Collaborative GenAI: Humanized Interaction Fields for Knowledge Creation

Karsten Böhm[1] and Susanne Durst[2]
[1]FH Kufstein Tirol – University of Applied Sciences, Kufstein, Austria
[2]Department of Business and Economics, Reykjavik University, Iceland

karsten.boehm@fh-kufstein.ac.at
susanned@ru.is

Abstract: Generative AI (GenAI) is increasingly becoming part of our habits, both in our professional and private lives. The use of this is a way to shape, change and influence knowledge creation and utilisation, and thus a very interesting phenomenon for the field of Knowledge Management (KM). In a previous work, the authors of this paper focused on the bidirectional effects of KM processes due to the interaction between humans and machines using natural language as a medium. The result of this work was the generative and responsive artificial intelligence (GRAI) model, which not only generates content on demand, but also adapts and modifies knowledge-related interactions. This research focusses on the concept of interaction fields and investigates the collaborative nature of those interaction fields to develop the conceptual model even further. This is achieved by relating to the characteristics of collaborative robotics (COBOTs) as an established form of human-machine interaction and the main differences of human-machine interactions to derive the concept of Humanized Interaction Fields (HIF) that describe relevant aspects of interaction in the field of Human-centered AI (HCAI). The research contributes to the understanding for the co-creation of knowledge between human and machine.

Keywords: Generative AI, Collaboration, Knowledge management, Knowledge creation, LLM

1. Introduction

As Artificial Intelligence (AI) and more specifically Generative AI (GenAI) becomes a part of professional and in the private life, it becomes more important to investigate the implications of those uses and study the way we interact with this new technologies. In particular, this technology shapes, changes and strongly influences Knowledge Creation and Knowledge and is already changing our accustomed behaviours. Thus, it is a very interesting phenomenon to study in the realm of Knowledge Management (KM). In previous work the authors focused on the bidirectional impact of Knowledge Management processes due to the interaction of human and machine using natural language as a medium. The model of a Generative and Responsive Artificial Intelligence (GRAI) that does not only generate content upon request but also adapts and changes the knowledge related interactions was developed in this research (Böhm and Durst, 2024).

GRAI introduced the concept of interaction fields and in this research the authors investigate the collaborative nature of those interaction fields to develop the conceptual model even further. An important aspect seems to be that natural language is the carrier for the common collaboration space during knowledge creation and knowledge use. It provides a common ground between men and machine as the language capabilities of the machine have increasingly improved leading to a new level of (implied) trust and (attributed) individualization.

In order to investigate that collaborative nature of human machine interaction a relation is drawn to the field of collaborative robotics (COBOTS). These type of robotic systems differ from the traditional industrial robotics as the collaboration of humans and robots is assumed in the design having direct impact on the robotic machines. In a similar way GenAI that is build to work together with the human in creating new knowledge (as a form of co-creation) is different from the setting that a GenAI just generates the desired output based in an initial stimulus.

This research contributes to understanding the co-creational power of substantial collaboration between men and machine as an emerging pattern. Understanding the mechanics, the advantages and the disadvantages of this pattern is important to develop KM further – in terms of the interaction (pattern) between men and machine.

Specifically the authors derive important properties for such a collaborative interaction field that has human characteristics and build the foundation for systems that proactively use GenAI to build the future KM systems. By doing so, the KM resource based view in which GenAI is understood as just another resource to be used for KM is changing towards a view in which the use of GenAI technologies actually change the way how knowledge is being created and used. It adheres to related fields like the Human Computer Interaction (HCI) and interaction research in general.

The field of HCI has a long tradition (Karat and Karat, 2003) and evolved over the last decades, but the advent of Generative Artificial Intelligence systems changed the human machine interaction significantly. Many studies dealt with the new, often text-based declarative interfaces and the interaction pattern that developed along with those (e.g., so called v“prompting techniques”). Recent research also discovered a changes in the human computer interaction when AI is being used (Xu et al., 2023)

Thus, Human-centered AI (HCAI) is and approach in the development of AI systems that is becoming more important.

An extensive study by Garibay et. al. identified six grand challenges in the domain of HCAI: (1) It is centred in human well-being, (2) is designed responsibly, (3) respects privacy, (4) follows human-centred design principles, (5) is subject to appropriate governance and oversight, and (6) interacts with individuals while respecting human’s cognitive capacities. (Ozmen Garibay et al., 2023). Among those challenges the interaction human and AI (or more general the machine) is the most interesting concepts. The authors in the study differentiate several stages as shown in figure 1 below (reproduced from (Ozmen Garibay et al., 2023): The levels of human-AI (H–AI) system interactions are level 1 = working separately or competing; level 2 = supplementing each other work; level 3 = interdependent on each other and finally level 4: full collaboration.

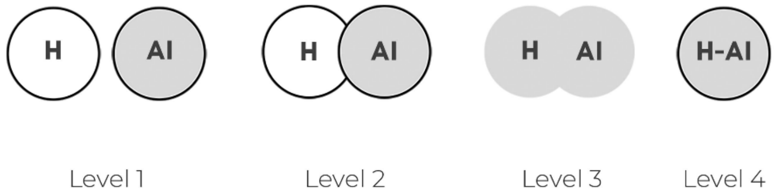

Figure 1: Different Levels of interaction (Source Garibay et. al.)

As the development and deployment of HCAI continues, standards and best practices are evolving. An extensive overview on currently available and evolving standards can be found at (Zhao and Xu, 2025).

The different levels of interaction proposed by Garibay et al. correspond well with GRAI while the focus of the former is on general HCI and the latter focusses on knowledge intensive interactions between human and machine. An interesting aspect of Gribay is the distinction of different levels, which indicate an intensified interaction over time and/or for different application areas.

To develop and verify theory of the GRAI model, different research methods should be applied (Wacker, 1998). This paper uses analytical research as described by Wacker (1998). More precisely, we associated the procedures taken with the analytical conceptual research type that tries to add new insights through the logical connection of past (existing) research. In this context the research is aiming at developing the specific characteristics of the interaction of the human user and the machine (using GenAI technologies) within the domain of knowledge creation and knowledge use.

The remaining paper is structured as follows: In the following section the interaction pattern in the field of collaborative robotics is introduced. Section 3 compares the interaction of human actors with the interaction of human-machine interactions. The following section synthesizes these findings in the novel concept of a humanizes interaction field and derives the main characteristics of such an interaction. The paper concludes with a summary on the results and the next steps in this line of research.

2. Collaborative Interaction in the Field of Robotics

The use of robotic technologies in industrial settings has a long tradition and was a game changer in terms of efficiency and speed of processes on the shop floor. These traditional industrial robots operated in specific work environments to ensure worker safety and need individual programming for every task. Later collaborative robots (COBOTs) appeared that differ from classical industrial robots as they have been designed for the collaboration with the human worker. It is interesting to note, that this main aspect of interaction with a human user (the worker) changed many characteristics of robotic systems. In table 1 below some of the main differences are listed, extensive comparisons can be found in the literature (Faccio, Bottin and Rosati, 2019; Patil, Vasu and Srinadh, 2023). The synthesis of the human actor and the robotic system was already foreseen some time ago (Romero et al., 2016), but took much longer to become slowly a reality are a special type of industrial robot that are particularly designed for direct interaction with humans (Romero et al., 2016), but the advent of humanoid robotic systems changes the level of human-machine interaction even more (Friedman, 2025).

Table 1: Differences of traditional industrial robotic systems and collaborative robotic systems

Feature	Collaborative Robots (Cobots)	Traditional Industrial Robots
Human-robot interaction	Direct and continuous collaboration with humans	No direct human interaction, fenced-off areas
Safety measures	Force-limiting, vision-based safety, no barriers	Requires physical safety barriers and enclosures
Work environment	Open, shared with human workers	Restricted, requires isolation
Speed and force limitations	Low speed and force for safety	High speed and force, unsafe for direct contact
Programming complexity	Intuitive, low-code/no-code, easy to reprogram	Requires specialized coding and expertise
Task flexibility	Versatile, adaptable to different tasks	Optimized for repetitive, predefined tasks
Installation and setup	Quick deployment, minimal infrastructure changes	Requires extensive setup and integration
Space requirements	Compact, does not need safety fences	Large footprint due to protective barriers

For the conceptual development of the human-machine interaction in the field of knowledge creation and knowledge use the developments in robotics are interesting because the aspect of collaboration substantially changes the machines, their functions and their characteristics. In that field collaboration also comes at a cost, e g., less speed, more aspects of safety in order to make the collaboration more human (compatible). This might be also the case in the knowledge management areas: Acting in the same collaborative digital space during knowledge creation would also mean to take the speed of humans into consideration (concerning the individual knowledge absorption, contextual understanding, knowledge levels and so on). The new level of human and machine collaboration using natural language, context and a level of understanding paved the way for a collaborative knowledge creation of human actor and machine in a similar way that it can be observed with COBOTs. In contrast the classical industrial robotics can be seen as a way of automating and optimizing an information process using ICT without or only with oversight of the human user.

3. Interaction Fields in the Knowledge Creation - Human Interaction Properties for the Transfer to the Machine to Human Collaboration

In order to develop a better understanding of the interaction of different actors and thus to come closer to the objective of this paper, it seems useful to show how the interaction between human to human and human to machine differs. Table 2 lists some of these differences and were derived from existing research (Krämer, Von Der Pütten and Eimler, 2012; Walter et al., 2014; Alarcon et al., 2023).

Table 2: Differences between Human-Human Interactions and Human-Machine (Robot) Interactions

Feature	Human-Human Interactions	Human-Machine (Robot) Interactions
Emotional Intelligence	Involves genuine emotions, empathy and the ability to perceive and respond to subtle emotional cues.	Simulated or limited: Machines may mimic emotional responses, but lack genuine feelings.
Communication	Involves verbal, nonverbal, and contextual communication.	Often structured: Relies on programmed language and data interpretation. May lack contextual understanding.
Contextual Understanding	Humans naturally interpret social, cultural, and situational contexts, allowing for flexible and nuanced communication.	Dependent on programming: Machines require explicit programming and data to understand context, and they may

Feature	Human-Human Interactions	Human-Machine (Robot) Interactions
		struggle with ambiguous or novel situations.
Adaptability	Humans can adjust their communication and behavior in response to changing social dynamics and unexpected situations.	Machines' adaptability is limited by their programming, and they may struggle with unpredictable or novel scenarios.
Intuition and Creativity	Humans possess intuition and creativity, allowing for spontaneous problem-solving and the generation of novel ideas.	AI is making strides in creativity, but true intuition remains elusive. Machines primarily rely on algorithms and data patterns.
Trust	Based on shared experiences, emotional connection, and perceived trustworthiness.	Based on perceived reliability and consistent performance.
Ethical considerations	Humans engage in ethical and moral reasoning, considering values, principles, and consequences.	Machines' ethical and moral decision-making is determined by their programming, raising questions of responsibility and accountability.
Spontaneity	Human interactions can be spontaneous, unpredictable, and influenced by a multitude of factors.	Machine interactions are generally predictable and follow programmed patterns.
Subjectivity	Each human has their own unique subjective view of the world, that influences every interaction.	Machines, while they can hold and process data, do not have subjective experiences.
Learning	Humans learn and grow through social interaction, gaining new perspectives and developing their understanding of the world.	Machines learn through data input and programming updates, lacking the organic nature of human learning.

Trust, in general, is a key aspect of any well-functioning interaction (Kaplan, Kessler and Hancock, 2020). The same refers to KM and different KM processes (Holste and Fields, 2010; Rutten, Blaas-Franken and Martin, 2016). Trust has been defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party (Mayer et al., 1995, p. 712). Existing research suggests that humans evaluate a non-human referent differently from a human counterpart, which means, in turn, that humans have different schemas for machines (robots) and humans (Alarcon et al., 2023). The unique agent hypothesis, for example, argues that people have biases for and against automation referents, which influence how humans interact with and respond to automation. People expect machines to perform perfectly and when they do not, the perceived competence decreases much more in comparison to a human who performed the same task (De Visser et al., 2016).

Against the background of the different strengths or weaknesses of the human and machine actors as highlighted in table 2, it could thus be argued that these actors would be better together. The content of table 2 suggests that there are moments in which the human is clearly ahead of the machine, e.g., when seeing the big picture, but also moments in which the machine is superior to the human, e.g., with repetitive tasks found in the manufacturing process.

However, this would mean that the actors must be on the same page. In order to increase the likelihood of interaction between humans and machines, it seems important that the communicative behaviour and relational abilities of the machine resemble those of humans. Furthermore, humans seem to be more willing to interact with certain machines that promise a higher benefit (Krämer, Von Der Pütten and Eimler, 2012).

In collaborative environments, which is the focus of this paper, humans and machines share a common space. There is no physical separation preventing contacts between these actors, but they work together on a joint task. This requires in turn that increased safety features need to be in place (Kopp, Baumgartner and Kinkel, 2021).

4. Humanized Interaction Fields (HIF)

Based on the observations of interactions in the robotics domain in section 2 and the general comparison between human-human and human-machine interaction in section 3, this section synthesizes the results from to define the characteristics of interaction fields for knowledge creation and knowledge use in the context of GRAI. As it can be observed with COBOTs the consideration of human aspects (including their limitations) is an important aspect for a successful collaboration. It is therefore paramount, that such a collaboration need to be humanized, which leads to the concept of a Humanized Interaction Field, which is defined as follows:

> *Definition Humanized-Interaction Field (HIF): A HIF is a form of human-machine interaction in the digital domain that embraces in an ongoing collaborative dialogue between human and machine, that takes the individual human capabilities into account. It is driven by the goals of the human user, evolves the generated knowledge over time and creates an integrated User Experience (UX) that amplifies the knowledge absorption capacity in meaningful ways for the human user.*

Currently HIF are targeting the Creation, the Shaping and the use of Knowledge both in an externalized and an internalized form, as the purpose is the application for GRAI (Böhm and Durst, 2024), yet the concept is generally not limited to that. The main intention of HIF is to understand and to describe the main characteristics ("the nature") of an interaction between human and machine with the predetermined intention of collaboratively creating or discovering something new. In the case of KM this relates to the concept of knowledge. The novelty of the created artefact does not to be ultimately new, it can – and in most cases will – just be new to the human user or novel in the context of the situation (e.g., the solution for a given problem), but not new in the sense of an invention.

It is important to understand this humanized aspects to generate meaningful dialogues for the user that are beneficial in terms of reaching the set goal and developing that solution during the dialogue in a way that anticipates the knowledge level of the user. This way the user is able to incorporate the created knowledge assets into her or his existing knowledge and develop it further – also without the help of the GenAI systems. This knowledge creation is the result of a collaborative dialogue and not only the result of a "command-and-deliver" communication pattern that might result in a knowledge asset that works as a solution for the current problem, but cannot be adapted by the user for different but similar contexts. The latter is rather externalized knowledge, while the former includes some form of internalization that happened during the collaborative dialogue already.

Collaborative dialogues between human user and machine will not only help to solve specific problems and generate specific new knowledge assets, but also influence and develop the knowledge creation strategies over time and the reinforcement learning provided to the machine also allows for the adaptation of the GenAI system. As a result, this interaction might lead to a co-evolution of the relation of the human user and he machine (Böhm and Schedlberger, 2023).

Application examples of meaningful collaborative dialogues that should represent an HIF are software development session with AI-coding assistance like Github Copilot or similar solutions. Another scenario might be an GenAI-assisted learning process in a domain relatively new to the human-user using the dialogue pattern with a GenAI. In both scenarios the dialogue and the knowledge creation for the human user go "hand in hand" and creating and using and applying the knowledge become activities that cannot clearly separated from each other. They become entangled in a similar way as it van be observed in a collaborative co-creation process of human actors, where a knowledge asset emerges from the interaction rather than a well planned workflow.

A HIF involves the human user in an inclusive way: it does not overwhelm them and take them along as the knowledge exploration and knowledge creation process unfolds. It explains the content if needed and incorporates ideas and other stimuli of the human user. This is especially important for the learning perspective – providing just enough support ("scaffolding") to enable the learner to take the next step.

On the other side, there is also the phenomenon of too much support – then no more learning takes place. For example, auto-compete in spelling or in programming with IDEs can be seen as examples for "negative scaffolding" – too much support in a knowledge acquisition process might feel like a shortcut as it is solving the current challenge. But it is effectively a barrier for learning, since actual learning did not take place as the learner just applied the proposed solution.

The amplification of knowledge generation using GenAI can also be compared to assisted mechanical systems (e.g., an exoskeleton): They are supportive and are amplifying the capacity of the muscles of our body. But a muscle that is no longer trained, subsequently leads to the loss of muscle mass. Thus, the amplification system has to sides: it is useful in supporting the own muscles or compensating, if not enough muscles exist. On the other side, it might lead to a degradation of muscle mass, if used too long or exclusively. Likewise the use of GenAI in collaborative knowledge creation should be used in a balanced way. A HIF would support this process by supporting the stimulation of our 'cognitive muscles' and amplifying our information processing capacity but also preventing those muscles to degrade.

The synthesis of the characteristics of a HIF based on the observations of the robotics application domain and the distinction between the interaction of human actors and those of a human actor and a machine leads to the three mail characteristics of (1) a joint digital environment, (2) the interaction of to very different actors in this environment and (3) the flexibility of this interaction. In figure 2, below these characteristics are visualized and the influence from the other observation domains is added with a different colour coding.

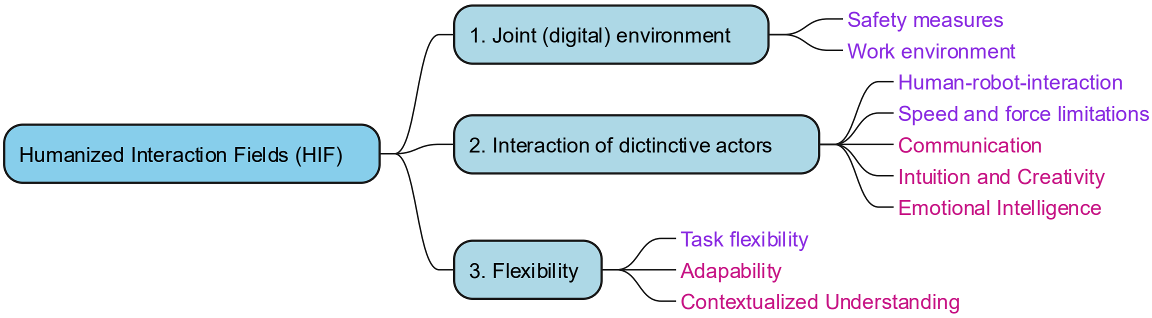

Figure 2: The main characteristics of HIF, influences of other characteristics visualized in violet (COBOTs vs. industrial robots) and red (distinction of human/human vs. human/machine interactions)

The concept of a joint (digital) work environment of two very different agents in a HIF is considered a an important root cause for the development of a successful HCAI as it puts the human agent in the focus and also stresses the agents being "very different by nature". As the COBOTs example demonstrates this aspect implied important design consequences that might also be different from other scenarios in which collaboration is not a central aspect, e.g., the aspect of automating a process by GenAI. Knowledge creation, however is at its core a collaborative and creative process, which makes HIF a good candidate for the interaction fields of GRAI. Likewise, flexibility is often also an important ingredient, when the path for creating new knowledge assets is not clear from the beginning.

When a successful collaboration in the HIF is achieved over several iterations or collaboration events, trust towards the HIF environment is gradually being being build or perceived. Trust is a result of communication and a "perceived (successful) collaboration". The collaboration is (subjectively) perceived from the human user side, because the machine is not having its own goals ans thus follows the stimulation of the human user, leading to a more asynchronous or unbalanced collaboration that is driven by the human-side (opposed to the collaboration of human users where both sides have collaboration goals on their own).

5. Conclusion

In conclusion, this research advances knowledge management by extending the GRAI model—an evolution of Nonaka and Takeuchi's SECI framework—to incorporate GenAI capabilities. This work demonstrates that human-machine interactions are evolving into a pattern, where generative AI complements and augments human knowledge creation and exhibit characteristics that support a successful interaction. The research introduces the concept of the Humanized Interaction Field (HIF), as a novel domain characterized by a joint environment with a flexible interaction of very distinctive actors.

As an analytical conceptual research it lays the groundwork for future empirical studies. To address the limitation of empirical validation, the next steps in are qualitative research, including case studies, interviews, and real-world observations, to validate these interaction fields and offer practical insights into effectively integrating generative AI into knowledge management practices.

The main purpose of this work is to understand the co-creation of knowledge between human and machine from the perspective of the capabilities and limitation of a human user. This understanding is becoming more important as the the collaborative use of GenAI increases across all application domains.

Ultimately, by re-framing generative AI as a collaborative partner rather than a mere tool, this research provides a roadmap for organizations to foster innovation and strategic growth while ensuring that the future of knowledge management remains both technologically advanced and deeply human-centric.

Acknowledgements

The authors would like to thank the anonymous reviewers of an earlier version of this contribution for their helpful comments that helped us to improve the final version.

Ethics declaration: No ethical clearance for the research referred to in this paper was needed.

AI declaration: This paper contains only original content created manually by the authors. No AI tools have been used to generate the content presented here.

References

Alarcon, G.M. et al. (2023) 'Differential biases in human-human versus human-robot interactions', Applied Ergonomics, 106, p. 103858. Available at: https://doi.org/10.1016/j.apergo.2022.103858.

Böhm, K. and Durst, S. (2024) 'Knowledge Management in the Age of Generative Artificial Intelligence: Time for Revisiting SECI', in Translating Knowledge into Innovation Dynamics. 19th International Forum on Knowledge Asset Dynamics (IFKAD), Madrid: Institute of Knowledge Asset Management (IKAM).

Böhm, K. and Schedlberger, L.-M. (2023) 'The use of Generative AI in the domain of human creations – a case for co-evolution?', in Proceedings of the 9th International Conference on Socio-Technical Perspective in Information Systems Development. STPIS 2023: Socio-Technical Perspective in Information Systems Development.

De Visser, E.J. et al. (2016) 'Almost human: Anthropomorphism increases trust resilience in cognitive agents.', Journal of Experimental Psychology: Applied, 22(3), pp. 331–349. Available at: https://doi.org/10.1037/xap0000092.

Faccio, M., Bottin, M. and Rosati, G. (2019) 'Collaborative and traditional robotic assembly: a comparison model', The International Journal of Advanced Manufacturing Technology, 102(5), pp. 1355–1372. Available at: https://doi.org/10.1007/s00170-018-03247-z.

Friedman, C. (2025) 'Artefacts of Change: The Disruptive Nature of Humanoid Robots Beyond Classificatory Concerns', Science and Engineering Ethics, 31(2), p. 9. Available at: https://doi.org/10.1007/s11948-025-00532-5.

Holste, J.S. and Fields, D. (2010) 'Trust and tacit knowledge sharing and use', Journal of Knowledge Management, 14(1), pp. 128–140. Available at: https://doi.org/10.1108/13673271011015615.

Kaplan, A.D., Kessler, T.T. and Hancock, P.A. (2020) 'How Trust is Defined and its use in Human-Human and Human-Machine Interaction', Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 64(1), pp. 1150–1154. Available at: https://doi.org/10.1177/1071181320641275.

Karat, J. and Karat, C.M. (2003) 'The evolution of user-centered focus in the human-computer interaction field', IBM Systems Journal, 42(4), pp. 532–541. Available at: https://doi.org/10.1147/sj.424.0532.

Kopp, T., Baumgartner, M. and Kinkel, S. (2021) 'Success factors for introducing industrial human-robot interaction in practice: an empirically driven framework', The International Journal of Advanced Manufacturing Technology, 112(3), pp. 685–704. Available at: https://doi.org/10.1007/s00170-020-06398-0.

Krämer, N.C., Von Der Pütten, A. and Eimler, S. (2012) 'Human-Agent and Human-Robot Interaction Theory: Similarities to and Differences from Human-Human Interaction', in M. Zacarias and J.V. De Oliveira (eds) Human-Computer Interaction: The Agency Perspective. Berlin, Heidelberg: Springer Berlin Heidelberg (Studies in Computational Intelligence), pp. 215–240. Available at: https://doi.org/10.1007/978-3-642-25691-2_9.

Ozmen Garibay, O. et al. (2023) 'Six Human-Centered Artificial Intelligence Grand Challenges', International Journal of Human–Computer Interaction, 39(3), pp. 391–437. Available at: https://doi.org/10.1080/10447318.2022.2153320.

Patil, S., Vasu, V. and Srinadh, K.V.S. (2023) 'Advances and perspectives in collaborative robotics: a review of key technologies and emerging trends', Discover Mechanical Engineering, 2(1), p. 13. Available at: https://doi.org/10.1007/s44245-023-00021-8.

Romero, D. et al. (2016) Towards an Operator 4.0 Typology: A Human-Centric Perspective on the Fourth Industrial Revolution Technologies.

Rutten, W., Blaas-Franken, J. and Martin, H. (2016) 'The impact of (low) trust on knowledge sharing', Journal of Knowledge Management, 20(2), pp. 199–214. Available at: https://doi.org/10.1108/JKM-10-2015-0391.

Wacker, J.G. (1998) 'A definition of theory: research guidelines for different theory-building research methods in operations management', Journal of Operations Management, 16(4), pp. 361–385. Available at: https://doi.org/10.1016/S0272-6963(98)00019-9.

Walter, S. et al. (2014) 'Similarities and differences of emotions in human–machine and human–human interactions: what kind of emotions are relevant for future companion systems?', Ergonomics, 57(3), pp. 374–386. Available at: https://doi.org/10.1080/00140139.2013.822566.

Xu, W. et al. (2023) 'Transitioning to Human Interaction with AI Systems: New Challenges and Opportunities for HCI Professionals to Enable Human-Centered AI', International Journal of Human–Computer Interaction, 39(3), pp. 494–518. Available at: https://doi.org/10.1080/10447318.2022.2041900.

Zhao, C. and Xu, W. (2025) 'Human-AI Interaction Design Standards'. arXiv. Available at: https://doi.org/10.48550/arXiv.2503.16472.