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CRAFTING MEANINGFUL GENERATIVE AI-ENABLED KNOWLEDGE WORK

Short Paper

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Abstract

This paper reports from an ongoing research project on meaningful adoption and use of Generative Artificial Intelligence within the Communication Department of a Danish Municipality. Given its capacity to generate images, information, and text, GenAI models are positioned as being potentially transformative to cognitive tasks in knowledge work, raising concerns about skill displacement and a loss of meaning in the profession. This paper presents a set of sociotechnical principles for the introduction and integration of novel technologies, such as GenAI, while retaining meaningfulness in work. These principles were crafted by combining work design theory and extensive empirical material gathered through Action Design Research, in close collaboration with employees from the department. Centering the need for a common understanding of expectations for GenAI, the principles also point to the importance of organizational support to enable autonomous experimentation and accountability, while emphasizing transparency surrounding the decision-making process for the use of GenAI.

Keywords: Action Design Research, Work design, Generative AI, Sociotechnical Principles.

1 Introduction

As artificial intelligence (AI) and digital technologies become integrated into various aspects of human activity, their expected impacts on global socio-economic and organizational structures carry significant weight (WEF, 2023). Narratives surrounding AI span from utopian to dystopian, attracting attention from both the public and scientific communities (Teubner et al., 2023). Some authors caution against organizational adoption of AI due to fears of job replacement, risks of misinformation, and a shift toward more of an “asocial system” wherein people may feel socially disconnected at work and from the real world (Tang et al., 2023; Ngwenyama et al., 2023), while others advocate for swift adoption for productivity and performance gains (Berente et al., 2021; Brynjolfsson et al., 2023). Regardless of their positions, researchers unanimously acknowledge that the convergence of big data and AI is expected to increase the automation and augmentation of cognitive tasks in knowledge work (Brynjolfsson & McAfee, 2014; Frey & Osborne, 2017; Parker & Grote, 2022; Ngwenyama et al., 2023; Leonardi, 2023; Eapen et al., 2023). With the recent advent of Generative AI (GenAI), the boundaries of computer capabilities are fast expanding, seemingly narrowing the realm of cognitive tasks that remain exclusively within the domain of knowledge workers (Fischer et al., 2023; WEF, 2023).

GenAI is a type of machine learning that uses algorithms to create new data from existing information and they are designed to change by themselves continuously (Leonardi, 2023). GenAI models, such as ChatGPT and Midjourney respond to prompts by users, allowing them to create new content based on the given input. For instance, ChatGPT generates text resembling human-produced content, while Midjourney creates images from text prompts, making it a versatile and creative form of AI (Teubner et al., 2023). GenAI is often predicted to have a transformative impact, as GenAI models are integrated into knowledge work to perform cognitive tasks such as analyzing, reasoning, synthesizing, and

translating information. For example, the World Economic Forum forecasts a 75 percent rise in algorithmic replacement in cognitive work tasks by 2027 (WEF, 2023).

In response to the recent development and the different positions existing around AI and GenAI, sensible crafting of GenAI-enabled knowledge work, have emerged as focal points for employees and managers (Parker & Grote, 2022, Tang et al., 2023; Leonardi, 2023). Inspired by the sociotechnical perspective (Sarker et al., 2019; Fischer & Baskerville, 2023; Fischer et al. 2023) and work design (Parker & Grote, 2022) our study focuses on providing an approach to develop a set of guiding principles that focus on work design's significance in understanding technology impacts. Work design addresses well-designed jobs to foster well-being, learning, skill maintenance, and innovation (Parker et Grote., 2022). With the expected impact of GenAI on knowledge work, support and guidelines for optimizing its benefits, and decreasing its negative effects is needed. In this regard we are inspired by the concept of sociotechnical principles, promoting a human-centered approach, which can foster an interactive and meaningful relationship between humans and technology (Cherns, 1976; Glegg, 2000; Baxter & Sommerville, 2011; Fischer et al., 2023).

Parker & Grote (2022) advocate for increased intervention research, acknowledging mixed success in prior design methods regarding the new digital technology landscape. Thus, examining how sociotechnical principles can guide the continuous design of work becomes imperative. Our study employs the Action Design Research (ADR) approach to understand adoption of GenAI and the expected changes it brings to knowledge work in the Communication Department of a Danish Municipality. As part of our study, we are co-creating an artifact covering a set of sociotechnical principles, to guide and support individuals and the Department's capabilities to adopt new technology as part of their workflows, while maintaining well-being at work. In this iterative approach, interventions are evaluated and reflected upon with the research participants.

The research question guiding us in this endeavor is: *how to facilitate the adoption of GenAI and support meaningful knowledge work by crafting sociotechnical principles?* Our objectives include formulating a method for thoughtful adoption of GenAI and co-creating sociotechnical principles to provide direction and guidance for meaningful knowledge work in the Communication Department.

In this paper, we first explain our theoretical foundations, followed by a description of our methodological approach and ongoing research. Finally, we present the preliminary findings from our empirical data analysis and interventions. The paper ends with a description of the remaining steps of the ADR-process over the next six months which will contribute new knowledge and insights.

2 Sociotechnical principles and work design

Different perspectives exist on the interplay between people and technology, described as the techno-deterministic, non-deterministic, and integrative views (DeSanctis & Poole, 1994). The techno-deterministic view posits technology as a driver of human efficiency and productivity. In contrast, the non-deterministic view sees technology as an opportunity, emphasizing social aspects and human agency. The integrative view, or social technology, encompasses sociotechnical systems theory (Eason, 2008; Mumford, 2006), here technology adoption is understood as a process of organizational change, integrating both technological and human aspects. Ideally, this leads to higher efficiency and improved human characteristics of the sociotechnical system, such as greater job satisfaction (Mumford, 2006).

Sociotechnical change research examines how teams (Baxter & Sommerville, 2011) and individuals (Fischer & Baskerville, 2023) cope with changes when adapting work with new workplace technologies. Changes which manifest as technological socialization and technological institutionalization (Fischer & Baskerville, 2023). The former shapes individual behavior within a prevalent culture, while the latter generalizes value and behavior across work-systems via technological innovation. Both embody the principle of joint optimization, where the social and technical subsystems synergize innovation and change (Mumford, 2006; Eason, 2008). The classical sociotechnical perspective is thus characterized by the two subsystems in continuous interaction. However, to achieve both economic and humanistic outcomes, guiding principles i.e. sociotechnical principles, are essential (Pasmore et al., 2019; Sarker et

al., 2019; Cherns, 1976; Trist & Bamforth, 1951) to support a sensible integration of novel technologies into work-systems.

The point of departure of our study lies in the history and theory of sociotechnical principles. The sociotechnical principles date back to Cherns (1976) and have been used and revised several times with shifts in technology (e.g. Clegg (2000) and Baxter & Sommerville (2011)). The sociotechnical principles presented by Pasmore et al., (2019) emphasize the importance of proper work designs when technology is introduced. They ensure not just efficiency but also improved job satisfaction and quality of work life. The principles advocate for: Wholeness in work; Team Autonomy; Process Control Variances; Self-direction; Multi-skilling; Discretion; Joint optimization; Adaptation; Meaning and Incompletion.

The development of sociotechnical principles meets a profound need articulated by Parker & Grote (2022). They argue that insufficient attention has been given to how technology and technology-enabled changes alter tasks and work-systems. The existing, overly passive perspective focuses on how humans need to adapt to technology, rather than how work designs and technology might be adapted to meet human competencies, needs, and values. Proactive human-centered efforts to shape work design, alongside human-centered technologies, are also expected to generate performance benefits, while plentiful evidence show that technocentric change lacking consideration of social and organizational factors is more likely to fail (Pasmore et al., 2019). Parker & Grote (2022) propose that work design theory is ideally positioned to reorient the current debates towards a more proactive stance on what work is desirable, and how we can get there in the future.

With the increasing influence of digital technology, the techno-deterministic nature of adoption, and the very shifting nature of digital technology in the workplace, we suspect that sociotechnical principles can become valuable. To center the integration of AI in knowledge work Fischer et al. (2023) theorized five sociotechnical principles, emphasizing the need for a human-centered approach to organizational adoption of AI. Below we build on these five principles, accentuating their importance when adopting GenAI in knowledge work. The five principles being:

Joint optimization: The digital transition challenges the longstanding perception of humans as complementary to machines (Cherns, 1976). Digital implementations without work design often overlook humanistic values (Ngwenyama et al., 2023; Parker & Grote, 2022; Fischer & Baskerville, 2023; Sarker et al., 2019). Ideally, digital work design should prioritize both economic and humanistic objectives, especially in the prevailing digital first reality (Ngwenyama et al., 2023; Fischer et al., 2023). Co-development of sociotechnical principles at workplaces can mitigate this (Parker & Grote, 2022).

Wholistic workflows: Traits with a comparative advantage for humans, such as reasoning, communication, and coordination, are susceptible to algorithmic displacement (WEF, 2023). With GenAI undertaking specific tasks in workflows – such as information filtering and idea generation (Teubner et al., 2023) there is a risk of black-boxing certain tasks, and thereby diminishing the sense of being in command of a ‘whole workflow’ (Fischer et al., 2023; Parker & Grote., 2022).

Meaningfulness: When GenAI replaces tasks (WEF, 2023), it bears the risk of diminishing elements in a workflow that gives people a sense of meaning. Knowledge work often involves coordination with colleagues, autonomy to perform tasks your way, making discrete decisions, and then explaining the reasoning behind your choices and solutions (Pasmore et al. 2019). Being aware of the meaningful elements is essential when turning to GenAI for productivity gains.

Sufficient variety: Over-reliance on algorithms and GenAI can diminish job variety, learning opportunities, lead to skill loss, and potentially to job dissatisfaction and a reduced sense of meaningfulness (Parker & Grote, 2022). However, it can also lead to more creativity, better overview, and less information overflow by taking over cumbersome elements of tasks in workflows, ideally allowing humans to spend their time on interesting and complex tasks (Eapen et al., 2023).

Continuous learning: WEF (2023) concludes that 44% of the entire workforce needs re- and upskilling to accommodate to the new digital first reality. Work design must therefore include continuous learning and upskilling opportunities (Brynjolfsson et al., 2023). Defining learning strategies for gaining experience, building competences, creating knowledge, staying professionally skilled when using GenAI is important for wellbeing and therefore productivity (Fischer et al., 2023).

These five sociotechnical principles serve as our theoretical foundation informing our interventionist research project, which we describe in the next section.

3 Action Design Research for GenAI-enabled meaningful work

Action Design Research (ADR) is a methodological approach that emphasizes the co-creation of practical solutions in a real-world context. ADR is an iterative, process-oriented method that aims to research a specific organizational setting through an interventionist approach and continuous evaluation, in order to construct an artifact, often taking a form of technology, to convey identified research findings. Thus, the objective of ADR is to engage with use and users affected by technology (Sein et al., 2011).

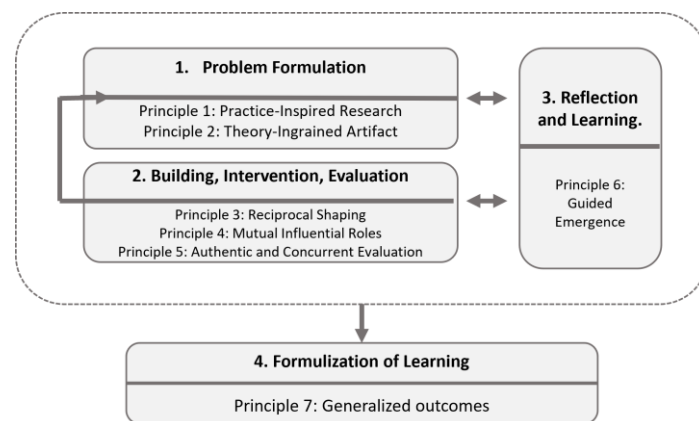


Figure 1. Action Design Research (Sein et al., 2011).

In our study we explore the adoption and potential of GenAI in the work and workflows in the Communication Department of a large Danish Municipality. We are interested in enabling a reciprocal shaping of an artifact taking the form of sociotechnical principles to guide the implementation and use of GenAI. We follow the ADR approach from Sein et al. (2011) which encompasses 4 phases, and 7 principles (see Figure 1). In this paper we focus on the first 2 phases.

3.1 Phase 1 Problem Formulation

Our research question: “how to facilitate the adoption of GenAI and support meaningful knowledge work through the crafting of sociotechnical principles?” mirrors the problem situation. We conducted two meetings in June 2023 with the Head of Communication in the Municipality, and later facilitated a seminar with the entire department of 22 employees in early August 2023. During these encounters, we formulated and validated the practice inspired research focus and the research question. Then we designed the first version of the theory-ingrained artifact, drawing from the derived sociotechnical principles presented in section 2. Inspired by Fischer et al., (2023) we developed figure 2 to illustrate how the artifact contains various concepts which interact and continuously change. The circular movement with arrows illustrates the dynamic nature between continuous adaptations of workflows and the rapidly changing GenAI technology resting in a state of unstable equilibrium between humanistic and economic objectives, as theorized in Fischer & Baskerville (2023). The unstable nature of configurations (represented by the 4 arrows and elaborated on in table 2), is illustrated by the wavy lines and the circular movements, back and forth, finding only brief moments of balance. The outer darker grey circle illustrates the context and reflects inherent values, and characteristics of the workplace culture, which will influence the 4 configurations (the arrows) and the crafting of a set of sociotechnical principles placed in the inner light grey circle. Figure 2 is thus how we depict the theory-ingrained artifact.

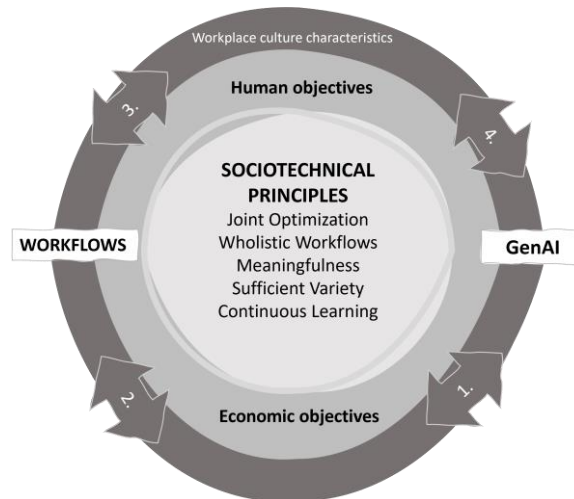


Figure 2. Theory-Ingained Artifact inspired by Fischer et al. (2023).

3.2 Phase 2 Building, Intervention, Evaluation

This phase collectively covers activities of building, intervention, and evaluation of the artifact. The phase builds on the principles of reciprocal shaping, mutual roles in shaping, and authentic and concurrent evaluation (figure 1).

Step 1 involved data-collecting interventions. We conducted six group interviews with three people in each during late august 2023. In total 18 communication professionals participated, spanning roles of web-designers, communication specialists and photographers. We asked them to draw up central workflows in communication tasks (such as webpage building, search-optimization, text development, target-group analysis, and photo-shoots etc.), their purpose of work, as well as experiences with GenAI (in this case ChatGPT 3,5 and Midjourney), and their ideas and thoughts on future use of GenAI. During September 2023 we – in pairs of two researchers – observed a representative from each group as they conducted their daily work for two hours. This initial data was then synthesized into five characteristics of the working culture in the communications department (see table 1). These characteristics inform the contextual setting of the outer darker circle in the artifact (figure 2).

| |
|--|
| <i>A solid and shared understanding of tasks, workflows, and central purposes.</i> This emphasizes the importance of everyone having a clear and common comprehension of their job responsibilities, how tasks are carried out, and the overarching goals. |
| <i>Strong individual and institutional knowledge, demonstrating care and support for others; assisting and collaborating with colleagues; engaging in constant dialogue.</i> This highlights the value of possessing both personal and organizational knowledge. It emphasizes the importance of showing care and support for colleagues, actively helping, and collaborating, and maintaining open communication. |
| <i>Clear in value creation and organizational "brand" and "tone-of-voice".</i> This suggests the need for clarity in expressing the value generated, as well as a distinct organizational identity or brand. It emphasizes maintaining a consistent and recognizable tone-of-voice in communication. |
| <i>Adequate resources available to support tasks and workflows.</i> This underscores the importance of having sufficient resources to effectively support and carry out tasks and work processes. It implies that having the right resources is crucial for successful operations. |
| <i>High ethical standards, professional pride, and a strong sense of job identity.</i> This involves maintaining high ethical norms, taking pride in one's professional work, and having a deep connection to one's job. It encourages upholding a high level of ethical behavior, feeling a sense of accomplishment and pride in one's professional achievements, and having a strong identification with one's role in the workplace. |

Table 1. Workplace characteristics of the Communication Department

As a second step in building the artifact, we synthesized the findings related to the four arrows in figure 2. The arrows represent the configurations relating to GenAI and workflows, expressing objectives of an economic and humanistic nature. In table 2, we present the content of the arrows.

| |
|---|
| Arrow 1: We enquired about the perceived value of GenAI. Answers related to productivity, optimization, and automation possibilities. |
| Arrow 2: We enquired about GenAI’s potential role in communication work. Answers related to serving as a sparring partner, an idea-, text-, and image-generator |
| Arrow 3: We enquired about the consequent alterations in workflows and outcomes, when using GenAI. Answers related to speculations on ensuring quality assurance, maintaining coordination of work with colleagues, and preserving context awareness of target groups and domain related knowledge. |
| Arrow 4: We enquired about considerations on sustaining productivity and well-being. Answers related to covering needs such as ensuring constant learning on the job, engaging in critical reflection, maintaining human creativity, visibility of workflows, and transparency of usage. |

Table 2. Questions and findings related to GenAI-enabled workflows and objectives.

As a third step, we presented the first version of the artifact (figure 2) and reported on our initial findings (table 1 and 2). Then we tasked participants to comment and evaluate the content of the arrows, to further develop the artifact. They did this in four groups of 5-6 employees, commenting with post-its. After 1,5 hours, we arrived at a more nuanced understanding of participants’ expectations regarding: 1. What value will GenAI deliver to workflows; 2. What role will GenAI take in communication work; 3. Immediate changes to communication work; and 4. How to maintain high quality and wellbeing. In figure 3 we have listed all post-it comments. As it appears there were several additions to the initial material.

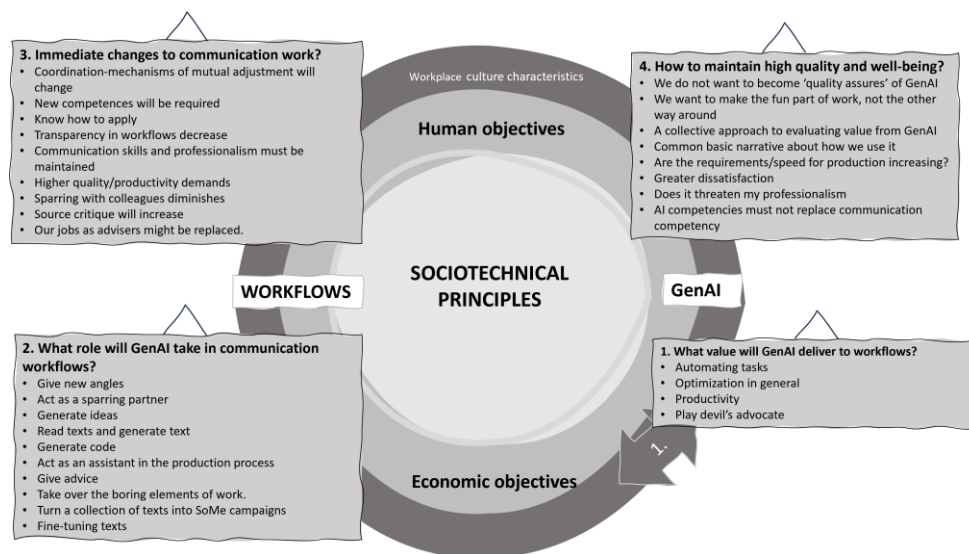


Figure 3. Insights from intervention workshop.

As a fourth step, we began crafting the sociotechnical principles. To initiate the discussion, we presented the department with a newly formulated set of eight sociotechnical principles, derived from our synthesis of the five principles in figure 2, in combination with the work culture characteristics (table 1) and the findings related to the four configurations (table 2). The participants discussed and evaluated the suggested principles in a workshop which lasted 1,5 hours. The suggested principles read as follows: 1. Mutual understanding of the use and value of GenAI; 2. Meaningfulness and creativity in the application of GenAI; 3. Organizational support through guidelines, policies and structures; 4. Autonomy and accountability in the application of GenAI; 5. Continuous learning to support maturity,

competence building and skills; 6. Visibility and transparency of what, when, and why using GenAI; 7. The role of decision-power in assigning, executing and approving tasks is clear; and 8. Strong organizational brand and 'tone-of-voice'. In figure 4, we present the outcome of the discussion. The eight pre-planned principles accordingly evolved into eleven sociotechnical principles, presented to the right in figure 4. The black arrow in the middle illustrates the process from the suggested to a revised list of principles.

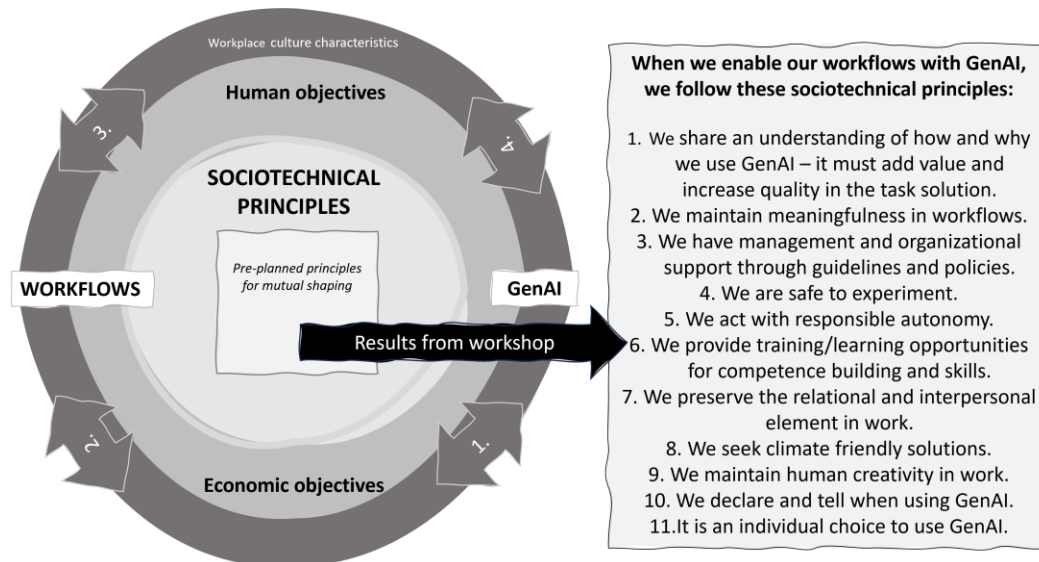


Figure 4. Sociotechnical principles for GenAI-enabled knowledge work.

4 Conclusion

This paper reports from an ongoing research project on meaningful adoption and use of GenAI within the Communication Department of a Danish Municipality. Thus, our study develops an approach and method of how to craft sociotechnical principles that can guide the adoption of novel technology in the workplace. Our method enables the creation of desirable futures by developing sociotechnical principles guiding the adoption of GenAI in ways that prioritize the needs of employees, and balance human and economic objectives. Our study shows the significance of not only using collected data to formulate sociotechnical principles but also engaging employees through processes of co-designing, evaluating, and refining an artifact. This approach ensures that the principles reflect the aspirations, needs, and uncertainties associated with the adoption of GenAI in knowledge work. Critically, the resulting artifact is dynamic, accommodating both the rapidly changing nature of GenAI, and consequently, how we understand new technology in relation to the workplace.

5 Next steps and future contribution

We held a co-creating workshop with the Communication Department in late February 2024. This resulted in newly revised principles and clearly demonstrates how phases 1 and 2 work circularly. While the derived sociotechnical principles are now crafted, we anticipate continuous revisions due to the changing nature of GenAI and its potential to augment and automate cognitive tasks in knowledge work. In accordance with ADR, the following step is an intervention focusing on phase 3, in which we reflect and learn from the results from phase 1 and 2. The next round of building, evaluation and learning involves co-designing specific workflows and assigning responsibility at appropriate levels (individual, group, department, organization etc.) to follow through on the crafted principles. Finally, and as phase 4, we can formalize the learning outcomes and thereby contribute to human-centric adoption of GenAI in knowledge work.

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