SEISMEC

Supporting European Industry Success Maximization through Empowerment Centred development

CAPS Self-assessment

Aiming for human-centricity through CAPS

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Table of contents

List of tables

1 SEISMEC Framework

In an age of digitalization, especially since the pandemic, workers have wanted more flexibility, support, and collaboration. Employers often promise to improve the worker's experience through technologies. Organisations, industries, and technologies, however, often fall short of their promises, especially when they don't put the human first. In this tension, we argue for the SEISMEC shift: industrial practices that combine advances in technology with the empowerment of workers through fair and ethical digital practices.

This shift moves past an Industry 4.0 perspective – one that puts technology and intensive data analytics at the forefront, and towards an Industry 5.0 perspective – one that focuses on the relationship between empowering human practices and new technologies.

But how can industries ensure human-centric technological applications that can simultaneously empower the workforce and enhance industrial competitiveness? We argue that this can be done when industries operationalize key CAPS empowerment factors. These CAPS empowerment factors are made of eight complementary concepts and require active participation to engage both concepts to empower workers. But what do these concepts look like, and how can you address them in your own workplace?

We provide a brief discussion below with targeted questions at three levels (worker, organisation, and industry-wide) to help you assess your own organisation.

2 Collaboration and Creativity

In a simple definition, **collaboration**, means interacting with others[1], but the term has moved from a more traditional, simple notion of 'working together' to a multifaceted strategy for creativity, problem-solving, and collective achievement. Collaboration involves mutual goal understanding, pre-emptive task co-management and shared progress tracking[2].

Similarly, **creativity** has been understood as the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive to task constraints)[3 4 5 6 7 8 9]. It is seen as a key driver of innovation[10 11 12].

To effectively work together to produce novel solutions in Industry 5.0, we need human-centred ways to work with technology for communication, coordination, and information sharing among team members which will in turn enable creative, rapid progress and goal achievement. Advanced technology increasingly influences the way collaboration and creativity evolves in organisations. It is thus crucial to determine how humans can effectively and meaningfully collaborate with their fellow colleagues, stakeholders and intelligent machines to ensure that work processes and outcomes align with the needs of both individuals and organisations. An environment should be created in which cross-functional collaboration is supported and visions that can foster innovative work are well communicated[13].

Based on these premises, we ask the following questions to reflect on one's own collaboration and creativity, from three stakeholder positions.

	Collaboration	Creativity
Employees:	How do employees perceive new technology? How have they been involved in the development and new technology implementation?	How do employees experience and be seen as valued for their innovative ideas in their daily work?

Organisations:	How has the organisational culture prioritised collaboration in the implementation of advanced technologies (e.g. integrating AI in daily work practices)?	What strategies have been employed to ensure that employee creativity is effectively integrated with new technology tools in collaborative projects?
Industries:	How has effective collaboration been promoted and sustained within the broader industry and in relation to stakeholders?	How enhanced creativity improved efficiency and innovation in your industry?

Table 1. Collaboration and Creativity – Self-assessment questions

3 Autonomy and Automation

In everyday language, autonomy refers to the capacity of an individual, agent, or system to make decisions and govern themself independently with minimal or no external assistance[14].

Automation, on the other hand, is understood as the use of systems and technologies to perform previously human tasks with minimal or without external intervention, using mechanical devices to automate the production[15]. These two terms are often at odds with each other. Processes of automation may create the potential to infringe on others' autonomy. At present, inappropriate deployment might lead to disadvantageous outcomes such as unemployment, economic inequalities, and decreased job satisfaction.

To ensure more human-centric technology implementations, decisions about automation should also be done in consideration of autonomy. The goal of achieving human-centric innovations demands a balancing act between automation and autonomy where technology serves to augment human abilities rather than weaken them. By embracing principles of meaningful human control

and prioritising the greater level of autonomy, organisations can effectively address the complexities of automation to empower individuals, create human-centric work environments, foster creativity and uphold human dignity in the light of technological advancements.

	Autonomy	Automation
Employees:	How do employees experience their own autonomy and decision-making potentials with organisational boundaries?	What are the feedback and process mechanisms for the integration of automation in daily employee tasks?
Organisations:	What changes to organisational structures or processes have or will be made to support greater employee autonomy?	How would you describe your organisation's approach to integrating automation into your work processes?
Industries:	How open and supportive is the broader industrial sector towards employee autonomy? How does this affect decision-making processes within the supply chain?	In what ways does automation serve to improve the industrial sector and how does this contribute to the overall wellbeing of workers?

Table 2. Autonomy and Automation – Self-assessment questions

4 Privacy and Productivity

While defining privacy is difficult, privacy can be understood as sharing information outside socially agreed contextual boundaries[16].

Productivity can be essentialized as the relation of output (i.e. produced goods) to input (i.e. consumed resources) for a specific production situation (e.g.

manufacturing transformation process) and is one of the most important basic variables that govern economic production activities[17] [18] [19].

The tension in these definitions lies in what is considered a socially agreed upon boundary for privacy. While workers want privacy, employers also feel they have legal rights to deny those desires[20]. Thus, attention at the management level is needed to address the interaction between utilising technology for productivity gains and respecting the privacy of individuals.

On the one hand, the impact of advanced technologies on individual privacy is connected to an increased level of surveillance and employee monitoring which can increase stress and decrease job satisfaction and health[21]. On the other hand, surveillance practices and employee monitoring are implemented to ensure an increase in productivity and in theory, equity among employees[22]. The goal of technological solutions is to engage with individual privacy and productivity as synergetic empowering concepts rather than positioning these as a trade-off between each other.

Thus, with a human-centric focus to empower workers, an employer would benefit from creating a balance between privacy and productivity. Communicating about productivity can introduce management's plans for improvement and help employees understand the company's goals. However, the strategic view of productivity among managers is usually different from the more operational view of productivity among assembly line operators[23]. This indicates that productivity must be seen from a different point of view at each level and that the means for achieving high productivity may be level specific.

To reflect on one's own positions on privacy and productivity, it is useful to ask a variety of questions:

	Privacy	Productivity
Employees:	How aware are employees about how their data is being used for organisational purposes?	How do employees experience expectations of productivity while having flexible working arrangements?
Organisations:	How does your organisation integrate privacy-enhancing policies into its operations to support employees and their data?	How does the organisation ensure that advanced technologies intended to optimise productivity are ethically grounded and accountable?
Industries:	What human-centric initiatives are in place to address privacy concerns on an industry-wide level?	How do productivity expectations align with human-centric objectives of the organisation?

Table 3. Privacy and Productivity – Self-assessment questions

5 Safety and Satisfaction

Safety is a fundamental part of the occupational health and safety discipline. Its main objective is to promote and maintain "the highest degree of physical, mental and social well-being of workers that is the 'whole person' in all occupations; prevention among workers of adverse effects on health caused by their working conditions[24].

Job satisfaction is more the extent to which employees are satisfied or dissatisfied with their job[25]. The integration of human-centric approaches across industries has gained significant attention due to its benefits (e.g. accident

prevention, energy saving)[26], and we have seen a proliferation of technological safety solutions[27].

While safety seems integral to satisfaction, that is not always the case. While both individuals and organisations seek to promote and build safe work environments, it is also critical to understand that technological solutions aimed at improving security can also (but should not) compromise employee well-being. Job satisfaction is not achieved with concerns about job security. Instead, safety measures should be viewed as empowering factors that promote greater safety and satisfaction within the work environment, also incorporating other positive CAPS factors such as autonomy and privacy.

Overall, human safety is fundamental, and thus, human-centric systems should aim to place human operators, their knowledge, and skills in key positions[28]. By incorporating human-centred design principles, organisations can create technology that aligns with workers' needs and behaviours, ultimately improving safety and usability[29].

	Safety	Satisfaction
Employees:	How has employee safety (and security) become a crucial component of work routines? How have employees been able to actively participate in identifying safety hazards and proposing solutions to mitigate risks?	What tools and resources are available for employees to improve themselves in their positions?
Organisations:	How is human-centricity prioritised in your approach to safety measures (e.g., risk management, AI safety, training and support mechanisms)?	How do you measure the overall satisfaction of your employees at the organisational level? How has technology and process development enabled the promotion of job satisfaction?

Industries:	How have standards for safety been developed across the industrial sector?	What measures have been taken to increase overall job satisfaction across the industrial sector?

Table 4. Safety and Satisfaction – Self-assessment questions

Taken together, these CAPS factors begin to tell a story of human-centred management of technological solutions. While these factors are for organisational purposes organised separately, as this project progresses, we show the interconnected relationship between each CAPS factor and argue that organisations operating at the intersections of these factors can benefit from being more human-centric.

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