

# Revisiting Sociotechnical Work Principles from a Digital First Perspective

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Digital technologies are moving deeper into the social domain of work. Consequently, the social and human dimension of work – e.g., learning, thinking, reflecting, and acting autonomously – now becomes preconstructed by digital devices, preprocessed information, and numeric thinking (Fischer & Wunderlich, 2021; Baskerville et al., 2020). The expression “the datafied workplace” is increasingly used by practioners and researchers to frame the changing nature of knowledge work in such environments, and in particular how human decision making and management – usually involving skills of leadership, expertise, and experience – is increasingly conditioned by Artificial Intelligence (AI) and algorithms (Fischer & Wunderlich, 2021; Mejias & Couldry, 2019). As more AI-applications and digital technologies are becoming crucial integral of the workplace, how to guarantee a balanced relationship between the social and technical elements to reach both economic and humanistic outcomes is becoming critical (Sarker et al., 2019). The classical view of how to obtain both outcomes, by establishing a stable social and technical balance, no longer holds (Fischer & Baskerville, 2022). On the other side, the ontological reversal of “digital first” suggests a reconsideration of the known duality of the physical world and the digital world, proposing a tenet of a primarily virtual creation of reality, human experience, and society in the digital (Baskerville et al., 2020). Considering the shift to digital first alters extant conventions on neither privileging the technical nor the social dimension (Lyytinen et al., 2020). However, researchers report that without an active support of human values, a focus on change from digital technology narrowly emphasizes efficiency and economic value (Sarker et al., 2019), preventing human actors from adjusting their behavior in response to the pertinent change (Pasmore et al., 2019). When the technical dimension of AI and digital technologies tends to dominate the social side of work, the persistence of respected human values, job design principles, and considered outcomes must be re-assessed. Recent and early-stage research proposes a set of “technosocial” workplace principles, which set out to answer how to make workplaces fulfilling for humans, when progressively designed for digital technologies first (Fischer et al., 2023).

In this abstract, we build upon this idea and assess how to empirically evaluate and further develop those suggested principles. We refer to the literature on sociotechnical (S-T) systems design from the IS-discipline (Sarker et al., 2019), porting it into what is increasingly being promoted as a new ontological order of digital first. Consequently, we discuss how to study and promote research within the realm of a technosocial (T-S) work reality.

## The Background of Sociotechnical Principles

As a first step, we revisit the S-T principles to evaluate how to design “humane workplaces” when faced with technological and digital advancements, as we perceive principles for obtaining both instrumental and humanistic objectives as a condition for designing “good jobs” in a digital

first reality. Cherns (1976) and Clegg (2000) have been foundational in the development of S-T principles. In 2019, William Pasmore (2019) and colleagues revisit these S-T design principles and suggest ten, while considering the 20th century changing workplace. They suggest the following: *Wholeness*: The work system should be conceived as a set of activities making up a functioning whole, rather than a collection of individual jobs. *Teams*: The work group should be considered more central than individual jobholders. *Process control*: Variances should be identified and handled as close to their point of origin as possible, without requiring supervisory intervention. *Self-direction*: Internal regulation of the work system is preferable to external regulation of individuals by supervisors. *Multi-skilling*: The underlying design philosophy should be based on redundancy of functions rather than on redundancy of parts. *Discretion*: The discretionary component of work is as important to the success of the system as the prescribed component. *Joint optimization*: The individual should be viewed as complementary to the machine rather than as an extension of it. *Adaptation*: The design of work should be variety increasing rather than variety decreasing, as learning is essential to allow organizational adaptation to change. *Meaning*: For the individual job in a socio-technical system, there should be an optimal level of variety, learning opportunities, some scope for setting decisions that affect the outcomes of work, organizational support, a job worthy of societal recognition, and potential for a desirable future. *Incompletion*: As organizations will continue to evolve over time, no design can be considered ‘finished.’

## Proposing Technosocial Principles of a Digital Workplace

A “technosocial” reality proves consistency with the ontological reversal of IS, in which it is argued that a digital reality increasingly is created “first”, while living reality enjoys second priority (Baskerville et al., 2020). Workplace designers must aim in planning for paying respect to both humanistic and economic outcomes when transforming digitally. Shifting emphasis from S-T to T-S might only produce harmful outcomes from the humanistic perspective if the digital world ignores associated values. To propose guidelines on how such design can account for the reversed duality of techno vs. social, in table 1, we present four T-S principles as discussed in recent literature (Fischer et al., 2023) and briefly clarify their relevance in the following.

<b>#1. Continuous learning.</b> Human learning and experience are foundational to the continued development of the ability to respond pertinently on the individual-human- and the organizational-social level.
<b>#2. Sufficient variety.</b> As variety is decreasing due to datafication, work is also experienced as increasingly complex. It becomes important to find a balance between variety to grow competencies and the straining cognitive consequences of handling work that is not automated.
<b>#3. Wholistic workflows.</b> A broad and unified access to oceans of data can allow developments of machinery supplementation and recreation of human wholistic thinking.
<b>#4. Meaningful work.</b> In recognition of classical sociotecnica, work in the digital first reality, must continuously be perceived as meaningful. It must provide a sense of fulfillment and purpose, which will be experienced as well-being.

Table 1. T-S principles (Adopted from Fischer et al., 2023)

A promotion of T-S principles is pivotal to bridging the gap between an economically induced predominance of the technical dimension and a guarantee of social values for a meaningful work-life and human well-being, as recognized at the very core of classical S-T thinking (Sarker et al., 2019). The first suggested principle postulates *continuous learning* as a precondition for human thriving in a T-S workplace. Human learning and experience ensure staying responsive in a changing technological work environment on continuous basis (Pasmore et al., 2019). As a counterweight to a predetermination by data, the next postulation demands *sufficient variety* of work tasks as a guiding principle. Due to datafication and automated decision support, a variety is at risk to decrease while, at the same time, higher degrees of complexity can be expected (Wunderlich & Fischer, 2022). Another principle to provide orientation and sense making in T-S work suggests *wholistic workflows*. When machines and fragmented data interfere with human-comprehensible information cues, one a remaining strength of the human workforce might be to overlook the importance and necessity of work from a broader, holistic perspective (Fischer & Baskerville, 2022). Such holistic thinking and sense-making inspires the last proposed T-S principle of providing and maintaining *meaningful work* in recognition of human requirements of motivation and well-being at the workplace. Evermore when technical elements tend to achieve predominance and to influence constant change at work, being aware of the meaning and the (socially related) purpose of work tasks could nurture human well-being, as proven to show positive impact on individual work performance.

Following these principles for human thriving in a T-S work reality, we postulate the need for further exploration of these guidelines and recommendations for their empirical study.

### **Extrapolating Recommendations for Techno-Social Research**

Elaborating two cases that study upheavals of AI implementations in contemporary work environments, we extrapolate recommendations that empirical investigations of T-S principles should follow. The first case examines conditions of hybrid learning in a R&D environment in the pharmaceutical sector and how human and machine learning interact reciprocally in detecting new substances ('pharma') (Sturm et al., 2021). The second case analyzes the implementation of AI substituting loan decision making in a financial institute ('banking') (Strich et al., 2021).

Both cases motivate their problematization with potentially unintended effects when implementing AI. Inherently, the researchers assume joint optimization of humans and data-driven algorithms as underlying rationale, which has been proposed as foundation for T-S thriving (Fischer et al., 2023). The first principle of *continuous learning* is particularly accentuated in the 'pharma' case, where learning is discussed as both a human and machinery task. The article concludes that the level of organizational knowledge significantly benefits from a joint, reciprocal learning arrangement between the knowledge worker and the algorithm. The case 'banking' reports that previous competences and knowledge of the bank managers decreased since the entire loan decision was taken by the algorithm, without any human consideration or insight into the decision process. This case also detects some managers to shift their focus on remaining tasks,

especially a turn from the (now automated) decision-making to deeper social interaction with customers. Such shift to adopting new tasks states a self-adjusting reaction of human workers to ensure *sufficient variety*, as proposed as the second T-S principle. Regarding this principle, the ‘pharma’ case suggests humans still to be crucial in those joint learning environments to frequently reconfigure machine learning tasks, thereby questioning a total replacement of particularly domain experts who contribute with deep human problem understanding. The third principle suggests *wholistic workflows* as relevant design criteria, which becomes evident in the case of hybrid learning by the fact that humans still outperform algorithms in turbulent environments. As obvious in this ‘pharma’ case, the human contribution to a joint learning outcome increases when conditions become more turbulent. The human trait of exploration combined with the ability to adapt beliefs as well seems to remain superior in situations that require handling novelty. As the ‘banking’ case demonstrates, comprehension of the wholeness of workflows becomes subverted when the algorithm’s decision is not transparent and thereby hard to grasp. The loss of critical thinking leads to a decrease in transferring knowledge to other areas or detecting errors at initial stages. This case also explains how algorithmic decisions can bring managers into situations of increased moral burden, when the automated choice was perceived as adverse to their experience or ethical thinking. Such situations can alter the managers’ self-perception of *meaningful work*, but also external perception. Interviewees reported on their job being less appreciated in private life, when friends and families recognized the loss of decisional power as a degradation of the managers’ qualifications. The ‘pharma’ case provides insights to achieve meaning of human work by analyzing differing results on the hybrid learning outcome, in dependence on the contribution of human exploration or exploitation: Exploration proves higher impact on knowledge creation than exploitation, fueled from greater motivation of the knowledge worker.

## Discussion and Conclusion

When regarding the two considered cases (Strich et al., 2021; Sturm et al., 2021), we learn that a mere consideration of efficiency criteria is not sufficient to study the presented T-S principles. While building on a profound understanding of the technological abilities and potentials of an AI implementation, an empirical study needs to also capture the human perception of change. When evaluating the two cases, we recognize an increase of relevance of the humanistic dimension and values to grasp principles 1 to 4. Whereas the ‘pharma’ case, led by measuring efficient learning outcomes, provides sufficient information on principles 1 and 2, for wholistic workflows and meaningful work the ‘banking’ case provides more related insights, most probably due its focus on studying professional role identity. To address the primary conflict between a techno or social dominance in designing hybrid work systems, an empirical case thus needs to provide access to study preconditions and outcomes of both dimensions to comparable extent, namely to (technically induced) economic values such as efficiency as well as to humanistic values such as motivation, engagement, and well-being. The two cases also suggest considering time as relevant variable in the processes, reactions, and adaptations, particularly in relation to changing role models and realizing learning effects. Consequently, a relevant element of T-S empiricism to

consider is capturing longitudinal consequences. Including such temporal aspects may also provide the opportunity to elaborate on causal directions or dissolutions, as touched upon in discussing ontological reversals about which dimension may be created “first” and may dominate the other (Baskerville et al., 2020). Both cases confirm the relevance of studying a T-S work reality in knowledge intensive industries, i.e., pharma and banking exemplarily. This fact underlines a further need for multi-case settings, while also inspiring to incorporate case companies of less knowledge intensive business. While the developments in digital value creation underscore that accompanying transformations became first apparent in knowledge intensive industries, they are supposed to embrace entire business and society and thus less knowledge intensive companies as well in the nearer future (Lyytinen et al., 2020).

Going beyond “as-is” case studies, we would also like to inspire adopting a slightly normative angle. Such angle might account for the growing societal importance of IS research as suggested for the era of digital transformation (Baskerville et al., 2020; Fischer et al., 2023). In compliance with these recommendations as summarized in table 2, we hope to empirically and theoretically substantiate T-S principles for AI and individuals co-evolving at a “humane” workplace.

<ul style="list-style-type: none"> <li>• Access to preconditions and outcomes of the techno and social dimensions equally</li> <li>• Joint optimization of humans and algorithms</li> <li>• Normative angle</li> </ul>	<ul style="list-style-type: none"> <li>• Capturing longitudinal consequences</li> <li>• Raising causal directions and dissolutions</li> <li>• Comparative multi-case settings</li> <li>• (Less) knowledge intensive industries</li> </ul>
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*Table 2. Extrapolated recommendations for T-S research design*

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