Artificial Intelligence in Engineering Management—An Editor's Perspective (2023)

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***Abstract*—*Today, we live in a world determined by multiple crises creating less certainty about the future and its prediction. At the same time, new Artificial Intelligence (AI) technologies are developed at high pace that may lead to a new revolution in how we do business and manage companies. Generative AI tools offer exciting opportunities while at the same time putting to question some well-established solutions. This calls for more and extensive insights in research and practice to tackle the question how these technologies can be used for engineering management.*

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We are living in volatile times of several kinds of shocks that impact the way businesses operate. Pandemics, wars, climate crises, inflation, and many other global conflicts and challenges make predicting the future difficult, leading to a phenomenon called "polycrisis" [1]. On top of that, the present is highly influenced by disrupted global supply chains creating a shortage of resources, among many other factors. This leads to a so-called "systemic unsustainability" [2], which we are not used to in many parts of the world that were previously subject to greater levels of stability. Here a lot of opportunities arise for research to develop new managerial tools and to share experiences gained from practice. Feel free to submit your research results and personal experience to IEEE ENGINEERING MANAGEMENT REVIEW. This will be an interesting read for other scholars and practitioners.

The same is true for another development that some people already call a revolution: The recent advancements in Artificial Intelligence (AI). Since OpenAI made its generative chatbot tool ChatGPT available for free late last year, millions of users worldwide have started to understand the new dimensions of tasks such tools can do. Social media is full of examples of people using it for different purposes. Despite the public hype around ChatGPT, there are many other companies actively pursuing similar technologies: Google, Microsoft, Meta, Nvidia—to name some—are in the game, but also startups like Aleph Alpha with their product luminous. In China, the internet company Baidu is also working on its own chat solution called Ernie. In professional and business applications, generative chatbots have even led to the creation of a new job called "prompt engineering," focused on finding the best way to use these tools in certain business contexts and beyond [3].

Apart from chat tools, many other interesting developments deserve

attention. In arts, AI tools can help to foster creative thinking. One example is called Scribble Diffusion, a technology that completes drawings based on an AI algorithm. Further examples are Midjourney or DALL-E, also from OpenAI, which generates pictures based on written descriptions. Moreover, DeepL is an online translation service that aims at relating the translation to its semantic context. This list can be continued without limits, which shows how fast this field is emerging.

However, there are also limitations to these new and upcoming AI tools. One is the famous ELIZA effect, shown by Joseph Weizenbaum [4]. In this study, a computer program simulates a chat with a psychotherapist—a computational capability similar to AI chatbots. Test persons quickly reacted as if they were talking to an actual human. Trust and goodwill are important traits of human interaction, but many people are aware this should differ when "talking" to machines. However, with the advancements of generative AI, this distinction will become increasingly difficult for some users. A machine as is has no "knowledge"; it rather is comprised of data it has been trained with. Thus, it does not have the ability to judge if a statement it makes or receives is true or wrong. Hence, potential outputs may sound correct, but without the right domain of knowledge, it would not be easy for humans to determine whether they are true. In addition, many ethical questions arise around such tools. They are as good as the people developing them, but humans (also) do mistakes.

Today, most of generative AI tools are based on historical data only and still produce wrong or misleading results. Hence, there is still vast room for these new AI tools to be improved. Considering the fast developments in recent years and even months and the fact that AI in broad application likely came to stay, this will lead to potentially transformative implications to all levels of life and living. For example, even for researchers and higher education some far-reaching implications should be expected [5]. Society and businesses need to embrace the new AI reality and develop strategies for how to deal with and exploit its potentials in useful (i.e., nonharmful) ways.

For example, in one of our earlier articles in our sister journal IEEE Transactions on Engineering Management [6], we argue for two different roles AI can take in innovation management: as an originator or facilitator of innovation. In an originator role, AI is the starting point for innovation. It is the foundation of the creation of products and services. For instance, a company may include tools like DALL-E into its product offering to the customer or develop its own similar solution. In a facilitator role, AI serves as the starting point for a transformation within the company. Here, AI augments existing products and services. An example is using ChatGPT as an internal chatbot in a company's idea management unit. Taking on such viewpoints may further serve as a source of inspiration for further research, since a lot is currently being published in this field. An article in this issue of IEEE Engineering Management Review also shows an interesting direction how generative AI can foster ideation, even applying creativity methods [A1].

Concluding, AI has the potential to disrupt the way companies operate. The above-mentioned tools and examples offer a glimpse into potential direction this might head. This ongoing development also offers exciting opportunities for articles to be published in IEEE Engineering Management Review.

Questions to be answered could be, but are not limited to:

- How are AI tools used in companies? For which purposes? And in which departments?
- Which qualifications are necessary to manage AI tools?
- How to use AI tools for new product development, supply chain management, or in HR?
- Who should and can manage processes around AI?
- Can AI be used to train and educate staff, and if yes, how?
- How to address data security and ethical issues related to AI?
- What are critical future skills for tomorrow's employees and how can businesses ensure continuous training in times of fast technological development?

If you do research in this area or want to share your managerial experience, we look forward to receiving your articles for IEEE Engineering Management Review. Our worldwide readership of engineers engaged in management functions will love to learn more. With our different publications options of very comprehensive (Technology Manager Notebook), comprehensive (short article) and regular (longer article) papers, we are confident that we can provide engineers with management functions the up-to-date knowledge they need.

Appendix
Related Article

[A1] V. Bilgram and F. Laarmann, "Accelerating innovation with generative AI: AI-augmented digital prototyping and innovation methods," *IEEE Engineering Management Review*, vol. 51, no. 2, Jun. 2023, doi: 10.1109/EMR.2023.3272799.

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