha, A. K., & Kar, A. K. (2021). MarkBot – A Language Model-Driven Chatbot for Interactive Marketing in Post-Modern World. Retrieved January 31, 2023, from *Information Systems Frontiers*. https://doi.org/10.1007/s10796-021-10184-y.
Laffont, J.-J., & Martimort, D. (2002). *The Theory of Incentives: The Principal-agent Model*. Princeton University Press,.
Larsen, K. R., Lukyanenko, R., Mueller, R. M., Storey, V. C., VanderMeer, D., Parsons, J., & Hovorka, D. S. (2020). *Validity in Design Science Research, Designing for Digital Transformation*. Co-Creating Services with Citizens and Industry: *15th International Conference on Design Science Research in Information Systems and Technology*, DESRIST 2020, Kristiansand, Norway, December 2–4, 2020, Proceedings 15 (pp. 272–282). Springer,. Co-Creating Services with Citizens and Industry: *15th International Conference on Design Science Research in Information Systems and Technology*, DESRIST 2020, Kristiansand, Norway, December 2–4, 2020, Proceedings 15.
Laumer, S., Maier, C., Eckhardt, A., & Weitzel, T. (2016). Work routines as an object of resistance during information systems implementations: Theoretical foundation and empirical evidence. *European Journal of Information Systems, 25*(4), 317–343. https://doi.org/10.1057/ejis.2016.1
LeCun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. *Nature, 521*(7553), 436–444.
Li, J., Larsen, K., & Abbasi, A. (2020a). TheoryOn: A design framework and system for unlocking behavioral knowledge through ontology learning. *MIS Quarterly, 44*(4).
Li, T., Sahu, A. K., Talwalkar, A., & Smith, V. (2020b). Federated learning: Challenges, methods, and future directions. *IEEE Signal Processing Magazine, 37*(3), 50–60.
Licklider, J. C. (1960). Man-computer symbiosis. *IRE Transactions on Human factors in Electronics*, (1), 4–11.
Lin, J.-S. (Elaine), & Wu, L. (2023). Examining the psychological process of developing consumer-brand relationships through strategic use of social media brand chatbots. *Computers in Human Behavior, 140*, Article 107488.
Liu, S., Yang, L., Zhang, C., Xiang, Y. T., Liu, Z., Hu, S., & Zhang, B. (2020). Online mental health services in China during the COVID-19 outbreak. *The Lancet Psychiatry, 7*(4), e17–e18.
Lokman, A. S., & Ameedeen, M. A. (2018). Modern chatbot systems: A technical review. *Proceedings of the Future Technologies Conference* (pp. 1012–1023). Cham: Springer,. https://doi.org/10.1007/978-3-030-02683-7_75 (November).
Lucey, B., & Dowling, M. (2023). ChatGPT: our study shows AI can produce academic papers good enough for journals - just as some ban it. *The Conversation* (Available at) ⟨https://theconversation.com/chatgpt-our-study-shows-ai-can-produce-academic-papers-good-enough-for-journals-just-as-some-ban-it-197762⟩.
Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence Unleashed: An Argument for Ai in Education*. Pearson London,.
Ma, L., & Sun, B. (2020). Machine learning and AI in marketing–Connecting computing power to human insights. *International Journal of Research in Marketing, 37*(3), 481–504.
Maguire, S., Hardy, C., & Lawrence, T. B. (2004). Institutional entrepreneurship in emerging fields: HIV/aids treatment advocacy in Canada. *Academy of Management, 47*(5), 657–679.
Mao, Y., White, T., Sadler, P. M., & Sonnert, G. (2017). The association of precollege use of calculators with student performance in college calculus. *Educational Studies in Mathematics, 94*(1), 69–83.
Mariani, M. M., Machado, I., & Nambisan, S. (2023). Types of innovation and artificial intelligence: A systematic quantitative literature review and research agenda. *Journal of Business Research, 155*, Article 113364.
Mariani, M. M., Machado, I., Magrelli, V., & Dwivedi, Y. K. (2022). Artificial intelligence in innovation research: A systematic review, conceptual framework, and future research directions. *Technovation*. , Article 102623. https://doi.org/10.1016/j.technovation.2022.102623
Martin, K. (2019). Ethical implications and accountability of algorithms. *Journal of Business Ethics, 160*(4), 835–850.
McCarthy, J. (2007). What is artificial intelligence. Available from ⟨http://jmc.stanford.edu/artificial-intelligence/what-is-ai/index.html⟩ Accessed 10.03.23.
McGrath, J. E. (1984). *Groups: Interaction and performance* (Vol. 14). Englewood Cliffs, NJ: Prentice-Hall,.
McKinsey & Company, 2023, What is generative AI? Retrieved from ⟨https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-generative-ai#/⟩.
Melis, G., Dyer, C., & Blunsom, P. (2017). On the state of the art of evaluation in neural language models. arXiv preprint arXiv:1707.05589.
Merhi, M. I. (2022). An Evaluation of the Critical Success Factors Impacting Artificial Intelligence Implementation. *International Journal of Information Management*. , Article 102545. https://doi.org/10.1016/j.ijinfomgt.2022.102545
Metcalfe, M. (2004). Theory: Seeking a plain English explanation. *JITTA: Journal of Information Technology Theory and Application, 6*(2), 13–21.
Metz, A. (2022). 6 exciting ways to use ChatGPT – from coding to poetry. *TechRadar*. ⟨https://www.techradar.com/features/6-exciting-ways-to-use-chatgpt-from-coding-to-poetry⟩ Accessed: Feburary 20, 2023.
Mishra, M. (2023). As ChatGPT takes the internet by storm, here's what its rivals are up to. *The Economic Times*. January 31 ⟨https://economictimes.indiatimes.com/tech/technology/as-chatgpt-takes-the-internet-by-storm-heres-what-its-rivals-are-up-to/articleshow/97441789.cms⟩.
Mitchell, A. (2023). ChatGPT could make these jobs obsolete: 'The wolf is at the door.'. *New York Post*. January 25 ⟨https://nypost.com/2023/01/25/chat-gpt-could-make-these-jobs-obsolete/⟩.

Mithas, S. (2016). Digital intelligence: what every smart manager must have for success in an information age. *Portfolio Penguin*.
Mithas, S., & McFarlan, F. W. (2017). What is Digital Intelligence? *IEEE IT Professional, 19* (4), 3–6. ⟨https://www.computer.org/csdl/mags/it/2017/04/mit2017040003.html⟩.
Mithas, S., Chen, Z.-L., Saldanha, T., & Silveira, A. D. O. (2022). How Will Artificial Intelligence and Industry 4.0 Emerging Technologies Transform Operations Management? *Production and Operations Management, 31*(12), 4475–4487. https://doi.org/10.1111/poms.13864
Mithas, S., Murugesan, S., & Seetharaman, P. (2020). What is Your Artificial Intelligence Strategy? *IEEE IT Professional, 22*(2), 4–9.
Mogaji, E., & Nguyen, N. P. (2022). Managers' understanding of artificial intelligence in relation to marketing financial services: insights from a cross-country study. *International Journal of Bank Marketing, 40*(6), 1272–1298.
Mogaji, E., Farquhar, J. D., Van Esch, P., Durodié, C., & Perez-Vega, R. (2022). Guest editorial: Artificial intelligence in financial services marketing. *International Journal of Bank Marketing, 40*(6), 1097–1101.
Mogaji, E., Olaleye, S., & Ukpabi, D. (2020a). Using AI to personalise emotionally appealing advertisement. *Digital and Social Media Marketing: Emerging Applications and Theoretical Development* (pp. 137–150). Cham: Springers,.
Mogaji, E., Soetan, T., & Kieu, T. (2020b). The implications of artificial intelligence on the digital marketing of financial services to vulnerable customers. *Australasian Marketing Journal, 29*(3), 235–242.
Mollick, E. (2022). ChatGPT Is a Tipping Point for AI. *Harvard Business Review*. December 14.
Mollick, E.R. & Mollick, L. (2022). New Modes of Learning Enabled by AI Chatbots: Three Methods and Assignments. Available at: http://dx.doi.org/10.2139/ssrn.4300783Pflügner,
Montti, R. (2022). What is ChatGPT and how can you use it? *Search Engine Journal* (Accessed from) ⟨https://www.searchenginejournal.com/what-is-chatgpt/473664/#close⟩.
Moor, J. H. (2008). Why we need better ethics for emerging technologies. In J. V. D. Hoven, & J. Weckert (Eds.), *Information Technology and Moral Philosophy* (pp. 26–39). Cambridge: Cambridge University Press.
National Institute of Standards and Technology, 2023, January 26, NIST AI Risk Management Framework Playbook. NIST. Retrieved February 8, 2023, from ⟨https://pages.nist.gov/AIRMF/⟩.
Nature. (2023). Preparing your materials. *Nature* (Available at) ⟨https://www.nature.com/nbt/submission-guidelines/preparing-your-submission⟩.
New York Times. (2023). Don't Ban ChatGPT in Schools. *Teach With It*. ⟨https://www.nytimes.com/2023/01/12/technology/chatgpt-schools-teachers.html⟩ Accessed 10.03.23.
Newman, K. L. (2000). "Organizational transformation during institutional upheaval". *The Academy of Management Review, 25*(3), 602–619.
Ng, J., Haller, E., & Murray, A. (2022). The ethical chatbot: A viable solution to socio-legal issues. *Alternative Law Journal, 47*(4), 308–313.
Nguyen, N., & Mogaji, E. (2022). #BankFromHome: Using Advertisement Campaigns to Change Banking Behaviour During the COVID-19 Pandemic in an Emerging Economy. *Marketing Communications and Brand Development in Emerging Markets Volume II: Insights for a Changing World* (pp. 83–108). Cham: Springer International Publishing,.
North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge, UK: Cambridge University Press,.
Northey, G., Hunter, V., Mulcahy, R., & Choong, K. (2022). Man vs machine: how artificial intelligence in banking influences consumer belief in financial advice. *International Journal of Bank Marketing, 40*(6), 1182–1199.
O'Connor, S. (2023). Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse. *Nurse Education in Practice, 66*, Article 103537.
O'Connor, A. (2021). Reading people. *The Lancet Child & Adolescent Health, 5*(11), 779.
O'Connor, S.J. N.E. i P. (2022). Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse? *66*, 103537–103537.
O'Connor, S., & ChatGPT. (2023). Editorial: Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse? *Nurse Education In Practice, 66*, Article 103537. https://doi.org/10.1016/j.nepr.2022.103537
Ofcom (2022). Instagram, TikTok and YouTube teenagers' top three news sources. Available at ⟨https://www.ofcom.org.uk/news-centre/2022/instagram,-tiktok-and-youtube-teenagers-top-three-news-sources⟩ Accessed 10.03.23.
O'Flaherty, J., & Phillips, C. (2015). The use of flipped classrooms in higher education: A scoping review. *The Internet and Higher Education, 25*, 85–95.
Okonkwo, C. W., & Ade-Ibijola, A. (2021). Chatbots applications in education: A systematic review. *Computers and Education Artificial Intelligence, 2*, Article 100033. https://doi.org/10.1016/j.caeai.2021.100033
Omoge, A. P., Gala, P., & Horky, A. (2022). Disruptive technology and AI in the banking industry of an emerging market. *International Journal of Bank Marketing, 40*(6), 1217–1247.
OpenAI (2022). New and Improved Content Moderation Tooling. ⟨https://openai.com/blog/new-and-improved-content-moderation-tooling/⟩. Accessed: 24 FEB 2023.
OpenAI, 2023a, ChatGPT: Optimizing Language Models for Dialogue. Available at: ⟨https://openai.com/blog/chatgpt/⟩.
OpenAI, 2023b, Usage policies. ⟨https://platform.openai.com/docs/usage-policies⟩. Accessed: 24 FEB 2023.
OpenAI, 2023, "DALL.E2", Available at: ⟨https://openai.com/dall-e-2/⟩.
Oppy, G., & Dowe, D. (2021). The Turing Test. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy*. Winter Edition. ⟨https://plato.stanford.edu/archives/win2021/entries/turing-test/⟩.
Oreg, S. (2003). Resistance to change: Developing an individual differences measure. *Journal of Applied Psychology, 88*(4), 680.
Ortiz, S. (2023a). ChatGPT is changing everything. But it still has its limits. *ZDNet* (Available online) ⟨https://www.zdnet.com/article/chatgpt-is-changing-everything-but-it-still-has-its-limits/⟩.
Ortiz, S. (2023b). What is ChatGPT and why does it matter? Here's everything you need to know. *ZD Netto Innovation* (Accessed from) ⟨https://www.zdnet.com/article/what-is-chatgpt-and-why-does-it-matter-heres-everything-you-need-to-know/⟩.
Pagani, M. and Champion, R., forthcoming, Artificial Intelligence for Business Creativity, Routledge.
Pappas, I. O., & Giannakos, M. N. (2021). Rethinking Learning Design in IT Education During a Pandemic. *Frontiers in Education, 6*, 103.
Pariser, E. (2011). *The Filter Bubble: What the Internet Is Hiding from You*. London: Viking/Penguin Press,.
Pazzanese, C. (2020). Great Promise but Potential for Peril. *The Harvard Gazette*. October 26 ⟨https://news.harvard.edu/gazette/story/2020/10/ethical-concerns-mount-as-ai-takes-bigger-decision-making-role/⟩.
Pearl, M. (2022): The ChatGPT chatbot from OpenAI is amazing, creative, and totally wrong. ⟨https://mashable.com/article/chatgpt-amazing-wrong⟩.
Perrigo, B. (2023). OpenAI Used Kenyan Workers on Less Than $2 Per Hour to Make ChatGPT Less Toxic. Time. ⟨https://time.com/6247678/openai-chatgpt-kenya-workers⟩.
Pflügner, K., Maier, C., & Weitzel, T. (2021). The direct and indirect influence of mindfulness on techno-stressors and job burnout: A quantitative study of white-collar workers. *Computers in Human Behavior, 115*, Article 106566.
Pinker, S. (2022). Tech Prophecy and the Underappreciated Power of Ideas. In J. Brockman (Ed.), *Possible Minds: Twenty-Five Ways of Looking at AI*. New York: Penguin Press.
Pizzi, G., Scarpi, D., & Pantano, E. (2021). Artificial intelligence and the new forms of interaction: Who has the control when interacting with a chatbot? *Journal of Business Research, 129*, 878–890.
Popper, K.R. (1957). *Philosophy of Science: A personal report*.
Qadir, J. (2022). Engineering Education in the Era of ChatGPT: Promise and Pitfalls of Generative AI for Education. TechRxiv. https://doi.org/10.36227/techrxiv.21789434.v1.
Radford, A., Narasimhan, K., Salimans, T., & Sutskever, I. (2018). Improving language understanding by generative pre-training. Preprint. 1–12.
Rafalin, D., undated, Designing Assessment to Minimise the Possibility of Contract Cheating. Available at: ⟨https://www.city.ac.uk/_data/assets/pdf_file/0019/440245/Designing-Assessment-to-Minimise-the-Possibility-of-Contract-Cheating-18-RL1.pdf⟩ (last accessed 09/02/2023).
Rai, A., Constantinides, P., & Sarker, S. (2019). Next generation digital platforms: toward human-AI hybrids. *MIS Quarterly, 43*(1), iii–ix.
Rasmusen, E. (2014). Perfect, certain, symmetric and complete information. *Games and information: An introduction to game theory* (fourth edition.,). Basil Blackwell,.
Reed, L. (2022). ChatGPT for Automated Testing: From conversation to code. *Sauce Labs*. ⟨https://saucelabs.com/blog/chatgpt-automated-testing-conversation-to-code⟩ Accessed: February 20, 2023.
Reese, H. (2016). Why Microsoft's 'Tay' AI bot went wrong. *TechRepublic* (Available at) ⟨https://www.techrepublic.com/article/why-microsofts-tay-ai-bot-went-wrong/⟩.
Reich, R. (1992). *The work of nations. Preparing ourselves for 21st century capitalism*. Alfred Knopf,.
Riedel, A., Mulcahy, R., & Northey, G. (2022). Feeling the love? How consumer's political ideology shapes responses to AI financial service delivery. *International Journal of Bank Marketing, 40*(6), 1102–1132.
Rogers, E. M. (2010). *Diffusion of Innovations*. Simon and Schuster,.
Rosenblatt, K. (2023). ChatGPT passes MBA exam given by a Wharton professor. Available at: ⟨https://www.nbcnews.com/tech/tech-news/chatgpt-passes-mba-exam-wharton-professor-rcna67036⟩.
Rosenzweig-Ziff, D. (2023). New York City blocks use of the ChatGPT bot in its schools. *The Washington Post*. ⟨https://www.washingtonpost.com/education/2023/01/05/nyc-schools-ban-chatgpt/⟩.
Rowe, F. (2018). Being critical is good, but better with philosophy! From digital transformation and values to the future of IS research. *European Journal of Information Systems, 27*(3), 380–393.
Ryle, G. (1945). Knowing how and knowing that: The presidential address. In *Aristotelian Society* (Vol. 46, pp. 1–16). Wiley, (January).
Sarker, S., Chatterjee, S., Xiao, X., & Elbanna, A. (2019). The Sociotechnical Perspective as an 'Axis of Cohesion' for the IS discipline: Recognizing its Historical Legacy and Ensuring its Continued Relevance. *MIS Quarterly, 43*(3), 695–719.
Schucany, W. R., Minton, P. D., & Shannon Jr, B. S. (1972). A survey of statistical packages. *ACM Computing Surveys (CSUR), 4*(2), 65–79.
Schuetz, S. W., & Venkatesh, V. (2020). "The Rise of Human Machines: How Cognitive Computing Systems Challenge Assumptions of User-System Interaction". *Journal of the Association for Information Systems*, (21:2), 460–482. https://doi.org/10.17705/1jais.00608
Schuetzler, R. M., Grimes, G. M., & Giboney, J. S. (2020). The impact of chatbot conversational skill on engagement and perceived humanness. *Journal of Management Information Systems, 37*(3), 875–900.
Science. (2023). ChatGPT is fun, but not an author. ⟨https://www.science.org/doi/10.1126/science.adg7879⟩ (accessed 20th Feb, 2023).
Scott, R. (2001). *Institutions and Organizations*. Thousand Oaks, CA: Sage,.
Scott, W. R., Ruef, M., Mendel, P. J., & Caronna, C. A. (2000). *Institutional change and healthcare organizations: From professional dominance to managed care*. Chicago, IL: University of Chicago Press,.

Searle, J. R. (1980). Minds, brains, and programs. *Behavioral and brain Sciences, 3*(3), 417–424.
Seeger, A.-M., Pfeiffer, J., & Heinzl, A. (2021). Texting with Humanlike Conversational Agents: Designing for Anthropomorphism. *Journal of the Association for Information Systems, 22*(4), 931–967.
Selwyn, N. (2022). The future of AI and education: Some cautionary notes. *European Journal of Education, 57*(4), 620–631.
Shah, C., & Bender, E.M. (2022). Situating Search. In ACM SIGIR Conference on Human Information Interaction and Retrieval, 221–232.
Sheth, J. N., Jain, V., Roy, G., & Chakraborty, A. (2022). AI-driven banking services: the next frontier for a personalised experience in the emerging market. *International Journal of Bank Marketing, 40*(6), 1248–1271.
Shneiderman, B. (2020). Human-Centered Artificial Intelligence: Three Fresh Ideas. *AIS Transactions on Human-Computer Interaction, 12*(3), 109–124.
Shrivastava, R. (2022). Teachers Fear ChatGPT Will Make Cheating Easier Than Ever. *Forbes*. Retrieved January 31, 2023, from ⟨https://www.forbes.com/sites/rashishrivastava/2022/12/12/teachers-fear-chatgpt-will-make-cheating-easier-than-ever/⟩.
Shujahat, M., Sousa, M. J., Hussain, S., Nawaz, F., Wang, M., & Umer, M. (2019). Translating the impact of knowledge management processes into knowledge-based innovation: The neglected and mediating role of knowledge-worker productivity. *Journal of Business Research, 94*, 442–450.
Sieloff, C. G. (1999). 'If only HP knew what HP knows': the roots of knowledge management at Hewlett-Packard. *Journal of Knowledge Management, 3*(1), 47–53.
Simon, H. A. (1960). The corporation: Will it be managed by machines? In M. L. Anshen, & G. L. Bach (Eds.), *Management and the Corporations 1985* (pp. 17–55). McGraw-Hill.
Singh, V., Chen, S. S., Singhania, M., Nanavati, B., & Gupta, A. (2022b). How are reinforcement learning and deep learning algorithms used for big data based decision making in financial industries–A review and research agenda. *International Journal of Information Management Data Insights, 2*(2), Article 100094.
Singh, V., Nanavati, B., Kar, A. K., & Gupta, A. (2022a). How to maximize clicks for display advertisement in digital marketing? A reinforcement learning approach. *Information Systems Frontiers*, 1–18. https://doi.org/10.1007/s10796-022-10314-0
Soetan, T. O., Mogaji, E., & Nguyen, N. P. (2021). Financial services experience and consumption in Nigeria. *Journal of Services Marketing, 35*(7), 947–961.
Sollie, P. (2009). On Uncertainty in Ethics and Technology. In P. Sollie, & M. Düwell (Eds.), *Evaluating New Technologies: Methodological Problems for the Ethical Assessment of Technology Developments, The International Library of Ethics, Law and Technology* (pp. 141–158). Springer.
Springer-Nature, 2023, Tools such as ChatGPT threaten transparent science; here are our ground rules for their use. ⟨https://www.nature.com/articles/d41586–023-00191–1⟩ (accessed 20th Feb, 2023).
Stahl, B. C. (2021). *Artificial Intelligence for a Better Future: An Ecosystem Perspective on the Ethics of AI and Emerging Digital Technologies, SpringerBriefs in Research and Innovation Governance*. Springer International Publishing,. https://doi.org/10.1007/978-3-030-69978-9
Stahl, B. C., Flick, C., & Timmermans, J. (2017). Ethics of Emerging Information and Communication Technologies-On the implementation of RRI. *Science and Public Policy, 44*, 369–381. https://doi.org/10.1093/scipol/scw069
Stein, N., & Brooks, K. (2017). A fully automated conversational artificial intelligence for weight loss: longitudinal observational study among overweight and obese adults. *JMIR Diabetes, 2*(2). https://doi.org/10.2196/diabetes.8590
Stevenson, C., Smal, I., Baas, M., Grasman, R., & van der Maas, H. (2022). Putting GPT-3's Creativity to the (Alternative Uses) Test. In International Conference on Computational Creativity (ICCC) 2022. arXiv preprint arXiv:2206.08932.
Stokel-Walker, C. (2022). AI bot ChatGPT writes smart essays - should professors worry? *Nature (London)*. https://doi.org/10.1038/d41586-022-04397-7
Stokel-Walker, C. J. N. (2023). ChatGPT listed as author on research papers: many scientists disapprove. *Nature, 613*, 620–621. https://doi.org/10.1038/d41586-023-00107-z
Strahan, B., & Gleason, B. (2019). Building a multi-channel Q&A chatbot at Saint Louis University using the open source QnABot. Available at: ⟨https://aws.amazon.com/blogs/publicsector/building-a-multi-channel-qa-chatbot-at-saint-louis-university-using-the-open-source-qnabot/⟩.
Strang, D., & Meyer, J. (1993). Institutional conditions for diffusion. *Theory Soc, 22*, 487–511.
Stylos, N., Zwiegelaar, J., & Buhalis, D. (2021). Big data empowered agility for dynamic, volatile, and time-sensitive service industries: the case of tourism sector. *International Journal of Contemporary Hospitality Management, International Journal of Contemporary Hospitality Management, 33*(3), 1015–1036. https://doi.org/10.1108/IJCHM-07-2020-0644
Sun, T. Q., & Medaglia, R. (2019). Mapping the challenges of Artificial Intelligence in the public sector: Evidence from public healthcare. *Government Information Quarterly, 36*(2), 368–383.
Susnjak, T. (2022). ChatGPT: The End of Online Exam Integrity? arXiv preprint arXiv: 2212.09292.
Svrluga, S. (2023). Princeton student builds app to detect essays written by a popular AI bot. *The Washington Post*, ⟨https://www.washingtonpost.com/education/2023/01/12/gptzero-chatgpt-detector-ai/⟩.
Tang, C. S. (2022). Innovative technology and operations for alleviating poverty through women's economic empowerment. *Production and Operations Management, 31*(1), 32–45.
Te'eni, D., Rowe, F., Agerfalk, P., & Lee, J. S. (2015). Publishing and getting published in EJIS: marshaling contributions for a diversity of genres. *European Journal of Information Systems, 24*(6), 559–568.
Tellis, G. J. (2006). Disruptive Technology or Visionary Leadership? *Journal of Product Innovation and Management, 23*(1), 34–38.
Terblanche, N., & Cilliers, D. (2020). Factors that influence users' adoption of being coached by an artificial intelligence coach. *Philosophy of Coaching: An International Journal, 5*(1), 61–70. https://doi.org/10.22316/poc/05.1.06
Tércio Pereira, P., Limberger, F., Minasi, S. M., & Buhalis, D. (2022). New Insights into Consumers' Intention to Continue Using Chatbots in the Tourism Context. *Journal of Quality Assurance in Hospitality & Tourism*. https://doi.org/10.1080/1528008X.2022.2136817
Terwiesch, C. (2023). Would Chat GPT Get a Wharton MBA? A Prediction Based on Its Performance in the Operations Management Course. Mack Institute News, White Paper. Available at: ⟨https://mackinstitute.wharton.upenn.edu/2023/would-chat-gpt3-get-a-wharton-mba-new-white-paper-by-christian-terwiesch/⟩.
Theconversation, 2023, "ChatGPT could be a game-changer for marketers, but it won't replace humans any time soon", Available at: ⟨https://theconversation.com/chatgpt-could-be-a-game-changer-for-marketers-but-it-wont-replace-humans-any-time-soon-198053⟩.
Thorp, H. (2023). ChatGPT is fun, but not an author. *Science, 379*(6630), 313-313.
Thorp, H. H. (2023). ChatGPT is fun, but not an author, 313–313 *Science (American Association for the Advancement of Science, 379*(6630). https://doi.org/10.1126/science.adg7879.
Tight, M. (2019). Mass Higher Education and Massification. *Higher Education Policy, 32*, 93–108.
Tiku, M., De Vinck, G., Oremus, W. (2023, February 3). Big Tech was Moving Cautiously on AI. Then Came ChatGPT, Washington Post. Retrieved from ⟨https://www.washingtonpost.com/technology/2023/01/27/chatgpt-google-meta/⟩.
Trinidad, J. E. (2020). Understanding student-centred learning in higher education: students' and teachers' perceptions, challenges, and cognitive gaps. *Journal of Further and Higher Education, 44*(8), 1013–1023.
Tung, L. (2023). ChatGPT can write code. Now researchers say it's good at fixing bugs, too. *ZDNet*. ⟨https://www.zdnet.com/article/chatgpt-can-write-code-now-researchers-say-its-good-at-fixing-bugs-too/⟩ Accessed: February 29, 2023.
Turing Test, 2023, January 29, In Wikipedia. ⟨https://en.wikipedia.org/wiki/Turing_test#Google_LaMDA_chatbot⟩.
Turing, A. (1950). Computing machinery and intelligence. *Mind, 59*, 433–460.
Turnitin (2023). Sneak preview of Turnitin's AI writing and ChatGPT detection capability. Available at: ⟨https://www.turnitin.com/blog/sneak-preview-of-turnitins-ai-writing-and-chatgpt-detection-capability⟩.
Uc-Cetina, V., Navarro-Guerrero, N., Martin-Gonzalez, A., Weber, C., & Wermter, S. (2022). Survey on reinforcement learning for language processing. *Artificial Intelligence Review*, 1–33. https://doi.org/10.1007/s10462-022-10205-5
UK Government (2021). National AI Strategy. Available at ⟨https://www.gov.uk/government/publications/national-ai-strategy⟩ Accessed 10.03.23.
UK Government Digital Service, 2019, July, UK government digital service standard. Retrieved from ⟨https://www.gov.uk/service-manual/service-standard⟩.
UNESCO (2021). AI and education: guidance for policy-makers. Available at ⟨https://unesdoc.unesco.org/ark:/48223/pf0000376709⟩ Accessed 10.03.23.
van Dis, E. A. M., Bollen, J., Zuidema, W., van Rooij, R., & Bockting, C. (2023). ChatGPT: five priorities for research. *Nature, 614*, 224–226. https://doi.org/10.1038/d41586-023-00288-7
van Esterik-Plasmeijer, P. W., & Van Raaij, W. F. (2017). Banking system trust, bank trust, and bank loyalty. *International Journal of Bank Marketing, 35*(1), 97–111.
Van Noorden, R. (2022). How language-generation AIs could transform science, 21–21 *Nature, 605*. https://doi.org/10.1038/d41586-022-01191-3.
Vargo, S. L., Maglio, P. P., & Akaka, M. A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal, 26*(3), 145–152.
Vassilakopoulou, P., Haug, A., Salvesen, L. M., & Pappas, I. O. (2023). Developing Human/AI interactions for chat-based-customer-services: lessons learned from the Norwegian Government. *European Journal of Information Systems, 32*(1), 10–22.
Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., & Polosukhin, I. (2017). Attention is all you need. *Advances in neural information processing systems*, 30. *31st Conference on Neural Information Processing Systems*. CA, USA: Long Beach, (Available at) ⟨https://proceedings.neurips.cc/paper/2017/file/3f5ee243547dee91fbd053c1c4a845aa-Paper.pdf⟩.
Venkatesh, V., & Sykes, T. A. (2013). Digital divide initiative success in developing countries: A longitudinal field study in a village in India. *Information Systems Research, 24*(2), 239–260.
Vincent, J. (2022) Open AI's new chatbot can explain code and write sitcom scripts but is still easily tricked, The Verge, December 2nd, ⟨https://www.theverge.com/23488017/openai-chatbot-chatgpt-ai-examples-web-demo⟩.
Vincent, J. (2023) Top AI conference bans use of ChatGPT and AI language tools to write academic papers, The Verge, January 6th, ⟨https://www.theverge.com/2023/1/5/23540291/chatgpt-ai-writing-tool-banned-writing-academic-icml-paper⟩.
Vives, X. (2019). Competition and stability in modern banking: A post-crisis perspective. *International Journal of Industrial Organization, 64*, 55–69.
Wacker, J. G. (1998). A definition of theory: research guidelines for different theory-building research methods in operations management. *Journal of Operations Management, 16*, 361–385.
Walsh, T. (2023). Bard, Bing and Baidu: how big tech's AI race will transform search – and all of computing, available at ⟨https://theconversation.com/bard-bing-and-baidu-how-big-techs-ai-race-will-transform-search-and-all-of-computing-199501⟩.
Walzer, M. (2017). In M. L. Gross, & T. Meisels (Eds.), *Soft War: The Ethics of Unarmed Conflict*. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781316450802.

Watermeyer, R., Crick, T., & Knight, C. (2022). Digital disruption in the time of COVID-19: Learning technologists' accounts of institutional barriers to online learning, teaching and assessment in UK universities. *International Journal for Academic Development, 27*(2), 148–162.

Watson, R. T., & Webster, J. (2020). Analysing the past to prepare for the future: Writing a literature review a roadmap for release 2.0. *Journal of Decision Systems, 29*(3), 129–147.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, xiii–xxiii.

Weinberger, D. (2019, November 06). How Machine Learning Pushes us to Define Fairness. Retrieved from ⟨https://hbr.org/2019/11/how-machine-learning-pushes-us-to-define-fairness⟩.

Weissglass, D. E. (2022). Contextual bias, the democratization of healthcare, and medical artificial intelligence in low- and middle-income countries. *Bioethics, 36*(2), 201–209.

Weizenbaum, J. (1966). ELIZA—a computer program for the study of natural language communication between man and machine. Communications of the ACM, 9(1), 36–45 Welsh, S. (2023). ChatGPT and the Future of the Professions. Quillette. Available at: ⟨https://quillette.com/2023/01/26/chatgpt-and-the-future-of-the-professions/?ref=quillette-newsletter⟩.

West, D. (2018, September 13). The role of corporations in addressing AI's ethical dilemmas. Retrieved from ⟨https://www.brookings.edu/research/how-to-address-ai-ethical-dilemmas/⟩.

Whetten, D. A. (1989). What constitutes a theoretical contribution? *Academy of Management Review, 14*, 490–495.

Whitford, E. (2022). A Computer Can Now Write Your College Essay, Maybe Better Than You Can. *Forbes com*. ⟨https://www.forbes.com/sites/emmawhitford/2022/12/09/a-computer-can-now-write-your-college-essay—maybe-better-than-you-can/?sh=3f21aba2dd39⟩.

Wilkins, A. (2023). ChatGPT Detector Could Help Spot Cheaters Using AI to Write Essays.

Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. *Learning, Media and Technology, 45*(3), 223–235.

Williamson, B., Bayne, S., & Shay, S. (2020a). The datafication of teaching in Higher Education: critical issues and perspectives. *Teaching in Higher Education, 25*(4), 351–365.

Williamson, B., Eynon, R., & Potter, J. (2020b). Pandemic politics, pedagogies and practices: digital technologies and distance education during the coronavirus emergency. *Learning, Media and Technology, 45*(2), 107–114.

Wind, J. (2023). *AI-enabled New Educational Paradigm* (Seminar). SKEMA Business School.

Winikoff, M., Cranefield, J., Li, J., Doyle, C., & Richter, A. (2021). The Advent of Digital Productivity Assistants: The Case of Microsoft MyAnalytics. In IEEE Annual Hawaii International Conference on System Sciences (HICSS) 2021.

Wirtz, J., & Zeithaml, V. (2018). Cost-effective service excellence. *Journal of the Academy of Marketing Science, 46*(1), 59–80.

Wirtz, J., Kunz, W. H., Hartley, N., & Tarbit, J. (2023). Corporate digital responsibility in service firms and their ecosystems. *Journal of Service Research, published Online first*. https://doi.org/10.1177/10946705221130467

Wirtz, J., Lin, C., & Das, G. (2022). cost-effective health care developments and research opportunities in China, India and Singapore. *Journal of Services Marketing, 36*(4), 461–466.

Wirtz, J., Patterson, P. G., Kunz, W. H., Gruber, T., Lu, V. N., Paluch, S., & Martins, A. (2018). Brave new world: service robots in the frontline. *Journal of Service Management, 29*(5), 907–931.

Wlasak, W., Zwanenburg, S. P., & Paton, C. (2023). Supporting Autonomous Motivation for Physical Activity With Chatbots During the COVID-19 Pandemic: Factorial Experiment. *JMIR Formative Research, 7*(1). https://doi.org/10.2196/38500

Woolf, B. P. (1992). *AI in Education. In Encyclopedia of Artificial Intelligence* (2nd ed..,). New York: John Wiley & Sons,.

Woolf, B.P. (2015). AI and Education: Celebrating 30 Years of Marriage. In AIED Workshops (Vol. 4, pp. 38–47).

Yang, S. (2022). The Abilities and Limitations of ChatGPT. *Anaconda Perspectives*. ⟨https://www.anaconda.com/blog/the-abilities-and-limitations-of-chatgpt⟩. on 25th January 2023.

Zhai, X. (2022). ChatGPT user experience: Implications for education. arXiv SSRN 4312418, 1–10.

Zhai, X., Chu, X., Chai, C. S., Jong, M. S. Y., Istenic, A., Spector, M., Liu, J., Yuan, J., & Li, Y. (2021). A Review of Artificial Intelligence (AI) in Education from 2010 to 2020. *Complexity, 2021*, 1–18.

Zhang, L., Pentina, I., & Fan, Y. (2021). Who do you choose? Comparing perceptions of human vs robo-advisor in the context of financial services. *Journal of Services Marketing, 35*(5), 634–646.

Zhang, Z., Hummel, J. T., Nandhakumar, J., & Waardenburg, L. (2020). Addressing the key challenges of developing machine learning AI systems for knowledge-intensive work. *MIS Quarterly Executive, 19*(4), 221–238.

Zhao, L., Mao, H., Compton, B. J., Peng, J., Fu, G., Fang, F., & Lee, K. (2022). Academic dishonesty and its relations to peer cheating and culture: A meta-analysis of the perceived peer cheating effect. *Educational Research Review*, Article 100455.

Zhu, Y., Janssen, M., Wang, R., & Liu, Y. (2021). It is me, chatbot: working to address the COVID-19 outbreak-related mental health issues in China. User experience, satisfaction, and influencing factors. *International Journal of Human–Computer Interaction, 38*(12), 1182–1194.