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Pathway to work with AI: Testing the cIAIr role development method in an industrial work environment

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Abstract

The use of artificial intelligence (AI) in work processes requires the anticipatory change of work roles because areas of activity are shifting within job profiles, resulting in new interaction patterns between humans and AI and between employees. In order to avoid role conflicts, rejection of the AI system and other undesirable side effects of AI integration, organizations must support human-AI role development with suitable measures. This article presents a methodologically sound approach to role development (clarifying AI Augmented individual roles—cIAIr) using the example of service technicians in a mechanical engineering company before and during the introduction of AI-based services. It illustrates how role clarity can be achieved in the interaction with AI when job profiles shift and how role development also includes collaboration with other departments and goal-oriented external communication with customers. The method results in six basic roles that are rooted in role theory in terms of role identity, role innovation, and role clarity. cIAIr allows the anticipatory examination of human-AI work roles as a process-based approach.

Practical Relevance: Due to the rapidly advancing development of AI in work processes, there is a need in organizations for scientifically validated findings and examples of good practice for successful work with AI. A socio-technical approach with a focus on the changes in role identities of professionals is promising, as the anticipated development of tasks and professions resulting from AI use can only be countered with a comprehensive approach. Previous work refers to human-centered job designs but neglects the preceding process of role identification as a key challenge of implementation. This process support is made possible by the cIAIr method for determining roles for working with AI. Its use requires an understanding of role theory and expertise in organizational development.

Keywords Role development · Artificial intelligence · Socio-technical systems design · Case study

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Einstieg in die Arbeit mit KI: Erprobung der cAIr-Rollenentwicklungsmethode in einem industriellen Arbeitsumfeld

Zusammenfassung

Der Einsatz von Künstlicher Intelligenz (KI) in Arbeitsprozessen erfordert die antizipative Veränderung von Arbeitsrollen, weil sich innerhalb der Berufsbilder Tätigkeitsbereiche verschieben, in deren Folge sich neue Interaktionsmuster zwischen Mensch und KI und zwischen Beschäftigten ergeben. Um Rollenkonflikte, Ablehnung der KI und weitere unerwünschte Nebenwirkungen der KI-Integration zu vermeiden, müssen Organisationen die Mensch-KI-Rollenentwicklung durch geeignete Maßnahmen unterstützen. Dieser Beitrag zeigt eine methodisch fundierte Herangehensweise zur Rollenentwicklung (clarifying AI augmented individual roles – cAIr) auf, die am Beispiel von Servicetechnikern in einem Maschinenbauunternehmen vor und während der Einführung KI-basierter Dienstleistungen entwickelt und erprobt wurde. Es wird veranschaulicht wie Rollenklarheit in der Interaktion mit KI bei neuen Aufgabenzuschnitten erzielt werden kann und wie die Rollenentwicklung auch die Kollaboration nach innen mit anderen Abteilungen und die zielorientierte Kommunikation nach außen im Kundenumfeld einschließt. Aus der Methode resultieren sechs Basisrollen, die auf Erkenntnissen der Rollentheorie fußen und neben der Rollenklarheit auch die Rollenidentität und Rolleninnovation einschließen. cAIr erlaubt die antizipative prozessuale Auseinandersetzung mit Mensch-KI-Arbeitsrollen.

Praktische Relevanz: KI-Applikationen betreffen immer mehr Arbeitsprozesse. Es bedarf wissenschaftlich gesicherter Erkenntnisse und Beispiele guter Praxis für ihre gelingende Integration in den Arbeitsprozess. Eine auf die Veränderungen von Arbeitsrollen gerichtete sozio-technische Systembetrachtung ist dabei vielversprechend, da sie die durch KI-Einsatz bedingte Veränderung von Tätigkeiten und Berufen in einen umfassenden, auch die Identität der Arbeitskraft berücksichtigenden Ansatz überführt. Bisherige Arbeitsbewertungsansätze konzentrieren sich auf die Charakteristika von Job-Designs, können aber den vorauslaufenden Prozess der Rollenfindung als wesentliche Stellgröße der Implementierung nicht abbilden. Diese Prozessunterstützung wird durch die Methode cAIr zur Bestimmung von Rollen für die Arbeit mit KI ermöglicht. Ihre Nutzung erfordert ein rollentheoretisches Verständnis und Expertise in der Organisationsentwicklung.

Schlüsselwörter Rollenentwicklung · Künstliche Intelligenz · Soziotechnische Systemgestaltung · Fallstudie

1 Introduction

AI at work is on the research agenda and scholars are addressing the challenges arising from the tasks performed by AI. Research on human-centered AI at work evaluates the criteria of job design (Parker and Grote 2022; Berretta et al. 2023b). Some scholars go beyond and emphasize human-AI team concepts and new ways of interaction (Hagemann et al. 2023; Berretta et al. 2023a) or reflect on individual role definition and development of professionals while AI is integrated in the workplace (Galsgaard et al. 2022; Tang et al. 2022; Wilkens et al. 2024). These scholars ask which conflicts with the role identity (as a professional) might occur while interacting with AI and specify the antecedents of technology acceptance from the lens of the individual professional in terms of AI literacy, former experience with digitalization, the attribution of AI as a tool or counterpart, and the overall permeation of the job profile (Nelson and Irwin 2014; Galsgaard et al. 2022; Wilkens et al. 2024). The difference to job inventory approaches is that role development is a process which already starts before the technology is implemented. It is the pathway to work with AI based on individual and organizational learning leading to a new understanding of the role and contribution in a set of expectations. So far, little is known about concrete support needs

and measures to foster the process of role development towards new role identities in AI-based work context. For this reason, we developed the cAIr approach, which combines a change perspective with a blueprint and outline for individual role development using six basic roles designed to leverage the augmentation potential of AI.

2 Working with AI as an issue of role development

AI is a collective term for technologies which are pre-trained and fine-tuned on the basis of data to perform tasks that originally required human cognition (Fischer 2022). It gives machines “the ability to reason and perform cognitive functions such as problem solving, object and word recognition, and decision-making” (Hashimoto et al. 2018, p. 70). The discussion on AI at work is about change, disruption and uncertainty on the one hand side but also health, safety and wellbeing on the other hand (van der Maden et al. 2023). Scholars nowadays reflect *how* future work will be affected by AI and not *whether* it should or will be affected (Howard 2019; Langer and Landers 2021). This leads to the question of how to support the transformation towards work with AI in a human-centered manner. To answer this ques-

tion, adopting a socio-technical systems (STS) perspective appears to be promising. The usage and integration of AI in work systems do not lead to a separated field of tasks. Rather, AI applications are integrated in the job design of human beings and affect existing job descriptions (Parker and Grote 2022). Since the social and the material are inseparable (Leonardi 2013), the usage of AI in work processes is likely to bring about a new category of human-AI integrated expertise (Galsgaard et al. 2022) raising issues of role identity (Nelson and Irwin 2014; Ashforth 2001). An STS perspective underlined with a role theoretic understanding allows to address this entanglement between technology and human behavior (Orlikowski 1992; Strohm and Ulich 1998) while elaborating on a multiple stakeholder perspective (Eason et al. 1996). In order to support the human-centered transformation towards human-AI integrated expertise, a sound understanding of the role identities of professionals is necessary.

The role is a relational construct that contains behavioral expectations of role occupants in a social structure (Kahn et al. 1964). It is thus linked to a position, but at the same time goes beyond this in that it is dependent on how the role is shaped and interpreted by the role occupants (Ashforth 2001). The description of a position in the social structure with the associated expectations is referred to as a role, whereas the shaping and interpretation by role occupants can be referred to as role identity. Roles are a central unit of investigation in all social structures (e.g. families, cultures, village communities, etc.) and are also of great interest in organizational research (Anglin et al. 2022). Research on roles in organizations has produced a variety of streams that deal with how roles are understood, translated, negotiated and interpreted in order to deal with the diverse and dynamic expectations of role occupants. Since these streams of research are little connected we adopt the distinction made by Sluss et al. (2011) who summarize all these research streams as role crafting literature with the four streams role definition, role clarity, role innovation and role making/role taking. All of these appear to be relevant for role development with AI at work. However, the agentic nature of AI and its imitation of human cognition can challenge existing understandings of role identity and role development. Since role concepts have only occasionally been associated with specific challenges of AI at work, so far, the following paragraphs provide an overview of findings on changes in role and role identity. These are presented and organized in a way that allows to elaborate on a STS process perspective and identify pathways of developing roles for work with AI.

1. *Role definition* deals with the scope and breadth of the individual role concept. Main distinctions are between in-role behavior, i.e. behavior that falls within formal ex-

pectations associated with the role and extra-role behavior, i.e. behavior that goes beyond expected behavior but is also considered favorable for the role (Organ 1990; Katz and Kahn 1978). With AI taking over some work activities and assisting in others, it becomes an important issue of role definition which tasks fall within human roles and which tasks are allocated to AI. In a study on the cooperation between robots and humans by Kirsch et al. (2010), different sets of capabilities for humans and AI were identified. Positive effects for the overall work system were identified since human flexibility and rapid adaptation to new requirements was complemented by the precision of the machine. Fügner et al. (2022) found, that it can be difficult for employees to accurately assess their own abilities and the abilities of AI which can exert a negative impact on their overall performance. The authors suggest that employees need to develop their skill of delegating work to AI. Shaping well-balanced roles that incorporate complex cognitive tasks as well as some routine tasks, manual tasks and human interaction has to be done within a specific work context and requires constant refinement. In addition to task allocation, role definition includes establishing appropriate routines of questioning and challenging the AI systems in use to prevent overconfidence in AI outputs that is a frequent concern regarding AI use (Akudjedu et al. 2023). For example, value clarification techniques have been proposed to stay aware of ethical challenges regarding AI use (De Gagne 2023). Role-definition with AI therefore goes beyond issues of task allocation. Rather, there is a need for AI users to reflect the individual agency, the extent to which they actively question the AI tool instead of merely following AI outputs.

2. *Role clarity vs. role ambiguity*: refers to the extent to which people are certain or uncertain about the expectations of their work role (Kahn et al. 1964; Teas et al. 1979). Role clarity can be fostered by structured organizational programs, feedback from colleagues or proactive information-seeking behavior (Bauer et al. 2007). Absence of role clarity, i.e. role ambiguity or role stress, is known to have detrimental effects on individual and organizational outcomes (de Ruyter et al. 2001). Role clarity for the interaction with AI at work is a challenging issue. Studies with radiographers showed that AI is generally seen as very useful technology with the potential to make work easier (Hardy and Harvey 2020). At the same time, radiographers fear direct interaction of AI with patients and are skeptical regarding AI being involved in the final interpretation of images (Ryan et al. 2021). In a comparative interview study with radiographers and radiologists, radiographers tended to have an ambivalent stance towards AI as the perceived efficiency of the machine was associated with the assumption that AI could

essentially take over all interesting parts of their overall tasks. The study explained this ambivalence with negative former experience with digitalization and a rather low level of AI literacy leading to an overestimation of the technology. Role clarity was highest when professionals had a realistic understanding of AI functionalities and could specify the sub-tasks performed by AI and how this could contribute to a better outcome without raising doubts with respect to the individual proficiency as the compared group of radiologists showed (Wilkens et al. 2024). Role clarity is thus also a function of specifying AI-performed tasks.

3. *Role making vs. role taking*: role-making describes a process of role occupants' or leaders' actively engaging in a process characterized by trust and reciprocation (Graen and Cashman 1975; Graen and Uhl-Bien 1995). In contrast, role-taking is a more passive process that involves assuming pre-defined roles as a way of adapting to social norms and instruction (Katz and Kahn 1978). It is not necessarily an issue between human and human but also between human and AI. In the comparative study of radiologists and radiographers conducted by Wilkens et al. (2024), the proactive and informed deliberation of how AI can benefit the identity of a professional has been explicitly linked to role-making with AI while the ambivalence has been linked to role-taking behavior. Thus, role making vs. role taking is a crucial precondition of AI implementation.
4. *Role innovation* emphasizes the change of roles (Wrzesniewski and Dutton 2001). It refers to the integration of new behaviors into existing roles with the aim of improving outcomes (West 1987). Role innovation is a concept that is very much characterized by personal initiative and proactivity (Frese et al. 1997) and is closely related to the job crafting literature. Job crafting refers to the proactive change of employees to their work situation in order to create a better fit between their individual skills, needs and the demands of their work. This can be done through various behaviors, such as redesigning tasks, adapting work relationships or reshaping one's way of thinking about work. The aim of job crafting is to increase employee engagement, satisfaction and performance by giving them more control over their work situation and enabling them to better adapt it to their personal preferences (Demerouti 2014). Research contributions on antecedents of job crafting behavior show that organizational support and leadership support for job crafting behaviors are crucial mainly in form of support, encouragement and empowerment for seeking challenges and resources (Mäkikangas et al. 2017; Petrou et al. 2015). So far, some findings within the job crafting literature directly refer to AI applications whereas direct references to role innovation have not been made. Employees re-

spond to the introduction of AI with effective job crafting behaviors. They are adapting to their changed autonomy and also embracing the new meaning of work, which is characterized by less technical and trivial tasks, but increasingly by the customer relationship (Perez et al. 2022).

Building on the four components outlined above, we propose the approach cIAIr—clarifying AI augmented individual roles—for structuring the process of human-AI role development (see Chap. 3). The aim of the development and testing at a mechanical engineering company is to provide a systematic approach to role development that can be used by different companies with upcoming AI projects. The research questions are what kind of roles can support work with AI, which challenges of role development are addressed and how this role development can be implemented in the operational context.

3 Case description, CIAIr approach and design of analysis

The development and validation of the cIAIr approach took place in a three year planned intervention organized within the HUMAINE competence center. The use field is the Customer Service of SEEPEX GmbH, a medium-sized pump manufacturer. The company has implemented a digital platform with a large amount of data generated during pump use and faces the challenge of successfully offering new data-based services as an offering concept for existing clients and approach for attracting new clients. The digital platform includes a variety of analytics tools, some of which are based on expert-knowledge and others on AI. These analytics tools provide the opportunity to provide new forms of services and are thus crucial for the aspired transformation. The availability of these tools the reason for changing relations with clients and new expectations regarding technological expertise and entrepreneurial activities of customer service employees. The platform and analytics tools were at a late stage of development when the planned intervention phase began. The objective of the research-practice partnership was the identification and generalization of role concepts that foster the implementation of AI and constant technology interaction in future work settings.

The cIAIr method includes a series of workshops that were initially moderated and guided as part of a scientific process support and then continued within the company. The first workshop targeted executives and line managers in order to identify stakeholders and respective expectations. It began a few months before the new business models based on the AI-based tools were incorporated into the value stream. By this time, the digital platform with the an-

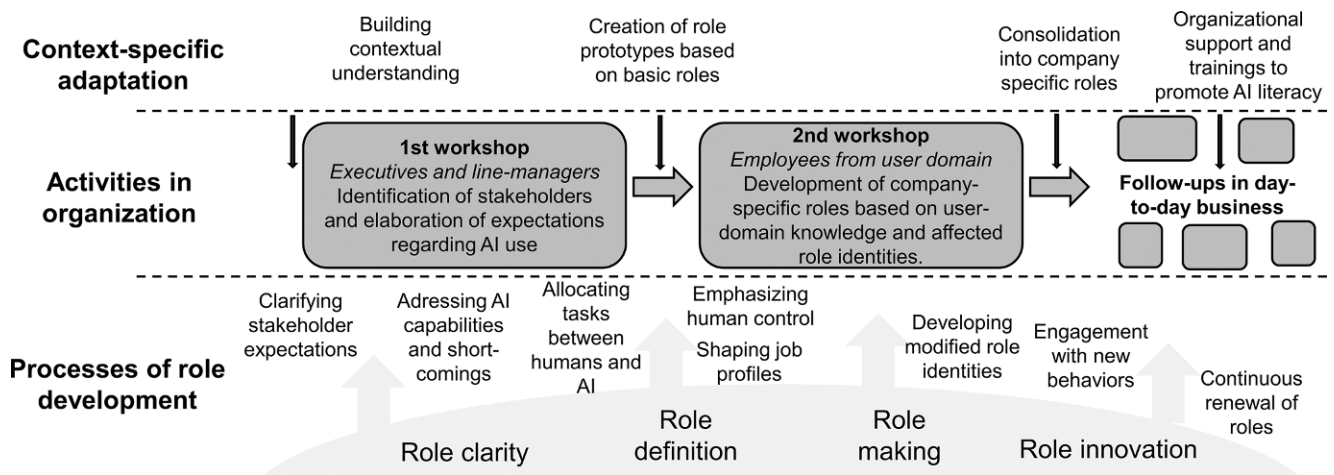


Fig. 1 The cIAIr approach to develop roles for working with AI

Abb. 1 Die cIAIr-Methode zur Rollenentwicklung für die Arbeit mit KI

analytics tools had been finalized and new service packages had been defined. The first workshop was held with four customer service team leaders, the internal project lead and one department head. In a second workshop with employees from the user domain, company-specific roles were proactively shaped based on user-domain knowledge and with respect to the affected role identities of employees. The second workshop was attended by six customer service employees including the internal project lead. The workshops were prepared and conducted in such a way that the focus was on the individual work processes of the customer service employees. Based on their domain process understanding and domain knowledge, concrete changes brought about by the AI tools as well as appropriate ways of dealing with these changes were anticipated. The focus was on the participants' perspectives. This process was further refined in internal workshops with different user groups. The outcome of these activities was a company-specific role concept that is now being used and updated within the company.

The workshops were orchestrated in a way that role development processes were supported. The first workshop was most strongly related to issues of role clarity and role definition since stakeholder expectations regarding user behavior and AI characteristics are likely to increase role clarity. During the first workshop, the detailed discussion on expectations also served role definition processes since it highlighted areas of human control which were used in the second workshop to focus roles that keep a balance between reducing workloads and maintaining the core aspects of role identities. The user-centric second workshop was intended to support role making behaviors by providing room for carefully developing modified versions of role identities. As part of the second workshop and follow-up workshops, role innovation was supported by fostering engagement with new work behaviors and providing a flexible

role concept that allows to continuously refine and renew roles if needed. The scientific support encouraged context-specific role concepts by summarizing and categorizing results of the workshops and aligning them with role theoretic knowledge. The cIAIr method with the related activities, role development processes and measures of context-specific adaptation are depicted in Fig. 1.

The development of the cIAIr method also included continuous validation with respect to the process efforts. Key criteria for validation were the fulfilled implementation of AI in work processes and meaningful interaction of employees with AI as they adapted to a new human-AI role concept while experiencing growth in terms of new proficiency in technology itself, in customer interaction (external role) or in internal collaboration between domains (internal role). The evaluation and reflection on action in terms of moderating and validating the process of clarifying human-AI roles allowed to abstract from company-specific roles to the narrative of six basic roles. This included the removal of company-specific expectations (e.g. spare parts business, digital services) and the identification of directions of impact inherent in the basic roles (technology-related role development, internal role development, external role development) with related challenges for work design. The reduction makes it possible to use the basic roles as a starting point for the application of the cIAIr approach in other companies and enables transfer of implementation experience to other contexts.

4 Results of the role development approach

The development and testing of the cIAIr approach at SEEPEX GmbH yielded three types of results: a) six company-specific roles that are associated with certain

Table 1 Company-specific roles and identified challenges**Tab. 1** Unternehmensspezifische Rollen und identifizierte Herausforderungen

Original tasks	Task-specific requirements and expectations for the integration of AI	Challenges while integrating AI linked to role development literature	Company-specific roles
Advising customers on pump use and maintenance	Use of supporting tools Participation in training courses Feedback culture Development of goal clarity	<i>Role definition:</i> Strengthening human agency through mastering the cloud and analytical tools. <i>Role clarity:</i> Expert status is maintained and even extended to digital services. <i>Role making:</i> Mastering the digital space is part of the own journey	Expert for digital services
Handling the spare parts business	Quick orientation based on the data Data-supported interpretation of the customer problem Knowledge of the customer's processes Enabling early planning	<i>Role definition:</i> Strong reliance on data for customer service activities. <i>Role making:</i> Combining experience and customer-specific expertise with reliable data for maximum benefit. <i>Role innovation:</i> Altering routines in the spare parts requests process through the use of data analysis	Smart care-taker for spare parts requests
Advice on pumps and maintenance	Analysis, interpretation and communication of customer requirements Using the data to identify potential for acquisition/cross-selling	<i>Role clarity:</i> Intrapreneurial thinking as integral part for success of digital solutions. <i>Role making:</i> Finding ways to leverage customer-specific expertise for company goals. <i>Role innovation:</i> New routines that focus more on company opportunities than single customers	Professional for benefit-generating data
Forwarding customer orders according to the processes	Complete documentation (internal) Creation of blueprints for adaptation Simplification of integration into standard processes (e.g. for suppliers/subcontractors) Support/consulting, e.g. for subsidiaries/distributors	<i>Role clarity:</i> Continuous exchange with technical departments central to enabling customer-specific solutions. <i>Role making:</i> Using own position between the customer and specialist departments for the best possible exploration of opportunities. <i>Role innovation:</i> New knowledge transfer routines through pioneer status	Helping hand in knowledge sharing
Customized consulting based on customer knowledge	Needs-based service assignments (timing, quantity, quality) Strategic communication Adaptation of level of detail/choice of words etc. to customer persona Avoiding overly complex presentations	<i>Role clarity:</i> Clarification that it is part of the own role to convince existing customers of digital solutions. <i>Role making:</i> Combining own acquired knowledge of data interpretation with a sense of the client's background and level of knowledge	Convincing ambassador of digital services to customers
Consulting, maintenance, processing	Speed, efficiency Effectiveness, quality Focus on sales/margin and other KPIs	<i>Role clarity:</i> Clarification that the current expert status will be retained	Master of standard business

processes of role development (see Table 1), b) theoretical insights on role development based on the validation of the cIAIr approach and c) basic roles as result of the reduction of the company specific roles.

The company-specific roles are based on specific expectations linked to the introduction of digital services. The expectations clearly show how the special requirements for interacting with AI and new technologies bring about changes in working methods and priorities. These changes can be illustrated by considering the implications for role definition, role clarity, role making and role innovation. For example, stakeholders stressed the expectation that customer service professionals utilize the digital cloud as part of their status as a service expert and participate in training courses when they encounter the need to extend their own knowledge. These expectations define the human role as pivotal for utilizing the potential of the cloud, convey a sense of expert status and a proactive approach towards defining the human-AI role (see company-specific role: Expert for dig-

ital services). Another area of expectations concerned active analysis of customer needs along with subsequent steps to seize opportunities. The expectations led to a role with clarity regarding intrapreneurial activities and role innovation regarding new routines to identify and seize opportunities beyond service for individual customers (see company-specific role: Professional for benefit-generating data). An overview is shown in Table 1.

The challenges identified also show what influence SEEPEX as a company can have on successful role development. The expert role for digital services, for example, is based on organizational support for training and the development of AI literacy. The role of helping hand in knowledge sharing requires support for role clarity, which also lies in the development of suitable communication and collaboration routines. In order to support the expert role for benefit-generating data, incentive systems for intrapreneurial thinking and corresponding training also come into view.

A total of six roles for successful work with digital services and AI were identified. Two of these roles included specific interaction principles with the new technology (Expert for digital services, Smart caretaker for spare parts requests). Two roles included intrapreneurial and strategic behavioral patterns that were considered necessary for success of the data-driven approach (Professional for benefit-generating data, Helping hand in knowledge sharing). Two roles were strongly related to the interaction with customers (Convincing ambassador of digital services to customers, Master of standard business).

The main theoretical insights as result of the validation process concern the path from task-related expectations to roles that goes beyond the clarification of responsibilities or task content. Rather, it is based on a new logic for achieving goals that strengthens the expert status of employees, increases freedom in procedures and localizes the initiative for change with the employee. Central to this is a role definition that views people as users and beneficiaries of AI and not as passive recipients of AI-induced change and modified work processes. The roles convey role clarity with regard to the activities where changes are to be expected (acquisition, changed internal communication, etc.) and where not (expert status, standard processes). From this strengthened role identity, the change in relation to the concrete design of the interaction with the AI (role making) and the development of new routines (role innovation) is placed on the

employees from the user domain (i.e. the customer service experts in this case).

This changed logic in the approach to task-specific expectations can be maintained when the specific context of the SEEPEX case is removed. By transferring the company-specific roles into overarching basic roles, the fundamental drivers role definition, role clarity, role making and role innovation are used to underpin six basic roles with different focal points. Two roles focus on the relationship between human and AI by specifying the utilization of AI as a tool for the own tasks and a critical and constant reflection of AI capabilities and outcomes. Two different roles exert an impact directed inside the organization by highlighting the need to use domain knowledge for detecting and seizing organizational opportunities as well as being transparent with the own expertise for collaboration with other departments and teams. The last two roles focus on communication outside of the organization by describing customer-centric solution-oriented communication and technology-supported handling of standard business. Role definition, role clarity, role making, and role innovation are relevant for all three directions. They need to be considered whenever company-specific roles are derived from the basic roles. The six basic roles along with their role theoretic underpinnings are shown in Fig. 2.

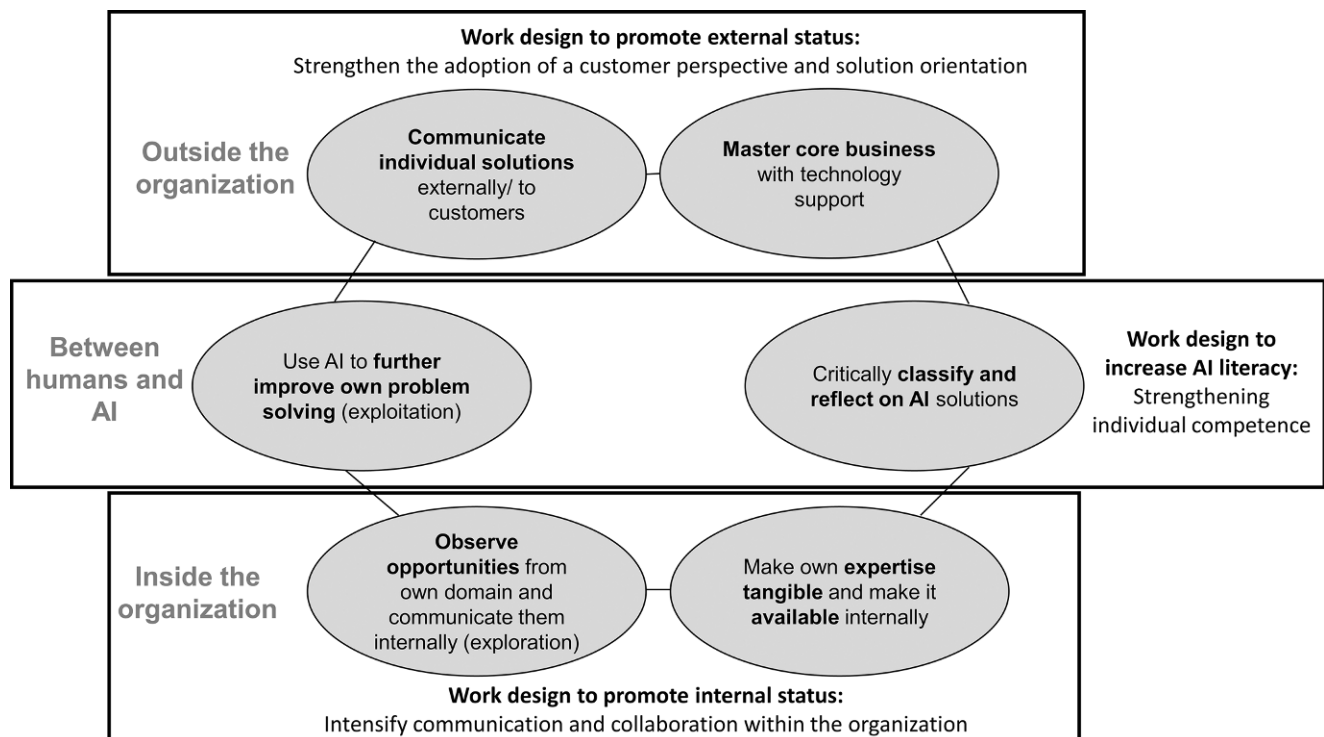


Fig. 2 Basic roles for working with AI and associated areas of work design

Abb. 2 Basisrollen für die Arbeit mit KI und zugehörige Bereiche der Arbeitsgestaltung

5 Discussion, conclusion and limitations

This article provides a socio-technical approach for designing a transformation process towards working with AI. The change in tasks for employees due to the technological innovation of the use of AI is linked to human behavior by drawing on a role-theoretical foundation. Drawing on role theory and exemplified for customer service employees in a mechanical engineering company in anticipation of new AI enabled services, the overarching role development approach cIAIr was created. The strengths of the approach lie in the integrative socio-technical approach to the AI-related change process that starts even before AI is implemented and the linking of role research with research on AI in the workplace. The developed basic roles offer an approach to role development that can be used for different industries and areas of application.

The cIAIr approach presented in this paper understands role development as a comprehensive process that combines organizational support and individual initiative. This comprehensive view is based on the diversity of the role development literature. This includes aspects of role clarity, which can be located in the interaction between the individual and the organization (Bauer et al. 2007). At the same time, aspects of role innovation and role making are aimed at individual initiative, which can be supported but not completely replaced by organizational measures (Petrou et al. 2015). A consideration of human-AI interactions, for example via human-centered inventories (Berretta et al. 2023b), is therefore necessary but not sufficient for role development. Organizational support and individual expertise can already begin with anticipatory consideration of the changes through the use of AI. In addition to an anticipatory approach, a regular examination of the roles with respect to individual adjustments and organizational support structures is also necessary. Role theory has inspired a large number of different strands of research. Especially those that deal with changes in roles are suitable for informing the design of AI deployment in work processes. So far, however, the research strands of role clarity, role definition, role making/taking and role innovation are little connected to each other (Sluss et al. 2011). With reference to the emerging literature on role development in AI in work processes, empirical findings from a mechanical engineering company and the development of the cIAIr approach for role development, this article provides ways to link these strands. Role clarity and role definition are of great relevance, as the expected consequences of AI use for employees are far-reaching and there are often misunderstandings and half-knowledge about AI in general and specific AI applications (Ryan et al. 2021; Wilkens et al. 2024). Unlike in task-based approaches, however, it is not possible to provide a complete catalog of requirements for

the use of AI on the company side. As in the case described above, clarity regarding role scope and a sensible human-AI-interaction arises from employees modifying their role identities in conjunction with support offered by the company in terms of training, skills development and the promotion of empowerment. Efforts in this regard can be initiated even before the introduction of AI, but it seems sensible to at least know the field of application and type of AI. The findings from this study suggest that role making and role innovation become even more important once AI is already in use. In the mechanical engineering company, many granular adjustments were made to the roles in the work process and in smaller intermediate workshops after the introduction of AI at team level. Here, too, areas of organizational support became apparent so that sufficient time and further resources are available for the further development of the roles. How the four processes of role development interact precisely and how these interactions also differ between companies cannot be answered by this study. However, the cIAIr approach emphasizes the simultaneous consideration of these processes and the importance of work design efforts for successful role development.

The approach taken in this paper has several limitations concerning objectivity and generalizability. Deriving the basic roles on a single-case basis does not, naturally, allow any statements to be made about the accuracy of the basic roles or the relevance of the roles identified in all fields of application. Instead, the description is intended to support the context-specific development of roles and the adoption of socio-technical perspectives for tackling transformation challenges within work with AI. It is neither possible nor intended to construe the basic roles as a ground truth that is valid across all contexts and underlying all role concepts. Instead, they are part of a method for the context-specific design of roles and are intended to make it easier to engage with work roles and promote differentiation.

The practical benefit of the cIAIr role development method is firstly that AI development can be approached as a technological innovation and changes in routines and working methods as a coherent effort. This is particularly important because the domains of AI development and AI use are usually initially decoupled and suitable forms of collaboration and communication must first be established. cIAIr can address this gap, which exists in many organizations, with a structured approach. However, cIAIr is best regarded as a ‘living’ approach in the sense of continuous refinement based on research advancements and practical experience. To this end, further validation with other companies is needed and associated cooperations already have been formed. The validation focuses on criteria like the successful integration of AI into the work process and sensitivity of working methods in connection with advancing capabilities of AI systems. The further validated approach

is intended to be used as part of a larger toolbox for human-centered AI to support organizations with respect to human-AI role development.

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