Transforming boundaries: how does ChatGPT change knowledge work?

Paavo Ritala, Mika Ruokonen and Laavanya Ramaul

Paavo Ritala, Mika Ruokonen and Laavanya Ramaul are all based at the Business School, LUT University, Lappeenranta, Finland.

Released in late 2022, ChatGPT took the world by storm and was quickly adopted by knowledge workers across a wide variety of sectors and fields. While artificial intelligence (AI) technology was previously used mostly behind the scenes to improve the algorithms of consumer and enterprise software, ChatGPT is now directly and noticeably changing the work habits of both tech-savvy and everyday users. Tapping into the potential of ChatGPT and generative AI more broadly is on the agenda of companies, managers and entrepreneurs across the globe, given the major productivity potential available from this new general-purpose technology.

ChatGPT, which was developed by the company OpenAI, is based on a large language model that is built using a technique known as reinforcement learning with human feedback. In practice, this means that the language model (GPT-4) is pre-trained with massive amounts of data and information available on the public Web and in databases before being fine-tuned with human feedback to provide responses that are useful and accessible. What is revolutionary about ChatGPT are its *generative* and *conversational* features, which enable easier and broader access to the capabilities of an AI system than has previously been available. In fact, recent studies estimate that GPT models will affect at least some work tasks of about 80% of all workers, with a smaller subset of more knowledge-intensive workers seeing a majority of their tasks impacted (Eloundou *et al.*, 2023).

Generative AI represents a new paradigm in AI systems and means that AI can exhibit and mimic human creativity, making it increasingly useful in creative and knowledge-intensive careers like advertising, publishing, entertainment and software coding and application development (Berg *et al.*, 2023; Dwivedi *et al.*, 2023). Use cases of ChatGPT range from writing and correcting marketing materials, business plans, legal documents and software code all the way to drafting email responses, summarizing text, translation and identifying anomalies, errors and defects in textual materials. Recent studies have shown that ChatGPT's performance on some knowledge work tasks surpasses the quality of human workers (Gilardi *et al.*, 2023).

Conversational AI refers to AI systems that can interact with users, providing easier access and more intuitive user interfaces. These aspects of ChatGPT further improve the system's ability to help knowledge workers and provide better access to the current generative capabilities than what was previously available. What is now called "prompting" or "prompt engineering" refers to the activity and craft of using textual commands and input by users to interact with ChatGPT. Such iterations provide additional value for users by providing follow-up prompts and improving the outcomes of the generative model by further refining the results in the desired direction. For instance, users can ask for a different style, provide new information or ask to have the output summarized in a different way.

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As ChatGPT is becoming not only relevant but also increasingly important to today's knowledge work, it challenges what we know about worker–AI coexistence (Zirar *et al.*, 2023), leaving open several managerially relevant questions. Given the nature of our business and our daily knowledge work, what capabilities of ChatGPT benefit us the most? In which use cases or tasks should we foster the use of ChatGPT in our organization – and which ones should we avoid? Which parts of our business could be vulnerable to disruption due to ChatGPT, and how can we turn that disruption into an advantage? All in all, how do we create business value from ChatGPT and similar generative AI tools?

To explore the answers to these important managerial questions, we conducted interviews in spring 2023 with knowledge workers and professionals at several Finnish-based companies and organizations that had experimented with or adopted ChatGPT. The most advanced use cases discussed in our sample included systematic implementations of ChatGPT and generative AI to the workflows of knowledge workers, while the less advanced ones involved personal experimentation with the tool in individuals' daily work. All in all, we interviewed 22 informants in spring 2023, ranging from managing directors and CEOs to marketing managers and professionals, software engineers and designers, lawyers and technology and business consultants. Drawing on the insights from the interviews, we conducted an inductive analysis on the use and utility of ChatGPT in knowledge work; based on this initial analysis, we discovered different ways in which ChatGPT either augments human agency, makes it redundant or lacks capability in that regard. We report these findings through examples of ChatGPT use cases and limitations and with a framework of algorithmic assistance that we define below.

The capabilities and limitations of ChatGPT in knowledge work

The rapidly accumulating use cases demonstrate that the generative and conversational abilities of ChatGPT have already had a substantial impact on the tasks that people perform in knowledge-intensive roles. Based on our interviews, Table 1 summarizes what ChatGPT can already do and what it cannot yet achieve. It should be noted, however, that the

Table 1 Current capabilities and limitations of ChatGPT

ChatGPT can already	*ChatGPT cannot yet*
■ Answer questions and generate output from prompts provided in natural language ■ Serve as a search engine for inspiration, creativity and overviews on a wide range of topics ■ Be used as a content production tool to generate new texts that are typically early drafts of documents such as legal agreements, business pitches, meeting memos and corporate presentations ■ Be used as a content reorganization tool by iteratively working with users to refine textual materials for style, content and format and to summarize, reformulate and even translate textual materials ■ Write, review and correct software code ■ Make learning something new much easier and faster, helping people learn the basics of new domains ■ Handle routine tasks like responding to emails and generating reminders ■ Create draft content for different communication purposes: social media posts, blog posts, websites and so on ■ Reduce costs as it can take over repetitive tasks, resulting in using fewer people and offering more independence to senior employees	■ Replace Google Search; ChatGPT should be thought of as a prediction machine that provides approximated insights rather than consistently providing unassailable truths ■ Answer complicated questions or offer unique insights into a topic; however, if prompted with new data, this limitation can be partially overcome ■ Provide consistently correct or unbiased answers or consistently answer questions that are asked multiple times, as the output changes each time ■ Generate text that is 100% free of syntax or language errors; therefore, the texts or outputs often need checking and polishing ■ Meet strict privacy, compliance or ethical requirements (a problem that might be solved with enterprise software) ■ Access-real time information, as the current versions are trained on data ranging until 2021. However, this downside is partially (but not fully) overcome with ChatGPT's new functionalities and plugins for Web access, as well as users' abilities to feed in their own data

Source: Authors' own work

capabilities of the technology are likely to change rapidly; for example, the GPT-4 version that was in use for our study was released in March 2023 and has since been updated.

The upsides and potential of ChatGPT in knowledge work are already quite remarkable, and new use cases emerge daily, even as we write this in May 2023, long after the tool was released. Astonishingly, ChatGPT can serve as a smart "personal coach" or "team member" for the knowledge worker, providing guidance and tips in various languages to bolster human capabilities and helping finalize human tasks efficiently at unprecedented speed, thus potentially leading to large productivity gains. For instance, our informants from the legal field found ChatGPT useful as a digital assistant for producing professional texts and summarizing or rephrasing information, although a professional's expertise and oversight is still required. Further, a manager from the software consultancy industry found that ChatGPT represents a "new AI" capable of doing almost anything related to software coding or text generation well enough, although not perfectly. By comparison, the "old AI" systems based on machine learning might have been good for certain point solutions and use cases but lacked the flexibility and adaptability of generative AI models like ChatGPT. One content marketing professional confirmed that the new capabilities offered by ChatGPT will dramatically reduce the cost and time involved in producing new content, help alleviate writer's block and change the ways in which content is produced, delivered and monetized.

The weaknesses of ChatGPT are related to the nature of how large language models work because they make complex predictions of what is likely to be the "right" or desired output based on user prompts (Edelman and Abraham, 2023). With ChatGPT, this can lead to incorrect or biased answers and to a phenomenon called "hallucination," with many of our informants noting that they would not use ChatGPT as the only source of factual information but instead as a "sparring partner" for ideation. Firms still have concerns about how to work with sensitive data using ChatGPT. For instance, several informants from consulting firms noted that they do not insert sensitive customer data directly into ChatGPT. It was also clear that this problem is likely temporary and will be resolved with enterprise models or integration with other enterprise software that meets compliance or data privacy and secrecy requirements.

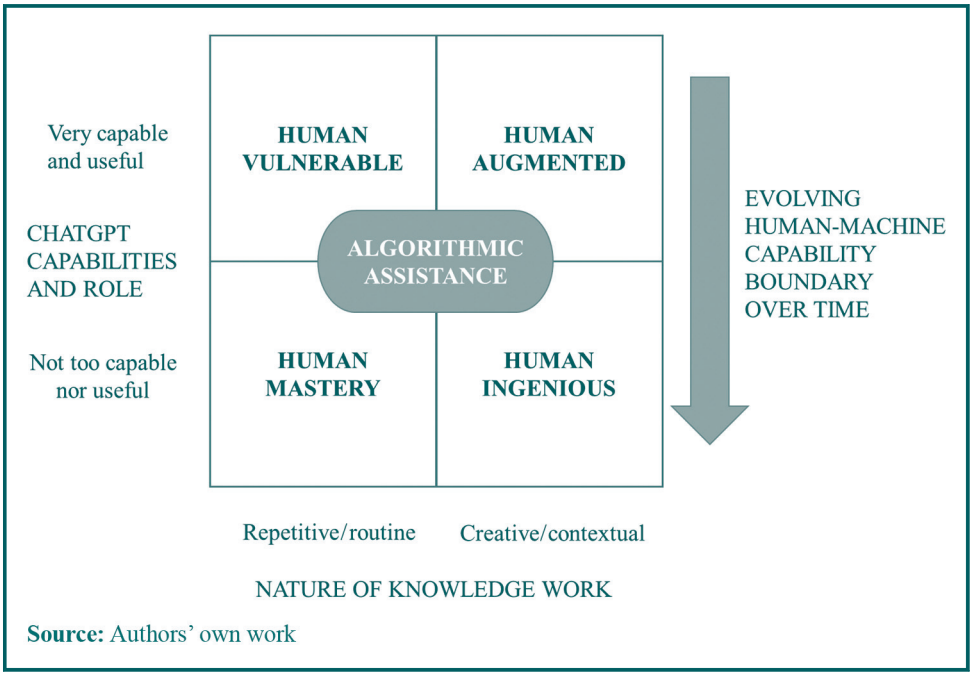
Algorithmic assistance: Transforming human–machine boundaries

It is increasingly obvious that generative and conversational AI tools such as ChatGPT have brought humans and technology closer together in new and more intuitive ways. In this regard, we use the term *algorithmic assistance* to capture how ChatGPT is already transforming knowledge work in companies. The "algorithmic" side highlights the sophisticated processes that lie at the heart of generative AI like ChatGPT that enable value-creating outputs based on user input. By choosing the word "assistance," we emphasize that ChatGPT helps humans perform—or avoid—tasks that are essential in knowledge work, thus impacting the roles of many employees in contemporary working life (de Cremer *et al.*, 2023).

We identify two dimensions and offer a related 2 × 2 matrix that are consequential in drawing the human–machine boundary in knowledge work (Figure 1). First, the nature of that kind of work involves the well-known division between repetitive and routine tasks and creative and contextual tasks (Madjar *et al.*, 2011). This dimension of our model answers the pragmatic question of what a task is like. Second, the capabilities and role of ChatGPT refer to its ability to undertake and perform certain tasks, with varying levels of user input. This dimension seeks to answer the pragmatic question of what the technology can do in relation to a specific task.

Together, the two dimensions provide clarity regarding the extent to which algorithmic assistance from ChatGPT can be useful to knowledge workers and how and to what extent it can or cannot replace human work. As depicted in Figure 1, we anticipate that the

Figure 1 ChatGPT and the boundaries of algorithmic assistance in knowledge work



Source: Authors' own work

continuously improving algorithms of ChatGPT and other generative AI technologies will create an evolving and accumulating pressure that reconfigures the human–machine capability boundary. This means that the tasks, both routine and creative, for which ChatGPT is useful will constantly increase, whereas the space for human-only work will persistently decrease. The framework also offers implications regarding the potential for ChatGPT in augmentation and automation (Raisch and Krakowski, 2021).

Human vulnerable

The upper left-hand corner of the framework represents tasks that are simple and mundane and for which ChatGPT is already valuable. Examples include summarizing notes, articles and many other kinds of text, generating reminders and drafting emails and answers to emails. Other tasks that are fairly routine where ChatGPT can outperform humans (in speed and sometimes accuracy) include debugging software code, pointing out linguistic errors and, as noted in a recent study, text annotation tasks (Gilardi *et al.*, 2023). Across all such tasks, we expect that algorithmic assistants will assume a greater role, with the possibility of reaching full automation, which would result in more human jobs becoming increasingly vulnerable to disruption. In fact, several of our informants recognized this evolution and mentioned that regular and mundane coding and debugging tasks will require much less human work in the future. In practice, ChatGPT typically has the human in the loop, but large language models and GPTs more broadly will be (and some already are) integrated with other software systems so that many routine tasks could be completely automated.

Human augmented

The upper right-hand corner includes challenging and complicated cognitive tasks. Many of our informants, especially from creative and content-intensive professions like marketing communications, mentioned that they use ChatGPT in generating communications materials, summaries, or even complete first drafts of blog posts. In many use cases, the

human–machine augmentation was highlighted, either by the user employing the ChatGPT outputs for their individual iteration or, conversely, with ChatGPT deployed to finalize user-generated content. In many cases, the process was iterative, even to the extent that one software consultant viewed ChatGPT as a team member (see also, Bouschery *et al.*, 2023). The role of the humans in augmenting ChatGPT outputs includes creating solid business plans for management approval and meeting a firm's privacy, compliance and ethical requirements. Furthermore, software consultancies use ChatGPT to aid in the coding and development process and to help in querying for programming-related knowledge. With ChatGPT (and the related AI tool GitHub Copilot), they can not only build standard code more effectively, but also customize software solutions as the coding process has become much more efficient and scalable.

Human ingenious

For now, we assume that some work tasks are so complicated, creative or contextual that ChatGPT as an algorithmic assistant cannot make a meaningful contribution to them. In such tasks, human ingenuity will still play a central role in the future. We have placed these tasks in the lower right-hand quadrant of our fourfold framework. These tasks include leading and managing people, operating in critical social situations, thinking outside the box and using creative artistic expression. For example, one of our informants from the legal field claimed that while ChatGPT could be used as a legal assistant, the main value for a client lies in the human touch or the specific negotiation or drafting skills of a human lawyer, which cannot be replaced, even in the future. Tasks that require a physical presence, interpersonal trust, emotional intelligence and other features that are deeply connected with human agency and social systems, are likely to remain human-first in the future (Clark and Chamorro-Premuzic, 2023). However, we observed in our informants' responses that the domain of human-ingenious tasks has begun to shrink. One leading consultant was already of the opinion that ChatGPT will affect all knowledge work in one way or another. As users start experimenting and sparring with generative AI systems in creative and contextual tasks, there will be more and more cases in which users will accept human–machine interaction as a natural part of social contexts.

Human mastery

Finally, while we assume that some simple and mundane tasks are likely to be automated or replaced by future versions of ChatGPT or other AI technologies, there is still a great deal of manual human work for which generative AI is not yet sufficiently capable or useful, such as any work that happens outside the digital domain or otherwise requires manual processing (e.g. patient care in healthcare, handling physical receipts in bookkeeping). There are also some types of tasks that fall under the umbrella of routine knowledge work that might happen in the digital context but still require a human touch, such as real-time replies to Slack or Teams messages, given the need to understand the nuances in many types of communication. In the future, while we expect that many tasks will remain in the domain of human mastery, developments in complementary technologies such as robotics and the Internet of Things will enable generative AI and AI systems more broadly to be integrated into tasks that used to be squarely in the human-only domain.

The diverse efficiency and creativity enhancing opportunities of ChatGPT calls both individual knowledge workers and companies to reflect what they can do to tap these opportunities. Based on the insights from our interviews, in Table 2, we propose a set of actionable questions for individual knowledge workers and companies from four viewpoints:

1. skills and capabilities;
2. team structure and workflow coordination;
3. culture and mindset; and
4. business model innovation.

Table 2 Key practical questions for using and scaling ChatGPT capabilities in knowledge work

Organizational transformation priorities	*Questions for individual knowledge workers*	*Questions for strategy and management*
Skills and capabilities	What tasks can I improve, automate or optimize with ChatGPT? What kinds of skills related to ChatGPT do I need to develop (e.g. prompting, data security, content curation)?	How can we leverage ChatGPT capabilities at scale across our organization? What kind of onboarding and training programs do we need to implement to fully benefit from ChatGPT?
Team structure and workflow coordination	How will my role on my teams and in the broader organization change once our organization adopts ChatGPT as part of the workflows? How will collaboration and communication processes in our organization change with the implementation of ChatGPT?	What are the tasks and roles that ChatGPT can replace or augment, and what roles and tasks will be completely new? How should we modify our team structures and workflows to incorporate relevant ChatGPT capabilities within them?
Culture and mindset	What level of support and guidance do I need to comfortably experiment and use ChatGPT in my daily work? How can I support my colleagues in adopting and using ChatGPT in ways that create value for them?	What steps can we take to ensure the ethical and responsible implementation of ChatGPT? How can we build a culture of trust and transparency around the implementation of ChatGPT?
Business model innovation	What types of experiments and pilots with ChatGPT can I undertake to create more value for our customers? Are there new ways to collaborate and communicate with our key stakeholders, given the new possibilities provided by ChatGPT?	How can we use ChatGPT to change or improve the key elements of our business model (value proposition, value creation, value capture)? Given that ChatGPT capabilities are widely available, what will our added value and strategic differentiators be in the eyes of our customers and partners?

Source: Authors' own work

It is obvious that we are still very much in the early days of ChatGPT, let alone other generative and conversational AI tools that are seemingly emerging daily. In its current form, ChatGPT is a useful algorithmic assistant and with further development and fine-tuning, it will become even more powerful. For instance, the integration of ChatGPT capabilities into software such as Teams, MS Word, MS Excel, and MS PowerPoint is likely to make this creative technology widely embedded if not ubiquitously available across platforms and tools, thus further generating new working habits. Other integrations of generative and conversational AI technology via application programming interfaces and plugins into other systems will provide yet another way for these new capabilities to proliferate and create new disruptions and innovations in knowledge work. We expect that potential future enterprise versions of ChatGPT and other generative AI tools should be able to resolve compliance and data privacy and security issues, expanding the boundaries within which this technology can create business value.

Yet, while disruption is already happening, nobody really knows the full nature and extent to which tasks and roles in knowledge work will be affected. For now, it is essential for managers and professionals to retain an open mind, exhibit the curiosity needed to experiment with ChatGPT and other generative AI tools and master the ability to learn quickly from the first trials to stay in the game in their given field and context. What is certain is that there is no going back: generative AI is here to stay.

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About the authors

Paavo Ritala is a Professor of Strategy and Innovation at the Business School at LUT University, Finland. His main research themes include networks, ecosystems and platforms, the role of data and digital technologies in organizations, business model innovation and circular and regenerative economy. His research has been published in journals such as *Journal of Management*, *Research Policy*, *Journal of Product Innovation Management*, *R&D Management*, *Technovation*, *Long Range Planning*, *Industrial and Corporate Change*, *California Management Review* and *Journal of Business Strategy*. He is closely involved with business practice through research projects, executive and professional education programs, and in speaker and advisory roles. Paavo Ritala is the corresponding author and can be contacted at: ritala@lut.fi

Mika Ruokonen is an Industry Professor of Digital Business at the Business School at LUT University, Finland. His research interests include data, artificial intelligence and digital business models and ecosystems. Mika has a broad experience in digital business, in managerial and consulting roles, and he holds several positions in different corporate boards.

Laavanya Ramaul is a Junior Researcher at the Business School at LUT University, Finland. Her research focuses on artificial intelligence, business models and industrial digital transformation. She has presented her work in numerous conferences and is actively working in the academia-industry interface.