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Collaborating Across Occupational Boundaries: Towards a Theoretical Model

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Abstract

The digital transformation leads to changing work contexts and new work objects that give rise to the necessity of collaboration across occupational boundaries. Yet there is a lack of theoretical models of cross-occupational collaboration, particularly with regard to individuals' cross-occupational collaboration competency (COCC). In order to close this research gap, this article presents a theoretical model of COCC and associated indicators which can be subject to education and diagnostics in VET. In accordance with activity theory, cross-occupational collaboration is characterized as an activity system. While an activity is collective in nature, its role-constituting elements (e.g., division of labor) point to role-theoretical approaches. This paper reviews role-theoretical frameworks and applies structural symbolic interactionism as a framework for modeling an individual's COCC. Using its conceptual apparatus, a hierarchical model of an individual's capacity for cross-occupational collaboration within an activity system is developed. Its elements are (i) knowledge about one's own occupational role, (ii) knowledge about the roles of the cooperation partners with other occupations, (iii) latent role distance, (iv) role-taking, and (v) object-oriented role coordination/role-making. This model can also be used as a basis for assessments that may lead to empirical investigations of how to promote individuals' COCC.

Keywords Cross-occupational collaboration · Digital transformation · Shared object · Cultural-historical activity theory · Role theory · VET

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Introduction

The digital transformation has led to fundamental changes in economic, political, and social aspects of societal life (Harteis, 2018; Kim, 2019; The Onlife Initiative, 2015; Wallin, 2020). While the accompanying effects on work predominantly take place in industrial-technical and clerical occupational practices directly addressed by the fourth industrial revolution, digital technology increasingly transforms previously less affected occupational fields such as personal services (see Brynjolfsson & McAfee, 2014; Wittmann & Weyland, 2020). In other words, a growing number of employees are encountering the complexities associated with disruptive and revolutionary technological modernization. Interdisciplinary and cross-occupational collaboration, such as collaboration between technical and social (e.g., Bennis et al., 2007; Tardieu et al., 2020) or technical and business occupations (e.g. Camarinha-Matos et al., 2019; Shibuya, 2020), is becoming increasingly relevant due to both the non-technical fields into which digital technology is increasingly being implemented and enhanced business integration enabled by networked digital infrastructures and real-time data processing.

In the field of vocational education and training (VET), there is particular interest across occupational fields in adequately preparing the workforce for the requirements of a digitalized labor force (see Douse & Uys, 2019; Wilson, 2019; Windelband, 2019; see also World Economic Forum, 2020). Accordingly, more and more scholars (e.g., Edwards & Fenwick, 2016; Guile & Unwin, 2019; Wittmann & Weyland, 2020) consider the capability of individuals to collaborate across occupational boundaries, which we will call cross-occupational collaboration competency (COCC), to be a relevant prerequisite for workplace performance and professional success (see also Guile & Lahiff, 2017; Kira, 2010). This specifically concerns collaboration among individuals with varying vocational and professional backgrounds, comprised in the German notion of *Beruf* (Winch, 2010), which we have in mind when conducting our research.

Supporting COCC in vocational and professional education in vocational schools requires rendering the individuals' COCC accessible to diagnostics and intervention, that is, instruction (see Abele et al., 2021; Blömeke et al., 2015; Pellegrino, 2012); however, this involves analytical and theoretical modeling of individual COCC (see Messick, 1994; 1995; Mislevy et al., 2003; Mislevy et al., 1999; Wilson, 2005). Since we are not aware of any theoretically elaborated model of this kind, the aim of this article is to provide a model of an individual's COCC which takes its collective nature into account and provides for related diagnostic indicators of performance.

For this purpose, we use a role-theoretical approach but also draw on conceptual ideas from activity theory. First, we outline digitalization-related changes to work leading to cross-occupational collaboration requirements across occupational fields and subsequently analyze them through the lens of activity theory as a means of clarifying the notion of cross-occupational collaboration. Second, we develop a role-theoretical model of COCC on the basis of structural symbolic interactionism. This two-step approach allows us, while rejecting an understanding of COCC as independent of occupation and subject, to conceptualize COCC as different from subject-matter competence (see Seeber & Wittmann, 2017). Therefore, we lay the

groundwork by emphasizing the role-constituting aspects explicitly contained in activity theory, such as division of labor. We select structural symbolic interactionism as our basis for modeling COCC to address both institutionalized norms of occupational practices and vocational and professional agency. This approach also allows us to mark the potential for assessing COCC. Finally, we shed light on future research efforts by discussing the implications and limitations of our model.

Cross-Occupational Collaboration as a Crucial Form of Work in the Context of the Digital Transformation

Within the social sciences, the digital transformation is understood as a transformative process that permeates the individual, organizational, and societal spheres (e.g., Helbig et al., 2021; Wittmann and Weyland, 2020). As a result, historically evolved socio-cultural—including occupational and professional—practices are undergoing fundamental changes, requiring substantial adjustments to our perceptual background, actions (Wittmann & Neuweg, 2021), and value-based assumptions (see Billett, 2008). These changes to work contexts are centrally attributable to the networking of digital technologies among one another as well as with physical environments and real-time data processing (Wittmann & Weyland, 2020). Related examples are network-based communication between RFID[1] chips and centralized systems, such as ERP[2] systems, or within cyber-physical systems (see Wittmann & Weyland, 2020). While we recognize that these changes are to a certain extent context-bound, our argument rests on the assumption that the digital transformation carries common features across occupational fields—and that, as a consequence, cross-occupational collaboration will become a significant form of occupational practice. In our view, three examples of factors driving cross-occupational collaboration are (i) increasing implementation of networked digital technology, including data extraction and analysis, in social fields such as education or care work, (ii) data driven, "personalized" satisfaction of the demands of recipients, including customers, clients, patients, and citizens, and (iii) business process orientation as an organizational response to rapid changes in organizational environments.

The integration of different occupational perspectives has become an issue in the field of industrial production, but increasingly also in previously less affected social fields of action (Wittmann & Weyland, 2020). Here, cross-occupational collaboration is a relevant means of ensuring that digital technologies are implemented in ways that support workers and clients in line with vocational and professional values and free of interruptions. This would be the case, for instance, in the implementation of smart home technology in care facilities, for which collaboration between technicians, care workers, and home economists might be relevant (Wittmann & Weyland, 2020).

This is particularly the case where data gathering and analysis allows for personalized, that is, data-driven, attribution of recipients' demands, often based on statistical categories and, increasingly, artificial intelligence, as well as data-driven fulfillment

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[1] Radio-frequency identification.

[2] Enterprise resource planning.

of these ascribed demands, which involves fields like industrial products (Piller, 2004) and services (Wirth & Sweet, 2019; Xu et al., 2018), but also personalized medicine (Hoeyer, 2019; Wittmann & Weyland, 2020). While personalization may be used to improve quality, lower costs, and shorten delivery times or improve their flexibility, it also requires both value-based judgements from professionals in the field, specifically with regard to their appropriateness regarding recipients' needs, and technological judgement as to the possibilities and requirements of its technological implementation. However, this presupposes the corresponding implementation and development of contextually appropriate networked digital infrastructures.

Moreover, cross-occupational collaboration is also gaining relevance because networked digital infrastructures enable—and the personalized satisfaction of recipients' demands requires—new forms of work and interfaces between occupational groups, and hence organization. For instance, Fischer and Pöhler (2018) state that a key potential of digital technology lies in vertically integrating "units" within an organization and horizontally integrating systems and services along value chains. Indeed, Bodrožić and Adler (2018) showed that the emergence of digital technology leads to a paradigmatic shift in organizations where value-added processes are linked across internal and external organizational boundaries on the basis of concepts of business process orientation (Reijers, 2003; Schirmer, 2020; Willaert et al., 2007), enabling the expertise of different actors to be profitably used to meet recipients' demands (see also Engeström, 2007). This is where cross-occupational collaboration becomes relevant (Wittmann & Weyland, 2020), for example in the placement of sensors or RFID chips that communicate with ERP systems where actors from technical occupations work together with representatives of business occupations so that the data processed in real time results in the effective control of production processes (see Hämäläinen et al., 2018; Vähäsantanen & Eteläpelto, 2018). These transformational aspects show that the intensified emergence of cross-occupational collaboration is already anticipated in many accounts concerned with the impact of digital transformation on work. The emergence of cross-occupational collaboration seems to be mainly rooted in the historical increase of complex work demands, whose evaluation and mastery require or benefit from the integration of varying occupational perspectives.

From an educational point of view, however, this argument is limited as it implies that occupations function exclusively as concepts representing the organizational division of labor—that is, as social artefacts including practices and norms that have evolved historically on the basis of social consensus and are for the most part institutionalized (Klotz et al., 2014; Marx, 1909). In this sense, the subject appears as the performer of a specific form of work that corresponds to the functional requirements of the division of labor; he or she is the bearer of an occupational role (see Billett, 2011; Hansen, 1994; Weber, 2019/1922). The German notion of *Beruf* we use transcends this meaning:

> The term *Beruf* signifies 'occupation' but in a broader sense which is more equivalent to the English term 'vocation', which signifies an ethical calling but also as a term that signifies the social identity of the person practising the *Beruf*. (Winch, 2010, p. 72)

Hence, occupations within the meaning of *Beruf*, and likewise professions such as nursing,[3] have both an individual and a social as well as societal component (see Zabeck, 2013); its constituents are personal agency and socially derived occupational practices (see Billett, 2019; Chan, 2019). Beyond proficiency, the concept also focuses on the individual's aspirations and interests. This notion of occupation makes it apparent that the aforementioned narrative surrounding cross-occupational collaboration disregards its potential in enabling individuals to actively shape and consolidate their occupational role and associated values (Billett, 2006). Hence, we understand cross-occupational collaboration not only as a means of generating solutions in a transformational context that leads to competitive advantages but as an opportunity to proactively initiate changes regarding values related to occupational roles. Indeed, the digital transformation is historically significant among other things because its economic drivers (Avis, 2021) challenge the understanding of the occupational role itself (see Beer & Mulder, 2020).

Consider the following example: From a historical perspective, the profession of home economics (Dewhurst & Pendergast, 2008; Stage, 1997) has an ambiguous role: (i) care for the clients' needs and autonomy and (ii) domestic care, including the striving to move as efficiently as possible (see Cassedy, 2020; Elias, 2008; McGregor et al., 2008). In the context of digital transformation, the latter aspect is addressed by the implementation of smart home systems. They allow home economists to increasingly control household appliances, such as turning on and off the stove remotely. However, the home economists may then have to justify more strongly why on-site domestic support and employment offers are made. What the work of the home economists will ultimately look like in the course of the digital transformation depends not only on the economic drivers but also on the home economists' understanding of their occupational role.

The example illustrates that occupational practice—even if some parts of it are not substituted—is nevertheless affected by the digital transformation and that learning and role expectations do not automatically result from the implementation and use of digital technologies (Beer & Mulder, 2020). Beer and Mulder (2020, p. 16) conclude that employees "need to take more responsibility with regard to their own development and professional work identity" (see also Scholkmann, 2021). This may be accomplished through cross-occupational collaboration. Indeed, Guile and Unwin (2020) recently argued that cross-occupational work contexts, with their specific socio-material and relational encounters, foster the development of expertise as a "capacity for action." Moreover, cross-occupational work enables individuals to maintain a sense of self or personal identity by allowing them to recognize the worth and responsibility of their occupational role in comparison to other occupational groups involved in a particular activity (see Bakker & Akkerman, 2019; Billett, 2011; Edwards, 2007).

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[3] The origin of our theoretical reasoning is our research on health professions, in which the term "interprofessional cooperation or collaboration" is common but typically ignores other occupations, e.g., from the technical domain.

Conceptualizing Cross-Occupational Collaboration

The Activity System

As already outlined, we expect that the digital transformation will increasingly change all areas of occupational practice. Conversely, there is a need for sufficient possibilities to theoretically depict such comprehensive contextual changes. One such approach can be found in the core of the *Helsinki school* of cultural-historical activity theory (CHAT; Sannino & Engeström, 2018, p. 44). The central unit of analysis in CHAT is the activity, which can be characterized as a relatively durable collective system (i.e., activity system; Engeström, 2019, p. xvi).

As shown in Fig. 1, an *activity system* generally consists of the following interconnected elements: subject, instrument, object, division of labor, community, and rules (see Engeström, 2019). *Subject* refers to the individual or subgroup involved in the activity from whose point of view the analysis is carried out. The "raw material," the "problem space," or the individual focused on by the activity is called the *object*. It objectifies the motive that gives meaning and significance to the activity. That is, the motivation of acting subjects lies in transforming the object at hand from a raw state into an *outcome* (Engeström & Sannino, 2010; Leont'ev, 1978). In line with Vygotsky's (1978; 1997) idea of a mediated act, the subject(s) use(s) instruments, that is, crystallized experience of the activity system with the object. Accordingly, *instruments* are mediating artefacts. Notably, this includes technological tools, but also other means, such as language and signs. The influence on the object mediated by instruments is organized according to the historically evolved *division of labor*.
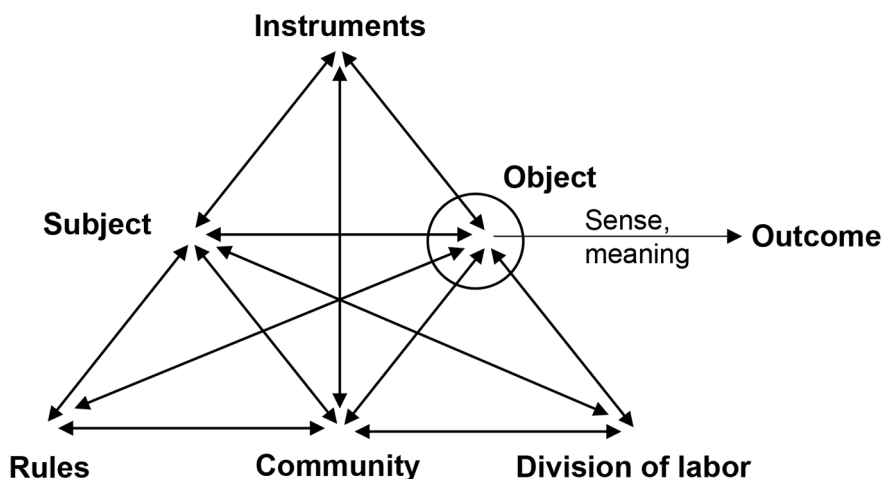

Fig. 1 General model of an activity system. Slightly adapted from "Educational Research Review, 5/1, Y. Engeström and A. Sannino, Studies of expansive learning: Foundations, findings and future challenges, 1–24, Copyright (2010), with permission from Elsevier".

It refers to the distribution of responsibilities, roles, and hierarchies within an activity system. All actors involved in the activity are referred to as a *community*; hence, they share the same object. Finally, *rules* refer to explicit and implicit regulations, norms, conventions, and standards that constrain actions within the activity system (Engeström, 2019; Engeström & Sannino, 2021).

With regard to cross-occupational collaboration, it is necessary to address the instrumental and communicative aspects of activity systems (see Engeström, 2019). The former refer to the subject–object relation. According to Leontyev (1981), motive-oriented activity is the most comprehensive instrumental stage of an activity system. On account of the division of labor, an activity is broken down into actions, each with specific goals. In the words of Engeström (2000), actions are "successive, momentary instantiations of a wider and more stable system of collective activity" (p. 961). Actions, in turn, include operations linked to the conditions for achieving the goal (Engeström, 2019; Leont'ev, 1978). Since the conditional context is contained in the activity system, it is fundamentally collective; only actions and operations are individual.

In contrast to the instrumental levels of activity, action, and operation, the communicative aspect of an activity system refers to the modes of the subject–subject relation (Engeström, 2019). Here, Engeström and colleagues (1991; 1997) distinguish coordination, cooperation, and reflective communication, referring to the concept of scripts (see also Engeström, 1992). The notion of script entails role-constituting components such as explicit rules and implicit traditions within a community based on the division of labor. If the script is transferred to individual actions in conformity with expectations and without reflecting the script or the common object, the subjects act at the level of coordination. In the cooperation mode, by contrast, the participants explicitly address the shared object (e.g., problem) in order to find a mutually acceptable way to transform it into an outcome (e.g., solution). For this purpose, the actors deviate from the script briefly, but the script itself is not questioned. That is, however, the case at the level of reflective communication. Here, the interaction partners reflect and reconceptualize both the common object and the script.

Cross-Occupational Collaboration as an Activity System

Beyond these theoretical elements, it should further be noted that CHAT provides some terms for grasping the phenomenon of people with various occupational backgrounds working together, such as the concept "knotworking," which Engeström (2004, p. 153) defines as "tying, untying and retying together otherwise separate threads of activity." Engeström (2004) states that due to their lack of temporal stability, knots cannot represent an activity system but should be understood as subjects of an activity system he labels "collaborative and transformative expertise" (p. 145). It is "to be taken as a historical working hypothesis. One would be hard put to point out a functioning example of mature collaborative and transformative expertise. The story of this type of expertise is only beginning" (Engeström, 2004, p. 163). In the context of the digital transformation, this also applies to what we call cross-occupational collaboration; however, cross-occupational collaboration differs from collaborative and transformative expertise in that it focuses on the shaping and re-forming of occu-

pational or professional roles. Hence, our understanding of cross-occupational collaboration is close to that of interprofessional collaboration as applied in the social and health care sector, the difference being that it includes but goes beyond collaboration within the social and health care sector (e.g., Karam et al., 2018; Leathard, 2003). Furthermore, in contrast to knotworking, we argue that digital transformation increasingly requires stable formations individuals from different occupations or professions engage in to cultivate collaboration actively on the basis of a sufficient understanding of the values and objectives of their own occupational role.

In Table 1, we integrate our line of thought into a model of cross-occupational collaboration as an activity system in the context of the digital transformation that can be addressed in VET and the related diagnostics.

In the previous section, we argued that cross-occupational collaboration responds not only to emerging objects, the trajectory of which requires or benefits from different occupational perspectives (e.g., the implementation and development of digital infrastructures), but also to the digitalization-induced irritation of the division of labor. Hence, the partially unclear or unconsented responsibilities also become an object of cross-occupational collaboration. In this sense, we understand cross-occupational collaboration as the effort of workers from different occupations, who may have different vocational and professional goals and rules, to maintain their common work on the shared object by negotiating and consolidating their responsibilities on the basis of their role conceptions (see Engeström, 2008; Konkola et al., 2007). Therefore, cross-occupational collaboration as we understand it tends to take place at the levels of cooperation or reflective communication (Engeström et al., 1997), meaning that it appears in situations requiring deviations from the script and possibly reflection. In terms of vocational and professional competence, it adds a meta-level, or at least fractures, to day-to-day professional action. It can be noted that it is therefore quite likely also a source for learning and identity building.

Hence, the outcome of cross-occupational collaboration may be twofold, including the satisfaction of recipients' needs on the one hand and the (re-)formation

Table 1 Cross-occupational collaboration as an activity system

General elements of an activity system	Specification for cross-occupational collaboration in the context of the digital transformation
Subject	Individuals with different occupations and/or professions
Instruments	a) Digital tools for cross-occupational collaboration: e.g., electronic patient record b) Language used for cross-occupational collaboration
Object	a) Trajectory of a shared object[a]: necessitates or benefits from different occupational and professional actors b) Partially vague or unconsented responsibilities
Outcome	a) Satisfaction of recipients' needs b) Mutually adapted occupational and professional responsibilities
Division of labor	Irritated by the digital transformation
Community	Workers from different organizations or in a (business) process-oriented organization
Rules	E.g., data protection

[a]For example, food provision respecting clients' needs and autonomy

and consolidation of the actors' situational roles and subsequently their vocational and professional roles on the other. Since the common object cannot be purposefully transformed into the intended outcome by a single occupation, the subjects of cross-occupational collaboration are specific formations of individuals with different occupations and/or professions, depending on the state of the shared object. The community of cross-occupational collaboration is therefore fed by workers with different occupational backgrounds. Due to the interconnection of the elements within an activity system, changes in the area of rules are also conceivable, for example regarding the consideration of data protection.

So what are the instruments in such an activity system? While digital technologies are conceivable as tools for cross-occupational collaboration, such as the electronic patient record containing information about the patient as a shared object of physicians, nurses, and other health professionals (see Engeström & Sannino, 2010; for another example, see Paavola & Miettinen, 2019), we consider spoken and written language as the central instrument, since it is "typical, continuously available" (Engeström, 2019, p. 185). But to actually realize the mediating function of language in the context of cross-occupational collaboration, its use requires a corresponding capability of individuals—that is, COCC—which is characterized by its "*object-orientation*" (Engeström, 2005, p. 320).

Accordingly, the activity-theoretical perspective we have chosen indicates which object-oriented capability is relevant for individuals acting in such an activity system (see Miettinen, 2005). However, since the primary unit of analysis in CHAT is not the individual but the activity system, which is collective in nature (Billett, 2011; Davies, 2013; Young, 2001), the challenge is to conceptualize an individual's COCC on the basis of the understanding of cross-occupational collaboration. One reason why we consider role-theoretical approaches to be adequate for modeling COCC is that they can be used to conceptually address the social and division-of-labor nature of cross-occupational collaboration as an activity system: Since we aim for workers and employees who do not simply subject themselves to imposed occupational roles—that is, merely coordinate—we seek to create a model of COCC with an underlying framework that corresponds inter alia to the concept of *Beruf* as defined above.

Conceptualizing COCC

Models represent applications of theories to a specific phenomenon. According to Wartofsky (1979), "models are embodiments of purpose and, at the same time, instruments for carrying out such purposes" (p. 142). As loose sets of premises and constructs, frameworks open up a specific perspective on the phenomenon of interest, serving as a potential basis for one or more theories in which the constructs of the framework are linked to propositions in order to enable explanations and/or predictions of empirically ascertainable phenomena (see Anderson, 1983; Stryker, 1981). We continue on the basis of this distinction by briefly outlining three role-theoretical frameworks to select a suitable framework for theorizing and modeling COCC. The framework should comply with the following criteria: It should (i) correspond to the German concept of *Beruf* and therefore the value-based change of roles and (ii) con-

tain implications that allow for diagnosing and, as a consequence, facilitating COCC within educational systems.

Structural Symbolic Interactionism as a Framework for Modeling COCC

The common feature of role-theoretical frameworks is that they connect the individual with society by understanding a (social) role as a set of norms or socially consensual expectations directed at individual action in a particular societal position (see Allen & van de Vliert, 1984; Stryker, 2001). Role performance or role behavior should be distinguished from the normatively charged concept of role as an "ideal folk conception" (Turner, 2001) of position-bound behavior: It concerns the actual action in a certain position (Goffman, 1972; Turner, 1956). However, its conceptualization and theoretical point of reference differ depending on the underlying framework. In this regard, two dualistic approaches are often considered (see Stryker, 2001; Turner, 2001): (i) structural functionalism and (ii) symbolic interactionism.

The former derives its theoretical assumptions from the concept of society, which Talcott Parsons (1951), a well-known representative of *structural functionalism*, characterizes as a set of functional units. He considers role-playing—acting in conformity with expectations (see also Parsons et al., 1951; Blumer, 1986)—to be a suitable means of stabilizing and reproducing a society's order. By contrast, *symbolic interactionism* emphasizes social interaction between individuals or groups of individuals. This framework originates from George H. Mead's reflections on the emergence of the individual self (Blumer, 1986). To Mead, constituents of self are stabilized behavioral expectations and symbols with sufficient intersubjective comprehensibility that enable the individual to understand and adjust his or her action in the context of collaborative activity. However, the interpretation of expectations relevant to action is situational or case-specific (Mead, 1934; 1936a; see also Gecas, 1982). Blumer (1986) concludes on the basis of this situational emergence that social behavior can only be observed naturalistically and understood post hoc. Accordingly, any attempt to predict lines of social interaction through theoretical considerations based on already existing concepts is pointless (see Stets & Serpe, 2013; Stryker & Vryan 2006). Consequently, if we were to subscribe to symbolic interactionism in this processual form, modeling an individual's COCC would be a waste of time from the outset (Serpe & Stryker, 2011). Yet structural functionalism also seems unsuitable for our modeling of COCC, because the one-sided emphasis of this framework on socially derived practices does not correspond to the German notion of *Beruf*. One framework that meets the criteria selected is the social-structural version of symbolic interactionism, called *structural symbolic interactionism* (e.g., Stryker, 1980).

Structural symbolic interactionism is based on the postulate of sufficient continuity of social life (see Serpe et al., 2020; Stryker & Serpe, 1982). Under this assumption, theoretical concepts can be useful for explaining social behavior even across different situations (see Kuhn, 1964; Kuhn & McPortland, 1954; Stets & Serpe, 2013). According to Serpe and Stryker (2011), not only should the definitions of the actor in a micro-process be considered but also the characteristics of social structures influencing them, such as societal roles, including the occupational roles that are implied in the *Beruf* or the profession. This means that the symbolic-interactionist dialectic of

individual and society should be paid respect (Mead, 1934; 1936b; see also Dewey, 1916). However, the latter is the meta-theoretical starting point in structural symbolic interactionism: "In the beginning, there is society" (Stryker, 1997, p. 315). Through the immersion of the person in society (i.e., socialization), a self is formed that leads to social behavior, which in turn largely leads to the reproduction of social structures (see Goffman, 1974; Stryker, 2001). Serpe and Stryker (2011) state: "While humans are actors, action does not necessarily result in changing situations or larger structural settings. We can expect social behaviour to exhibit a blend of creativity as well as stability and change" (p. 232; see also Stets & Serpe, 2013). Hence, structural symbolic interactionism acknowledges personal agency. It is more or less limited, but not determined, by social structures and the norms operating within them (Serpe et al., 2020; Stryker, 2001; see also Billett, 2011).

Thus, it becomes clear that structural symbolic interactionism uses the concept of role to integrate structural-functionalist and symbolic-interactionist thoughts, thereby eliminating their respective weaknesses (Serpe et al., 2020; Stryker, 2001; 1981). On the one hand, it follows from the structural-functionalist premise that only the internalization of behavioral norms leads to the definition of interactionally relevant object meanings (Parsons & Bales, 1955)—or, in the terminology of activity theory, it enables cross-occupational collaborative action towards a shared object within the division of labor. On the other hand, drawing on Mead's (1934) dictum that the self reflects society, role-theoretical concepts are central to theories based on structural symbolic interactionism (Stryker, 1980; Serpe et al., 2020). However, structural symbolic interactionism assumes a degree of internalization that enables the individual to show either conforming or nonconforming role performance. That is, in the terminology of activity theory, all communicative modes are possible. Accordingly, as a superimposing typification of behavior in a social position the role is both an orientation template and subject to redefinition according to vocational or professional values (see Turner, 1962).

Structural symbolic interactionism corresponds to the notion of *Beruf* in that it upholds the imagery of the mutual constitution of society and individual. Although this congruence applies to a certain extent to symbolic interactionism as well, structural symbolic interactionism's meta-theoretical reference—society—renders it possible to develop theories and models that can be applied or, in terms of measuring COCC, have empirical validity across specific situations of action in occupational roles held within a *Beruf* or a profession. In principle, both qualitative and quantitative research methods for empirically modeling COCC can be applied on the basis of structural symbolic interactionism.

For modeling COCC, we thus follow the epistemological premise of structural symbolic interactionism that it is worth adhering to social continuity in the context of social change, which is seen as inevitable by CHAT (see Miettinen, 2006, p. 402) and possible by structural symbolic interactionism. An example of this is advocacy for the recipient of care in the nursing profession. However, role-theoretical concepts focus on the interrelation between the person and the prior social structure (Serpe et al., 2020). That is, they tend to disregard the object, which, on the contrary, is the focus of CHAT. This is the fundamental reason why we merge CHAT and structural symbolic interactionism in our modeling of COCC, which we understand as

appropriate predispositions for coping with role-based requirements in such a way that—in activity-theoretical terms—an object is transformed into an outcome that meets recipients' needs and is in line with vocational and professional values (see Seeber and Wittmann, 2017). We will subsequently enrich the model of COCC with the activity-theoretical notion of (shared) object (for a synoptic comparison of CHAT and structural symbolic interactionism, see Appendix Table 3).

Modeling COCC

The model in Fig. 2 shows individuals' prerequisites for cross-occupational collaboration, with the bold framed boxes representing its broad outlines. The conception of the role episode model is taken from Kahn and colleagues (1964). It comprises a complete cycle of situational role stimulus by the role sender(s) and the resulting role performance of the occupational role bearer (focal person), the effects of which may result in another role episode. Situationally adequate role performance in the context

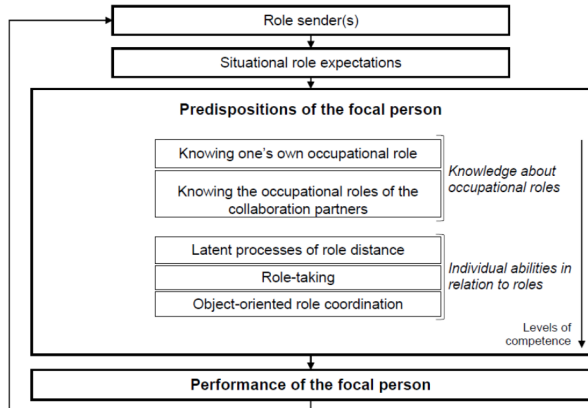**Fig. 2** Role-theoretical model of COCC

Predisposition	Examples of related performance of the occupational role bearer
Knowing one's own occupational role	Role-playing
	Recognizing situational role expectations of one's own occupational role
Knowing the occupational roles of the collaboration partners	Recognizing situationally relevant norms of occupational roles the collaboration partners have
Latent processes of role distance	Selecting critical questions from within one's own occupational role
Role-taking	Assessing the reasons for the situational action of collaboration partners from other occupations
Object-oriented role coordination	Making suggestions for change in interactive action

Table 2 Levels of COCC and examples of the related performance of the occupational role bearer

of cross-occupational collaboration, examples of which are shown on the right side of Table 2, is associated in our model with the predispositions of the occupational role bearer (see, e.g., Allen & van de Vliert, 1984; Blömeke et al., 2015).

Closely associated with these predispositions are two overt types of role behavior in real collaboration situations: role-playing and role-making, which we integrate into our model. As described in the previous section, role-playing is a behavior that conforms to role expectations. It includes conformity with regard to situational expectations on the part of the role sender and/or with regard to the understanding of one's own occupational role (Allen & van de Vliert, 1984). Role-playing occurs mainly when the role expectations in a specific situation are congruent with the role conceptions held by the role bearer (Biddle, 1986). Its diagnostic potential is therefore rather low. Furthermore, although role-playing is a potential component of real cross-occupational collaboration, it is not a sufficient characteristic. Role-playing is a manifestation of the "coordination" mode in CHAT (Engeström et al., 1991; 1997). As described above, we understand cross-occupational collaboration as an activity system whose main modes are "cooperation" and "reflective communication," meaning deviation from the script through negotiation with respect to the object and/or script (i.e., occupational roles). These modes can be taken up by the notion of role-making, which favors the adequate shaping and development of the individual self. It involves negotiating, modifying, developing, and shaping expectations (see Burke, 2003; Stryker & Vryan 2006). However, role-making requires a number of latent prerequisites, which we will now address. We will lay them out and model them following the theoretical assumption that they imply increasing levels of ability on the part of the occupational role bearer. We will also provide examples of related performance indicators.

Knowledge About Occupational Roles　In accordance with the meta-theoretical reference of structural symbolic interactionism, knowledge about the occupational roles of the actors in a specific constellation represents the least demanding prerequisite and therefore the lowest level of COCC in our model. Firmly grasping which actions are expected of the occupational role bearer in a situation is a fundamental prerequisite for the competence levels that build on it (see Goffman, 1972; Turner, 2001). Placed within the activity system, such knowledge can be derived from both the organisational division of labor and the *Beruf* or profession of the subject which allows it to hold a certain occupational role. For instance, when implementing smart home monitoring technology, a nurse might consider securing and protecting the care recipients' data as part of his or her autonomy-supporting role or fail to do so (see Federal Ministry for Family Affairs, Senior Citizens, Women and Youth, and Federal Ministry of Health and Social Security 2019). A distinction should be made between (i) knowledge about one's own occupational role and (ii) knowledge about the occupational roles of the collaboration partners. In the case of the smart home, the other role would be that of electronics technician in fulfilling technical requirements by means of digital technology and ensuring the data protection and data security of customers, including informed consent comprehensible to the care recipient. We generally assume that it tends to be less demanding for the occupational role bearer to

recognize the situationally relevant norms of his or her own occupational role than to recognize those of the roles of collaboration partners from other occupational groups.

Latent Processes of Role Distance In our model, a more elaborated indicator of COCC is *role distance*, which Erving Goffman (1972) defines as "actions which effectively convey some disdainful detachment of the performer from a role he is performing" (p. 98). Goffman explains this as follows:

> This 'effectively' expressed pointed separateness between the individual and his putative role I shall call *role distance*. A shorthand is involved here: the individual is actually denying not the role but the virtual self that is implied in the role for all accepting performers. (p. 95)

This representation of role distance points to Goffman's (1959; see also 1974) dramaturgically introduced dichotomy between the self as a performer and the situated or virtual self as expectations of the role one is to assume (see also the dialectic of "I" and "Me" in Mead, 1934). Accordingly, the individual distances herself or himself at a latent level from the norms and role expectations of the situational role in order to critically reflect on and interpret them. Psychological processes underlying role distance are thus an effort in role-making (see Allen & van de Vliert, 1984). According to Goffman (1972), the focal person accomplishes this effort by referring to roles: "The liberty he takes in regard to a situated self is taken because of other, equally social, constraints" (p. 107).

Thus, possible demonstrations of role distance in the context of cross-occupational collaboration include, for example, the identification of inappropriate or problematic expectations of others with regard to the object and the selection of appropriate critical questions, drawing on one's own occupational role or that of the collaboration partners. To again take the example of implementing smart home technology at an elderly care facility to support a care recipient's autonomy, including his or her intimacy (see Federal Ministry for Family Affairs, Senior Citizens, Women and Youth, and Federal Ministry of Health and Social Security 2019), the nurse who—in line with his or her professional role—considers the subjective perception of the person in need of care (see Käppeli, 1995) might, on behalf of the care recipient, question decisions about how monitoring technology is being implemented by the electronics technician. While we suggest that role distance represents a higher level of competence than knowledge of the occupational roles of the collaboration partners, we must caution that it remains unclear to what extent this model holds true empirically. In vocational and professional education, this might also depend on the extent to which this kind of knowledge is actively taught.

Role-Taking *Role-taking* is more demanding than role distance. It is the capacity to take the role or, synonymously, the attitude of others with whom one collaborates (Mead, 1934). According to Turner (1956), the individual "does so by placing himself in that other person's position, imaginatively reviewing that other's role until the attitude [i.e., tendency to act toward a particular category of objects] in question is indicated" (p. 317). Role-taking thus refers to the individual's ability to anticipate

others' relevant attitudes (Mead, 1934; see also Heimer and Matsueda, 1994). It can only occur when individuals are able to distance themselves cognitively from the expectations of their own occupational role. Additionally, role-taking necessitates awareness of the situational role of the relevant other, including his or her institutional context (see Turner, 2001). It may be concluded from this inclusive relationship that role-taking is a latent effort to develop an intact self (see Gruber & Harteis, 2018). However, in contrast to latent role distance, role-taking refers less to one's own occupational role and more to an empathetic perspective with regard to the collaboration partner(s). Again, understanding can be derived from both the responsibilities that come with a certain *Beruf* or profession and those originating in the organizational division of labor.

By characterizing role-taking as, among other things, an "empathic activity," Coutu (1951) draws attention to an important aspect of role-taking. Besides the analytical anticipation of the behavior of others, role-taking is also the "feeling of the attitude of the other" (Mead, 1934, p. 171). Through this, actions already performed can be interpreted by identifying the feelings or motives behind the behavior of others (Coutu, 1951; Turner, 1956). In the context of assessing COCC, a role-taking requirement might be to identify the reasons for the situational actions of others, or for the situational role expectations lying within their occupational role. To return to the example of the smart home monitoring technology, the electronics technician could determine the reason for the nurse's critical questions by taking his or her role. Doing this accurately would allow the technician to understand the nurse's attitude as originating from the legitimate professional focus on the client's needs and rights.

Thus, role-taking represents a basic prerequisite for being able to orient individual actions reciprocally (Joas & Beckert 2001). Mead (1934; see also Blumer, 1986) also sees the central part the capacity to take and feel the attitudes of others plays in collaboration:

> [Role-taking] is not something that just happens as an incidental result …, but it is of importance in the development of cooperative activity. The immediate effect of such role-taking lies in the control which the individual is able to exercise over his own response. The control of the action of the individual in a co-operative process can take place in the conduct of the individual himself if he can take the role of the other. (Mead, 1934, p. 254)

At this point, Mead suggests what Turner (1962) took as a reason to regard role-taking as a role-making process. Yet although there is some congruency in the sense that role-taking serves to negotiate and modify role expectations (i.e., role-making), these terms are nevertheless separated in the present model.

Object-Oriented Role Coordination From an analytical point of view, role-making does not emerge directly from role-taking, since the latter is primarily an interpretative and anticipatory action. Therefore, we propose a connecting element, which Blumer (1986) already described in general terms (see also the conceptual understanding of thinking in Dewey, 1922).

Put simply, human beings in interacting with one another have to take account of what each other is doing or is about to do; they are forced to direct their own conduct or handle their situations in terms of what they take into account. Thus, the activities of others enter as positive factors in the formation of their own conduct; in the face of action of others one may abandon an intention or purpose, revise it, check or suspend it, intensify it, or replace it. … One has to *fit* one's own line of activity in some manner to the actions of others. (Blumer, 1986, p. 8)

Here, Blumer leaves open the question of what the individual has to orient himself towards by doing this. For cross-occupational collaboration as an activity system, we propose that the shared object, which may involve material objects to be produced, problems to be solved, or a person to be treated, is a core reference point (see also the concept of relational agency by Edwards, 2011). Therefore, we would call this latent ability *object-oriented role coordination*, which means relating the roles of the actors involved, their role expectations, and the results of role-taking to cope with the common object in the most constructive way possible. By virtue of role coordination, the individual then has a mental template for engaging in adequate role-making with regard to the shared object.

Examples of related performance indicators are choosing conflicting positions and proposing changes for interactive action, thereby selecting situationally appropriate language (see Engeström, 2018) or adequate influence tactics in relation to the collaboration partners and the object (see, e.g., Yukl & Tracey, 1992). In the case of the smart home monitoring technology, the electronics technician could seek guidance from the nurse on how to appropriately explain means of data protection to care recipients and continuously provide customer-oriented, technical solutions that balance out differentiated monitoring requirements and the respective care recipients' autonomy. The nurse, on the other hand, if she is a good steward of care recipients' subjective perspectives and rights for autonomy in the face of the implementation of such digital instruments into her care facility, will not only be helped by a thorough understanding of the electronics technician's role but also requires a firm and increasingly differentiated grasp of his or her own occupational role.

Discussion

In this article, we developed a model of individuals' COCC which also allows for the elaboration of diagnostic indicators of COCC. For this purpose, we proposed a role-theoretical model, drawing on ideas from structural symbolic interactionism and activity theory (see Fig. 2). This model suggested the following role-theoretical concepts: (i) knowledge of one's own occupational role, (ii) knowledge of the occupational role of the collaboration partners, (iii) latent role distance, (iv) role-taking, and (v) object-oriented role coordination/role-making.

In its generic form, our model allows for the systematic consideration of collaboration between workers from the same as well as different occupational fields; thus, it is possible to develop tasks and assessment scenarios that integrate a wide vari-

ety of occupational actors within a collaborative constellation. The difference lies in the nature of the merged activity systems with their respective different normative frameworks of requirements, each shaped by different occupational and professional norms, as well as in the resulting restrictions and freedoms of action. Furthermore, in its present form our model allows us to take into account occupation-dependent relationships between requirements of socially competent behavior and, for example, factual knowledge on both the object and the role of other occupations (e.g., sales and services vs. social and health care; see Seeber & Wittmann, 2017). Finally, the model lends itself to varying forms of technological implementation for instructional or diagnostic purposes, such as video-based enactments of collaborative situations or serious games (e.g., Wittmann et al. forthcoming).

Since we suggest a hierarchical relationship between the concepts proposed for the purpose of diagnostics, this hierarchy can also be used as a heuristic for the difficulty of assessment tasks. In this way, an *a priori* assignment can be taken into account in the designing of tasks at varying levels of demand and may improve the interpretability of test results. The assessment designer could also decide whether to integrate prompts for several role-related requirements within a task[4] or only one per task in order to analyze a person's COCC in a differentiated manner (see Embretson, 1998; Hartig, 2008).

In order to pursue related research efforts, the model presented in this article needs to be operationalized. For a standardized assessment, such as a situational judgement test (e.g., Abele, 2018; Kaspar et al., 2016; Rausch, 2017; Ștefănică et al., 2017), operationalizing COCC involves relatively great effort because it requires the assessment designer to understand the occupational role of the collaboration partners to be depicted in the instrument within an activity system. Nevertheless, we argue that it is possible to operationalize the model, because activity theory offers valuable indicators for the specification of occupational roles, especially in the context of digital transformation, for instance, by making it possible to analyze changes in rules that emerge in the course of data protection or technological solutions as objects and outcomes. Moreover, it is desirable to transfer the model to a standardized assessment despite the development effort involved, since this enables a higher domain specificity than can be achieved through self-ratings (see Seeber & Wittmann, 2017; Wuttke & Seifried, 2017).

Furthermore, we are aware of a number of limitations that should be taken into account before using the role-theoretical model. First, our role-theoretical model of COCC depends on the existence and clarity of institutionalized differentiation between occupations in the sense of the German notion of *Beruf*, such as through occupational, vocational, and professional norms. This may be a limitation for the generalizability of the model. Second, COCC is cognitive in the narrow sense in our model. However, since cross-occupational collaboration is social in nature, future research should conceptualize the emotional and moral dimensions as well. Because of the closeness of role-theoretical approaches to these dimensions, our model lends itself to that extension. We contend that an extension in the moral dimension is of particular importance in the context of the digital transformation of social areas. Here,

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[4] For example in the form of polytomous items in quantitative assessments.

cross-occupational collaboration involves ethical demands both from the professional tradition of nursing, such as the client's self-determination, the quality of care, or the client's security, and technological standards like data security and data protection. Changing organizational divisions of labor of the kind that arise with (business) process orientation not only require subjects to collaborate in common problem spaces but are also likely to exacerbate requirements for emotion-related role-taking. Third, it also remains to be tested whether the hierarchy of the role-related aspects is empirically tractable. We intend to close this gap in the ongoing research project "Extended Competence Measurement in the Health Sector" (EKGe)[5]. Here, we used our model to operationalize the interprofessional collaboration competence of nursing students in VET, where initial empirical analyses from a pilot study have yielded promising results (Striković et al. forthcoming).

Conclusions

As we have argued, the digital transformation both enables and necessitates cross-occupational collaboration. We thus claim that COCC will need to become a dominant prerequisite for workers if they are to meet this development. This creates the need to promote practitioners' individual prerequisites for effective cross-occupational collaboration. By emphasizing stronger reflection on occupational roles in particular, the role-theoretical model presented here represents an integrative theoretical basis for addressing this requirement in VET and conducting empirical studies to test, further develop, and revise the framework of COCC.

Appendix

Table 3 Synoptic comparison of the Helsinki school of CHAT and structural symbolic interactionism

	Helsinki school of CHAT	Structural symbolic interactionism
Epistemological premises	Social change inevitable	Social change possible; sufficient continuity in social life
Focus of ontology	Activity system	Interrelation of person and social structure, the latter having ontological priority
Added value for modeling COCC	Object-orientation	Role-theoretical concepts

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Availability of Data and Material Not applicable.

Code Availability Not applicable.

Declarations

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