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What Research through Art can bring to CSCW: exploring ambiguous futures of work

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Abstract: As work is shifting and changing, we, CSCW researchers, must consider our role in creating work futures, and what experiences we want to produce through technology design. What qualities are important to consider about the human experience when designing work technologies for the future? Exploring the potentials of artistic practices for epistemological inquiry, we demonstrate Research through Art as a novel futuring approach for CSCW research, leveraging the power of artistic practice for exploring questions of human experience. We engaged with young artists who created art pieces that manifested their hopes, intuitions, and anxieties on the *future of work*. Our analytical inquiry of these artistic practices allowed us to explore what different futures might be imaginable and what might these futures feel like. We find that futuring entails engaging with ambiguities, which can be a productive resource for design. We identified the ambiguities of time, purpose, body, identity, and agency as foundational for the imaginaries produced by the artists. By intersecting the ambiguities, we can begin to systematically frame novel design questions for CSCW technologies of the future by conceptualizing these ambiguities as multifinalities – single points from which many possibilities emerge.

Keywords: future of work; Research through Art; multifinality; ambiguity; design; futuring

1 Introduction

“I don’t think it’s scary if you work all your life, if you enjoy it, and it’s something that isn’t stressful, and you can take breaks when

you want, and it’s not something you are captured in. [If] it’s not something that you really need because it’s something that you want to do. So it’s like you’re free.” (artist interview, December 2022)

Traditional CSCW research is concerned with understanding current work practices with the aim of designing new technologies supporting these practices.^{1,2} By implementing new technologies, organizational members transform the nature of the workplace,¹ enabling some activities while constraining others. Thus, new cooperative technologies create new technological futures for work. However, technological futures are not easily predictable, and CSCW research has shown that to fully understand how new technologies impact work practices, we need access to observe how practitioners adapt and transform their work practices in relation to new technologies over time. As work is shifting towards flexible employment, platform economies, and hybrid work,^{3–8} it is worth asking whose futures are being made, who gets to decide, and how these changes impact our lived experiences. What is a future of work where the meta-verse is a routine workplace, or where bossware⁹ becomes an expected norm?

To explore such questions, traditional CSCW approaches are inadequate, since they are focused on what is currently here, rather than what will or should exist in the future. To address this concern, contemporary CSCW should explore and experiment with new methodological approaches which challenge assumptions and ideas while pushing the design of CSCW technologies into the future. One such contemporary methodological approach is to explore the potential of cross-fertilization between artistic practices and CSCW design as Research through Art. We propose Research through Art as an epistemic form of inquiry for CSCW research, which is not about making artists design technologies,¹⁰ nor is it about Research through Design.¹¹ Instead, engaging with Research through Art as an approach to CSCW futuring is about broadening our understanding of a qualitative phenomenon or concept – in our case *the future of work*.

Research through Art as an approach to CSCW research complements existing efforts of futuring through speculative and critical design.^{12,13} Speculative and critical design research has introduced many productive approaches for thinking about and exploring technological futures as a

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way to critique current technologies and to inform future technology design. Yet as Haraway¹⁴ and Suchman¹⁵ remind us, knowledge is always made “from somewhere” in situated practice. Futures are also imagined and made within the same geography of knowing. Louise Amoore¹⁶ calls the attempt to use imagined futures to inform decisions “a politics of possibility,” warning that no matter how creatively we might want to imagine the future, it is always defined by the patterns of our past. Thus, futuring as a practice of informing design risks being fraught with problematic past assumptions and taken-for-granted knowledge. We attempt to push forward CSCW’s traditional focus on existing work practices, emphasizing exploration of the qualitative and ambiguous human experience of work to augment the practical foundations of CSCW, so that we can embrace ambiguities in the creation of work futures as the ground for technology design. We do this by utilizing artistic practices as the epistemological approach, engaging with artists on the topic of work.

We asked a group of young-adult artists to explore *the future of work* through their artistic practice, creating art pieces that allowed them to manifest their hopes, intuitions, and anxieties on this subject. We used the artists’ artistic practices, meaning the art pieces they produced as the result of deeply engaging with the topic, in combination with the articulations about the art pieces by the artists themselves, to identify which epistemological directions they volunteer for CSCW as exploration mechanisms for the future of work. Analyzing the artistic practices, we ask: What qualities are important to consider about the human experience in the future of work?

The result of our analytical inquiry includes not what singular future someone might be able to imagine, but rather *what possibilities of different futures might be imaginable and what might they feel like*. Imagining futures is a process necessarily fraught with ambiguities. However, in line with Gaver, we found that such ambiguities can become an important resource in design.¹⁷ We identified five main ambiguities (time, purpose, body, identity, and agency) that underpinned the imaginaries the artists produced as a collective. We view each ambiguity as a continuum of potential futures, and by intersecting the ambiguities into a mesh, we can pull certain stories about the qualities of human experiences apart from others, following the threads similarly to when Donna Haraway pulled strings out of a tangled ball of yarn as a metaphor for unpacking the multiplicity of meanings that comprise modern culture.¹⁸ We argue that examining artistic practices as a methodological approach allows us to systematically frame novel design questions for CSCW technologies of the future. Strings of questions, pulled from

the mesh, can be understood as multifinalities (single points from which many possible futures can emerge),¹⁹ allowing ambiguities to entwine and enable structured explorations of a new type of design space for the future of work.

This paper makes two primary contributions. First, we demonstrate the value in engaging an alternative approach to futuring in contemporary CSCW research, that seeks to evoke hopes and anxieties by taking artistic practice seriously as an epistemic process. Second, we offer a discussion of five key ambiguities of human experience in the future of work, and demonstrate a way for designers of CSCW technologies to structure inquiry on this topic through the exploration of these ambiguities as multifinalities. In this way, we produce a mesh of intersecting agenda to explore continuums of ambiguities, challenging and opening up the design space of the future of work.

In the remainder of the paper, we first situate our work within contemporary CSCW research, and describe how we are extending the CSCW agenda. We then introduce our method – particularly how we engaged with and analysed artistic explorations. We follow Gaver et al.²⁰ presenting our findings as annotated portfolios, demonstrating five types of ambiguity pertaining to the human experience of work. Finally, using the example of a recent case study of physiotherapists practicing remote medicine by Sergeeva,²¹ we demonstrate how our results can be used to extend existing CSCW research. We discuss how these ambiguities are intertwined and connected – and how paying attention to these can create new possibilities for design explorations for future technologies.

2 Situating human experience in contemporary CSCW research

We are making three agential shifts in CSCW by identifying and exploring qualities of human experience in contemporary CSCW research. The first shift is from focusing on the mechanics of cooperative work towards focusing on the human experience of work. The second shift is from a focus on understanding current cooperative practices towards focusing on futuring. The third shift is from considering merit in CSCW as centering efficiency and productivity, towards recognizing merit in exploring ambiguities. We will visit each shift in turn below.

2.1 From mechanics of cooperative work to human experience

CSCW research has traditionally focused on identifying important concepts about cooperative work, which can

help inform the design of cooperative technologies.^{1,2} This research has centered around a detailed understanding of different and complex work practices, as conceptual work is a long-term CSCW research endeavor. Such concept-oriented focus in CSCW research has most often been developed through in-depth ethnographic studies of work practices^{22,23} producing insights about aspects of cooperative work such as awareness,²⁴ coordination,²⁵ and knowledge.²⁶ The work most often takes its starting point in the fundamental difference between work and articulation work, and then identifies different ways in which practitioners manage to align, coordinate, and interrelate their complex work practices using technologies. In this way, CSCW research centers around the basic understandings of what work entails by zooming in on practices, artefacts, activities, and technologies.^{27–29}

While CSCW has developed deep theoretical knowledge about the mechanics of cooperative work, there is a lack of research that zooms out to consider work as part of a broader human affective experience. Exploring which qualities of the human experience of work we should consider when we design CSCW technologies is rarely the main focus of CSCW studies, however, the existential experience of work has been included as a factor in some contemporary CSCW research. For example, research on global work has shown that “being a software developer” means something different depending on where in the world this work is performed, even if the mechanics and goals of the job are very similar.^{30–33} The interest in human experience in CSCW has thus begun to enter the concerns that CSCW researchers have when designing technologies, since clearly specific design might produce barriers which are counter-productive to the nature of the work.^{34,35} Further, CSCW reveals how the actual detailed work required to get work done is often invisible from afar, leading to the risk of dehumanization.^{36,37} These experiential aspects of work deserve further study in the field, and we contribute here an exploration focused specifically on this topic.

If we are to fully create cooperative technologies spanning boundaries and facilitating cooperation across the global north and the global south, we have to include the holistic human experience of work into the mix. However, until now only little CSCW research considers or reflects upon what working feels like as part of daily life. Thus, the first shift we suggest is to expand the scope of CSCW inquiry beyond the cooperative mechanics of work to include focus on the human experience of work.

2.2 From contemporary practice towards futuring

Besides the shift towards human experiences, the authors also take another turn in this research: namely to move away from current work practices as the main concern, towards future work practices as central for our work. In CSCW, the majority of research exploring the conceptual nature of cooperative work is done through ethnographic studies or workplace studies. These approaches have been demonstrated to be excellent vehicles allowing for detailed ethnographic description which serves as the background for theoretical conceptualization. However, we are shifting our focus beyond the current work as it is accomplished within organizations today, and looking toward the potential futures of work. The systematic approach to exploring alternate futures is commonly referred to as *futuring*.

Technologists and researchers have embraced some well-established futuring practices such as design fiction^{38–40} and speculative design.⁴¹ There are also examples of futuring methods with connections to traditional CSCW research methods, such as fictional ethnography,⁴² ethnographic experiential futures,^{43,44} participatory speculative design,⁴⁵ and participatory futuring.⁴⁶ These have been shown to be interesting and useful design-oriented methods, using the design of fictional or speculative artifacts from a narrative imagined future as the primary tool of investigation.

Our attempt in this paper is complementary to these design approaches. An important difference is our interest in finding ways to do futuring which are *a priori*: as a way to inform meaningful design intentions *before* design. All design inquiries are iterative, however design activities can still have different connotations and dedications, such as the work on use-before-use, design-before-use, design-after-use, etc. by Björgvinsson et al.⁴⁷ Our interest is to provide a way for CSCW designers to take a step back and engage in epistemological futuring inquiry prior to design. This ensures that we keep the field of concern productively open, rather than risk closing it down prematurely and jumping straight to solutions. By embracing the expansiveness of the human experience more deeply when we design for the future, we might better avoid the pitfall of heedlessly using the same tools to solve a problem that created the problem in the first place. When conceptualizing and navigating this expansive futuring practice for CSCW, we follow the threads of multifinalities.

The concept of *multifinality* was introduced by Bertalanffy in General System Theory¹⁹ to describe how one event

may lead to multiple outcomes (in contrast to *equipfinality*, where multiple events may lead to the same outcome.) The notion of multifinality was appropriated in social psychology by Kruglanski⁴⁸ to describe motivated cognition, where “a single behavior is performed in the service of multiple goals”.⁴⁹ This term was also used by communications scholar Sillars⁵⁰ to describe how the same communication strategy may result in different consequences depending on the context in the relationship between parties. We introduce the concept of multifinality to CSCW for the ways in which we think about futuring practices. Multifinalities allow us to acknowledge that many different futures can be designed based on what we know right now. We find the concept of multifinality useful in our futuring practice for describing prompts that have the power to spawn many possible futures.

We can imagine an infinite number of futures from our starting points in the present, and it can be a daunting challenge to decide which of these future imaginings will matter. As such, we turn to the work of Elsdén et al.⁵¹ and their focus on consequentiality in their futuring approach of speculative enactments. When faced with an overwhelming multiplicity of possible futures, they argue it is necessary to ground these futures with consequences in the present, through material or social engagement, to maintain the usefulness of the futuring practice. Without consequentiality, futures can become untethered, abstract, and meaningless. While Elsdén et al. work to generate circumstances where elements matter to their participants as they imagine different futures, our approach focused on embedding the idea of the future of work into artistic process, where the creation of an art piece as a way of imagining a future in itself becomes consequential.

Thus, our contemporary CSCW approach is not only to focus on human experience (rather than mechanics of cooperative work), we also focus on how to produce multifinalities as part of futuring (before-design and beyond ethnographic studies). The third shift we enact concerns what counts as meritorious in design for cooperative work.

2.3 From valuing efficiency to valuing ambiguity

Focusing on the mechanics of cooperative work using ethnographic studies most often results in design-oriented interests, developing and defining merit in CSCW technologies as centering the aim of reducing efforts of articulation work. When we shift our focus towards human experience and futuring, we also need to shift our intention and understanding of merit in design. We therefore shift our focus from reducing the efforts of articulation work (and thus

achieving efficiency and productivity) as meritorious ambitions, to recognizing the value of ambiguities in defining the ambitions for CSCW design spaces.

Researchers agree that dedication to ambiguity when futuring is a cornerstone for such ventures. There is inherent ambiguity in imagining consequential futures, but which ambiguities become prominent and how we might employ them can be an important insight. The advantages of ambiguity have been well documented in research. The merit of allowing “uncertainty” to exist outside of neatly quantifiable scientific control was eloquently argued by Gaver et al.⁵² in their use of cultural probes in the early 2000s. Moreover, Gaver et al.¹⁷ identified three types of ambiguity in human-computer interaction (information, context, and relationship) and detailed tactics for using these types of ambiguity in HCI design. Highlighting the persistence of the tendency to over-rationalize qualitative ambiguities in research, in 2016 Blythe and Encinas⁵³ argued for the value of ambiguity, asserting that much futuring research has the pitfall of being “scientistic,” meaning that it is artificially and needlessly construed as scientific rather than left to stand on its own genuine merits.

Leveraging ambiguity is also a strategy for rejecting solutionism in design work,⁵⁴ embracing the absurdist potential of fictions, unuseless artifacts, and silly design to explore questions. This strategy is also explored in counterfunctional design such as the Zoom Obscura project by Elsdén et al.,¹⁰ which subverted the function of video conferencing software to explore themes of agency and personal privacy. In another example of applying ambiguity in research, Sanches et al.⁵⁵ illustrated how scaffolding ambiguities during an intentionally open phase of a design process can lead to a richness of interpretations and new practices in a given field (in their case, biodata tracking). This hearkens back to the argument by Sengers and Gaver⁵⁶ for strategically encouraging and embracing flexibility and ambiguity in the form of multiple and even contradictory user interpretations in the design and evaluation of HCI systems. A recent example of this strategy is the Beatfield musical device by Masu et al.⁵⁷ and subsequent case study by Morreale et al.⁵⁸ exploring appropriation in open-meaning interaction design. In another recent study, Gatehouse and Chatting interrogated the benefits and challenges of grappling with ambiguity via inarticulacy while hacking network technologies in a Research through Design practice.⁵⁹

While ambiguity has been thoroughly explored as a research and design resource in HCI more broadly, as shown in the examples above, CSCW research has remained largely concerned with mitigating or resolving ambiguities: answering questions, describing phenomena, and solving

problems in the domain of work and cooperation. These goals have obvious value, however we look to extend the scope of the knowledge informing such practical CSCW research with the inclusion of the unquantifiable experiential parts of work. Qualitative human experience, which is important to understand in the domain of work and cooperation, is not a problem to be solved but rather a dimension to be explored. We look to Haraway, and argue that “staying with the trouble”⁶⁰ and engaging with these open-ended ambiguities to construct a more nuanced awareness of the existential aspects of work can have benefits for research and design in CSCW.

Following the work on ambiguity as a feature of futuring, while combining the interest in work and work practices from CSCW, our approach can be considered as artistic futuring towards extending current conceptual research in CSCW concerning work, with the aim of producing a set of questions and tactics which CSCW researchers need to explore if we are to take active part in developing a future of work which might look different than the past of work.

3 Methods

We incorporated Research through Art alongside standard CSCW research methodologies, and below we describe the empirical context for our study, detail our data sources and data collection methods, and introduce our data analysis process and presentation of the data in the form of annotated portfolios. We conclude the section with an introduction to the art pieces featured in this paper, as well as a positionality and limitations statement.

3.1 Research through Art

In order to understand what qualities are important to consider about the human experience in constructing the futures of work in contemporary CSCW, we engaged with artists as a means to explore what different kinds of futures might *feel* like. Thus, we utilized artistic practices as a means to learn about human experience as a quality of work. Not all research involving artists or the arts is necessarily *Research through Art* as we are defining it. There are multiple examples of research encompassing co-design with artists, design of systems and products for use by artists, and interaction design for art-related experiences such as museums or theatrical events. When we refer to Research through Art, however, it is not design research, and is not simply any research related to art. Instead, we propose Research through Art as artistic approaches, methods, and processes (or *artistic practices*) used as epistemic forms of conceptual inquiry. We collected data through more traditional approaches such as observations and interviews to capture the details and nuances of the artistic practices.

Artists are an especially relevant group for researchers to collaborate with on subjects such as *human experience*, because skillful artistic practice entails divergent deep thinking about existential topics. This specific expertise afforded by artists offers considerable insights, and is currently under-utilized in CSCW research. There is precedent

for productive CSCW collaborations with other non-CSCW designers and participants (many examples of this exist). Research through Art is another instance in the tradition of cross-disciplinary collaboration, however, we emphasize that if we are specifically seeking to leverage artistic practice as a legitimate form of inquiry, it is important to recognize artistic practice as a legitimate field of expertise and to work with qualified artists. This may include professional artists as well as people deeply engaged in the serious study of artistic practice, as presented in this study.

Artistic practices have been shown to contribute knowledge about concepts and phenomena of inquiry for tech design. For example, in the field of interactive technology design, Sarah Fdili Alaoui⁶¹ demonstrates knowledge-making through iterative choreographic dance practice with the use of technology mapping live biometric data to outputs of sound and video, questioning the relationships between technology, art, and human experience. Jones et al.⁶² used performance art to investigate how algorithmic systems fail to understand or account for human bodies, by studying ways that artists interpreted performance instructions generated by GPT-3. The results of their research describe the ways that artists make sense of and relate to algorithmic systems. Holmer et al.⁶³ focus on the conceptual understanding of participatory design, by studying an instance of environmentalist participatory art at a festival, identifying the strategies used by the artists to engage participants, and observing the ways that participation was encouraged and inhibited by the context of the art interventions. They apply this knowledge to case studies in HCI to inform the use of participatory strategies in future research. Kang et al.⁶⁴ applied theories of improvisation from art and music to extend methodologies for design, identifying the concept of “intermodulation” as a tool of inquiry across disciplines. Finally, in the Zoom Obscura project, Elsdén et al.¹⁰ engaged with artists using counterfunctional design to explore and challenge the norms and culture permeating the use of videoconferencing technology.

We complement existing research on art interventions and design for artists in CSCW by contributing research *with* artists – proposing Research through Art as a methodological approach which is well suited to exploring the experiential and existential aspects of work in contemporary CSCW research. Thus, we extend the CSCW toolkit with the inclusion of epistemic artistic research as a futuring practice. We do this with the aim of including human experience into CSCW modes of inquiry as complementary to studies of the mechanics of cooperative work.

3.2 The empirical setting

The data for this study comes from research activities in the fall of 2022 with a group of young adult artists. The project engaged with a 2-month long art school course at BGK ArtLab in Denmark, providing the theme of *the future of work* as the foundation for the course. The artists in the course worked with the instructors to explore ideas around the topic. As the major output from the course, the artists produced art pieces for a themed public exhibition at the arts and culture organization that was part of organizing the course. In total 13 students showed art about the future of work at their exhibition, and 5 of those students volunteered to participate in interviews. Our research involvement in this process included planning sessions with the facilitators of the student art exhibition, visiting some of the artists’ work sessions during the course to talk with them and to observe their process, attending the opening night of their exhibition, and then conducting group and individual interviews with a subset of five artists.

We extended the invitation to interview with us to the entire class (an ask for extra time from the artists) which we relayed through the instructor of the course, and five (aged 17–24, three women, two men) agreed to participate, as well as granting us permission to use their words and photos of their work here. All of the participants intended to make art in their future lives, but not all were convinced that they would have a future career exclusively in the fine arts, with some describing other interests and possibilities as well. All of our participants had some kind of work or volunteer experience at the time of the interviews, describing retail jobs in grocery and hardware stores, service jobs in bars and restaurants, farming and gardening, cleaning, being an assistant sports coach, and working in a mini golf park. The younger participants predictably had less time and experience working in jobs, but the older ones described as many as six years of work experience in various settings. However, all of the participants we interviewed were still relatively unconcerned with the traditional conventions of *how things are supposed to be* and therefore in a unique position to *freely imagine other possible futures and ways of working and living*.

The artists engaged *the future of work* together through discussion and artistic practice in regular sessions in their art school course for two months. They produced art pieces about work in many forms of media, including paintings, drawings, mixed media works, sculptures, videos, animations, digital art, and written words. Through their art and interviews, the artists expressed complex and thoughtful ideas about the future of work. They articulated hopes and desires while also expressing fears, anxieties, and doubts about whether the futures they wanted would be possible or achievable.

3.3 Data sources and collection

The data set for this study includes photos and memo notes from planning meetings and researcher visits to the artists' work sessions, photos and video of the finished art pieces and the exhibit space, written

statements from some of the artists that accompanied their art pieces (not all of the artists chose to exhibit written statements with their pieces), and recorded semi-structured group and individual interviews with five participants. As we have the richest data about the art works created by the interview participants, these are the works we present in our results in this paper; however, the qualitative analysis included all of the art in the exhibition. The data sources and participant information are detailed in Table 1, and this subset of five art pieces are introduced in Figure 1 and described below in 3.5. The methods used in this research adhere to the ethical guidelines of the University of Copenhagen. All photos published here were taken by the authors, at the public exhibition, and are shared, including the titles of the works, with the permission of the artists.

The interviews took place in one day, in the exhibit space allowing participants to directly see and reference the finished art pieces as part of the conversation. All interviews were conducted in English. The group discussion was 30 min long, and prompted each artist to briefly introduce their pieces, followed by discussion of their creation processes, the intended meanings behind the art, what they thought was important for others to know about it, and making comparisons and connections. The artists had been working together on site for the duration of the course, they were already familiar with each other's work, and the researcher had also already attended the exhibition and had also interacted with the artists previously. This allowed us to keep the introductions to the pieces brief and spend most of the time in discussion. The individual interviews were 10–15 min long (being longer with participants with more extensive work histories) and focused specifically on the topic of work and its futures. The art pieces were sometimes mentioned by the interviewer or participant as a point of reference or explanatory device in the individual interviews, to illustrate a statement, expression, or complex concept, but unlike the group interview, the art pieces were not the main focus of these discussions. The individual interview protocol contained questions about their past and current experiences with work, their fantasies and hopes for the

Table 1: Data sources.

Research activity	Data type	Description
Project planning	Notes, emails, slideshow	Researcher 2 and BGK ArtLab
Work session visit 1	Notes, photos	Researcher 2
Work session visit 2	Notes, photos	Researcher 2
Work session visit 3	Notes, photos	Researcher 1
Art exhibit	Photos, videos	<i>Fremtidens Dominans</i> sculpture by P1
Art exhibit	Photos	<i>Fremtidens Dominans</i> statement card by P1
Art exhibit	Photos, videos	<i>The Future Homunculus</i> sculpture by P2
Art exhibit	Photos, videos	<i>The 4 Levels of Freedom</i> sculpture by P3
Art exhibit	Photos	<i>The 4 Levels of Freedom</i> artist statement by P3
Art exhibit	Photos, videos	<i>Furry Supremacy</i> digital art prints by P4
Art exhibit	Photos, videos	<i>Proces</i> video by P5
Art exhibit	Photos	<i>Proces</i> artist statement by P5
Art exhibit	Photos, videos	Art pieces and statements by 8 other artists
Group interview	Audio, notes	P1, P2, P3, P4, and P5
Individual interview	Audio, notes	P1, age 17
Individual interview	Audio, notes	P2, age 17
Individual interview	Audio, notes	P3, age 24
Individual interview	Audio, notes	P4, age 21
Individual interview	Audio, notes	P5, age 18



Figure 1: The five art pieces by our interview participants. (1) *The 4 Levels of Freedom* four-part sculpture by P3. (2) *Fremtidens Dominans* sculpture and card by P1. (3) *The Future Homunculus* sculpture by P2. (4) *Furry Supremacy* digital art prints by P4. (5) Still shot of *Proces* video by P5.

future of work, their fears about work in the future, and what they expect or want their own future lives to look like both in and outside of work. These were not questions about what tasks they will do at work, rather they were questions about *what it could be like to be a working person*. We concluded with open invitations to share any other thoughts or information they deemed relevant.

By the time of the interviews, the artists had been working together and thinking on this topic for an extended period of time (two months) and had well-developed thoughts and feelings on the subject. They held complex opinions and ideas about the topic and could imagine many futures. Art affords a freedom from the constraints of what is actionable, literal, or realistic, and this means that there is room to unpack complicated feelings and concepts without the mandate of identifying a problem and devising a solution in the same conversation. The artists understood that exploring the topic and being expressive about it was the entirety of what they were there to do. The researcher verbally set the expectations for the interviews with the participants by emphasizing that there were no good or bad,

right or wrong answers, and that our interest was to document their thoughts, ideas, experiences, and opinions on the subject which they had explored quite deeply through their artistic processes. The insights that these artists shared with us in their art and their words are not limited to a particular job or type of work, but instead extend the conversations about the basic nature of future jobs or workspaces.

The audio recordings of interviews were transcribed with Otter.ai software and then manually corrected by the interviewing researcher. The written artist statements were translated from Danish to English with Google Translate, and all translations were checked and corrected by a native Danish speaker.

3.4 Data analysis and annotated portfolios

All of the data were uploaded into MaxQDA qualitative data analysis software, and the data originating from the artists (photos and descriptions of art, statements, interview transcriptions) were coded with an initial set of 15 *a priori* codes developed to capture

positive/neutral/negative statements, descriptions of work experiences, and particular values that appeared prominent in the exhibition and interviews. Examples of codes were: enjoyment, security, respect, and descriptions of physicality such as body and work environment. We initiated our analytical process with an open-ended approach focusing on identifying experiences, imaginaries, wants and needs as expressed across the data material. We added inductive codes to the codebook while analyzing the data, e.g. we annotated all mentions of money, time, and additional values and attitudes. The next step in the data analysis included inductive refinement and reorganization of codes into sub-codes, resulting in a final codebook of 36 unique codes and subcodes. The remaining uncoded data (from project planning and researcher notes) was organized and referred back to for context in data analysis and researcher discussions. Through thematic analysis and iterative analytical discussions, we noticed a pattern of contradictions and ambiguities that were contained within the overarching themes in the dataset. Thus our analysis of the artistic practices unveiled the qualities of human experience as shaped by dimensions of ambiguity. Reconsidering and comparing the dimensions, we ultimately organized them under the headings of *time*, *purpose*, *body*, *identity*, and *agency*, which we describe in detail in the next section.

The dimensions of ambiguity were then combined with the photos and the words of the artists and organized in virtual whiteboards on Miro.com to create annotated portfolios²⁰ to document and present the results of the research. Annotated portfolios are a recognized format used by artists and designers for presenting, critiquing, and documenting the outputs of their creative work, and have been established as useful in HCI research.^{43,65–69} Rather than a prescriptive or “scientific” presentation, the annotated portfolio captures artifacts, ideas, and the relationships between them, in a way that leaves space for discussion and expansion. We are extending Gaver’s version of the annotated portfolio by documenting not only the artifacts and artists’ words, but also the input of the researchers with the inclusion of the themes from our qualitative analysis. By making such a combination, we insist on the cooperative engagement between artists and researchers to be part of the productive nature of Research through Art in contemporary CSCW research. The open-ended and conceptual aspects of the annotated portfolio concept make it an appropriate format for capturing the results of our collaborative artistic futuring process. The negotiation, discussion, and reflection would not have existed about the future of work, if we as researchers had not collaborated with the art course organizers and young artists. It was only through these interactions that the qualities of human experience were identified as dimensions of ambiguities for the future of work.

3.5 Art pieces by the interview participants

The art works created by our interview participants are detailed in Figure 1. We introduce them here to add context to our findings in the next section.

1. *The 4 Levels of Freedom* is a four-part sculpture created by P3. It presents four roughly life-sized head-and-shoulders of a worker in four alternate futures, each differing based on how much of the future worker’s life is devoted to – and consumed by – their job. In a one-page written statement accompanying the set of sculptures, the artist has introduced the set with this text: “... a work in four parts, each of which represents a possible future. Each future tells the story of how humanity is willing to sell itself to achieve

something greater. Whether it is materialistic ideals or prestige. We are all willing to sell our time for something. Time is the only thing we own that cannot be taken from us.” [Translated from Danish] Each part of the set is named: *Free* (right), *For Rent* (left), *Owned* (center bottom), and *Sold* (center top).

2. *Fremtidens Dominans* (“Future Dominance” in English) is a sculpture and accompanying postcard by P1. The sculpture features a tall tower in the middle of an abstract cityscape made of black painted blocks. The tower has a representation of smoke coming out of the top of it, and wires connecting it to each block in the cityscape, representing a panoptic surveillance state. The card is a greyscale image of an urban scene with tall buildings and vehicles, with red letters superimposed that read: “FUTURE DOMINANCE. The dominant future of the so-called rat race. The dominant monopoly that controls everything with a pulse, a metropolis that cannot be tamed by the individuals. Dominance over the animal world. A director that dominates regardless of the conditions. A hidden dictatorial system. An inflation of corruption.” [translated from Danish]
3. *The Future Homunculus* sculpture by P2 is approximately the size of a small child and stands on the floor. It has a very large head with exaggerated ears and enormous compound eyes, atop a small body. The hands are disproportionately large and have only two big fingers each, and the feet are shaped like boots with no toes. The artist’s choice of the word “homunculus” in the title of the piece evokes the historic meaning of the word as a representation of a small person, as well as the use of the word as part of the famous “cortical homunculus” illustrations of a human with the body parts shrunk or enlarged to represent how much area of the brain is dedicated to each part. This *Future Homunculus* has its body parts distorted according to the artist’s speculation about how our patterns of technology use could affect our bodies in the future.
4. *Furry Supremacy* is a series of four digital art prints created by P4 using 3D modeling software. Each print shows a greyscale head and neck of a different fantastical creature, against a black background. The creatures have features that evoke ambiguous animal, alien, and even mystical aesthetics. They are offered as possible digital avatars, ways to present ourselves in a future digital world that allows for an expanded idea of who – and what – we could be in a work environment.
5. *Proces* is a video by P5, which shows the artist’s hands using scissors to cut apart a large piece of reddish-brown fabric, and then sewing the fabric back together into one piece along two random edges with thick black thread. The video does not contain sound, and it is set to loop, with the gentle, methodical cutting apart and stitching together of the fabric never stopping or resulting in an identifiable finished product. The artist included a written statement in the exhibition, which says: “The work shows an endless process without an end point. The fabric that is sewn and cut again and again shows the aim or product sought for. In today’s society it is growth that is the most valuable factor in success. You will see achievements and results are expected, rather than immersion and curiosity. What is our goal? In the future, growth has been abolished, and work may still have an impact on society, but it primarily is meaningful to the person who does the work. The process will be in focus and those things that have value will be what drives passion.” [Translated from Danish]

3.6 Positionality and limitations

The first author has a background which includes university level arts education as a student and teacher, as well career experience in the fine arts; the other authors also draw from expertise in CSCW, education, and art history. This study occurred in Denmark, and consequently the researchers and participants all come from a place of western privilege, and our results should be viewed in that context.

As with all qualitative research, our analysis of the data cannot be divorced from our positionality as adult researchers rather than peers of the participants. The inclusion of the artists' own commentary on their peers' work (in the interview data) is one attempt to expand the scope of viewpoints captured in our data set. Additionally, all interpretations of art are inevitably subjective, with no singular "correct" interpretation being possible. Without going too far down the rabbit hole of art criticism and theory, we have attempted to embrace an open-minded multiplicity of interpretations and viewpoints in our analysis, as well as in our presentation of these art works and the other expressions of the artists in this study. Like all instances of artistic interpretation and qualitative research, our results are not exhaustive.

Focused artistic practice and arts education are well placed for exploring existential qualitative human experiences, however our methods are not necessarily suited to the practical investigation of specific jobs or work practices, and must be applied to the right questions. The dimensions of ambiguity we offer can be used to interrogate the existential aspects of any field of work (we demonstrate with the case of physiotherapy in 5.1) because these ambiguities are ultimately about people, not about tasks. For example, it would not make sense to use art to analyze the communication patterns in a hospital emergency room (and there already exist well-developed CSCW methods for this question) but it does make sense to use artistic practice to capture the complicated human experience of *what it feels like to be an emergency room nurse*. There are many possibilities for future Research through Art studies to extend contemporary CSCW, but these methods must be applied to appropriate research questions.

Finally, this study is limited to the imaginaries of participant artists who are very early in their work-lives with limited experience in specific careers, and we may have found different results with an older or differently-experienced group of participants. We contend that young adults should be included in discussions of possible futures, which they have an undeniable stake in as people who will be spending the most time in said future. However, our focus on young adults in this particular study should not be taken to argue for the exclusion of other generational cohorts, and we encourage future studies with additional groups. The authors are also currently engaged in Research through Art with established professional artists, which will be reported on in our own future work. We contribute the voices of the young people in this study as one part of the broader ongoing discussion about the future of work in CSCW.

4 Results: qualities of human experience in the future of work

There are few certainties in imagining and speculating about futures, and the artists in our study explored their hopes and their fears through artistic expression. In our analysis, we found that the knowledge about human

experiences of work that the artists contributed was characterized by contradictions and complexities, and we recognized that the defining theme of these qualities was their embedded ambiguity.

We identified five primary dimensions of ambiguity about imagined futures that productively capture considerations of work: *time*, *purpose*, *body*, *identity*, and *agency*. In this section, we introduce the insights developed about each of these ambiguities as qualities to consider for the future of work, indexed in Table 2. To illustrate these five dimensions we assembled annotated portfolios detailing art pieces created by our participants on the topic of the future of work, along with text from their artist statements and interviews (shown inside the boxes in the figures), and research findings from the thematic analysis of these data. In this way we are able to capture complex considerations about the future by treating artistic expression as a legitimate epistemic process of exploration, in combination with more traditional qualitative approaches.

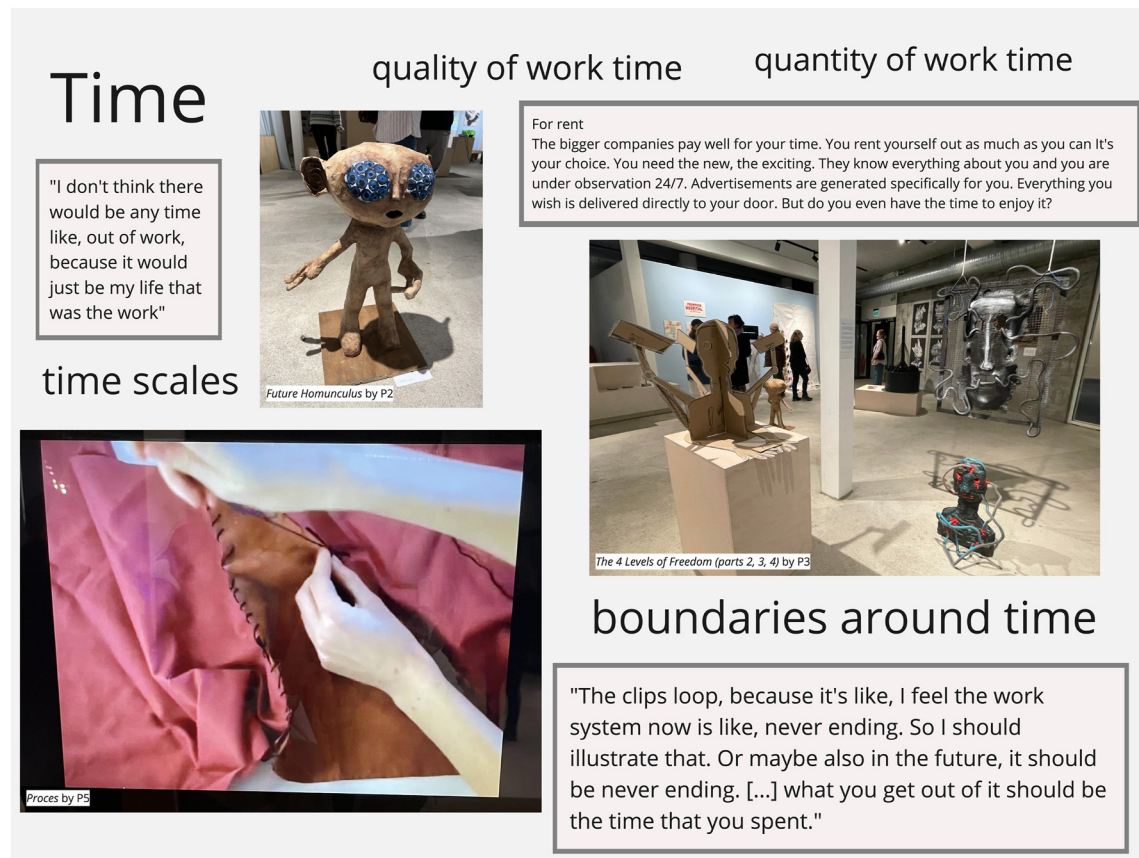
4.1 The ambiguity of time

Considerations of time in the future of work were a major theme for the artists. In addition to expressing desires about the quantity of time they wanted to spend working, they also considered quality: thoughts about the value of their time and what it is worth spending on. They explored the boundaries (or lack thereof) that we place around work time, and the impacts of work across time scales from immediate to long term to infinite. An annotated portfolio containing some of the images and words related to time is in Figure 2.

Unsurprisingly, there was no consensus among the artists about the ideal amount of time to spend on work. Some described a desire to deprioritize work in favor of more time for what they thought of as truly important. In his four-part sculpture (pictured on the right side of Figure 2) P3 depicts a worker living in alternate futures depending on the amount of time they spend at work, ranging from part time to 24/7. He described the worker as having more time for a healthy social and family life while working part time, and shows them progressively losing their humanity and becoming a machine as they are more permanently absorbed into the work. Voicing his own goals, he said, "I'm going for the first one, I'm going to work, get my education and then work as little as possible." When asked to describe his biggest fear about work in the future, he said: "That it would be constant and longer hours and mandatory." P5 expressed similar concern about a life dominated by work: "Yeah, but also maybe that I have to give too much of my time away for that [security]. So don't have time for anything else that I want to do." These artists seemed to see

Table 2: Dimensions of ambiguity detailed in Section 4.

Section	Ambiguity	Description
4.1	<i>Time</i>	Quantity, quality, and boundaries around work time, time scales ...
4.2	<i>Purpose</i>	Intrinsic vs. extrinsic purposes, work vs. life purposes ...
4.3	<i>Body</i>	Mental and physical health and ability, boundaries of bodies ...
4.4	<i>Identity</i>	Humanity, presentation, and influence interplay between identities and work ...
4.5	<i>Agency</i>	Power, trust, exploitation, and choices ...

**Figure 2:** An annotated portfolio exploring the ambiguity of time. Clockwise from top left: a quote by P1, *Future Homunculus* sculpture by P2, excerpt of artist statement by P3, *The 4 Levels of Freedom (parts 2, 3, 4)* sculptures by P3, quote by P5, still photo of *Proces* video by P5. All words outside of boxes are researcher insights from thematic analysis.

work as something inevitable and necessary but encroaching on freedom to be. The amount of time they might be required to spend at work was one way this frustration manifested for them.

Others were open to spending more time at work under the right conditions, acknowledging that there can be different kinds of experiences in work. P2 said: "I have heard stories of people who's just working all the time and can not let go of it. [...] But still, it could also be nice if you have the motivation to work all the time, because you liked it as much."

Rather than a straight answer about how much work time is ideal, flexibility was a common wish. P2 elaborated on this further: "I think it would be nice if it depends on what you want to do. If you can feel you need the time to be at home, and maybe focus on other things, then you didn't have to work as much. And maybe in periods when you're motivated for what you're doing at work, you could do a lot more, [...] instead of like, you have to go from nine to five."

Evoking a binary distinction between work and life was a common way to highlight the artificiality of restrictions and pressures that workplaces can create, yet this

distinction in itself was not necessarily always seen as a negative. P3 described how having some time dedicated to work meant he appreciated his time off of work, and it helped him make the most of both. How he valued his time was realized through contrast: “I like working too. I like doing something because there has to be some sort of yin and yang. I tried not working. And then suddenly that art or the creating became sort of my work or there became no breaks, no bad things in it. So it stopped being so interesting at a point. So I like to have something you have to go to, and then something you can enjoy, so that free time is created.”

These notions of flexibility about how much time to spend working are built on an assumption of a clear delineation between work time and non-work time. Some of the artists questioned this assumption entirely, raising the possibility of an experience of time with blurry or even nonexistent boundaries around it. The distinction between working time and non-working time need not be binary at all, according to P1: “I feel like my work would be very open and free. So I don’t think there would be any time out of work, because it would just be my life that was the work.”

In addition to considering the amount of time to be spent working, the artists also identified the quality of that time as a factor for exploration. *Proces*, seen in the bottom left of Figure 2, depicts the artist’s hands cutting fabric and sewing it back together in an endless video loop. There is an element of pointlessness and anxiety in this depiction: it never rests, and we never see the finished result of this labor. However, it also expresses a meditative softness and calmness in the pacing, lighting, and sensuousness of the materials. It balances on an edge between anxiety and self-soothing. This piece led to a discussion about whether it might not always be a bad thing to work without a conclusion, if the process itself is one that you find satisfying or meaningful. The artist, P5, said: “The clips loop, because I feel the work system now is never ending. So I should illustrate that. Or maybe also in the future, it should be never ending. But the goal to be [...] the process of it instead of the money, like what you get out of it should be the time that you spent.”

Time was not only defined by its quality, quantity, and boundaries of use. It was also explored with regard to scale. *The 4 Levels of Freedom* shows the impact of work time choices on an individual, as a more or less immediate consequence. The worker’s decision (or presumed consent) to sell their time to the employer manifests in visible effects on their body and immediate environment, which are felt in the moment, in that worker’s own lifetime. *Future*

Homunculus, by P2, in the top left of Figure 2, is a depiction of a hypothetical future human that has evolved over many generations in adaptation to working habits and tools. This future human has lost some parts we have today due to disuse (such as little fingers and taller height) but its eyes and brain have become much more powerful, an advantageous adaptation over many generations of processing intense sensory input. This sculpture shows an example of a time scale longer than one lifetime, looking many generations into the future. The *Proces* video, with its neverending sewing task which is impossible to finish, where experience can be equal parts empty and generative, grapples with a time scale that could be infinite.

On the surface, *time* may seem like an easily quantifiable thing, but we identify it as a dimension of ambiguity due to the many grey areas the concept of time can contain. For example, when considering time in discussions about work, it is very easy to stay on the well-traveled roads of the optimal number of work hours, or the value of a person’s time. However, the artists also highlighted other aspects of time to think about in futures of work. We could question whether the boundary around what is considered working time is natural rather than a construct, where so-called *work-life balance* is an ideal to strive for. We could explore what it means to define the value of work time in relation to other kinds of time, rather than quantitatively. We might also consider the unexpected implications and consequences of our practices over long-term, generational, or even infinite time scales.

4.2 The ambiguity of purpose

Whereas *time* elicits familiar concerns of *when and how long*, we must also consider purpose: *why and what for*. The young artists in our study were still early in their work-lives and their artistic careers, in a place where they could imagine work-life but had not yet experienced many of its realities. While they struggled with the idea of being constrained by workplace demands and reacted to what they observed around them as forms of work encroaching on life and freedom, they also saw the necessity and the generative potential of work in their own futures. There is weight and consequentiality to these imaginings anchored in the art they created, which offered a multiplicity of futures up for interpretation. The artists explored different kinds of purpose in work, as well as whether purpose is located inside or outside of the work, and who might benefit from these conceptions of purpose. Images and text related to purpose are shown in Figure 3.

There is a need for a purpose of some kind in work, but how to define that purpose is open to many interpretations.

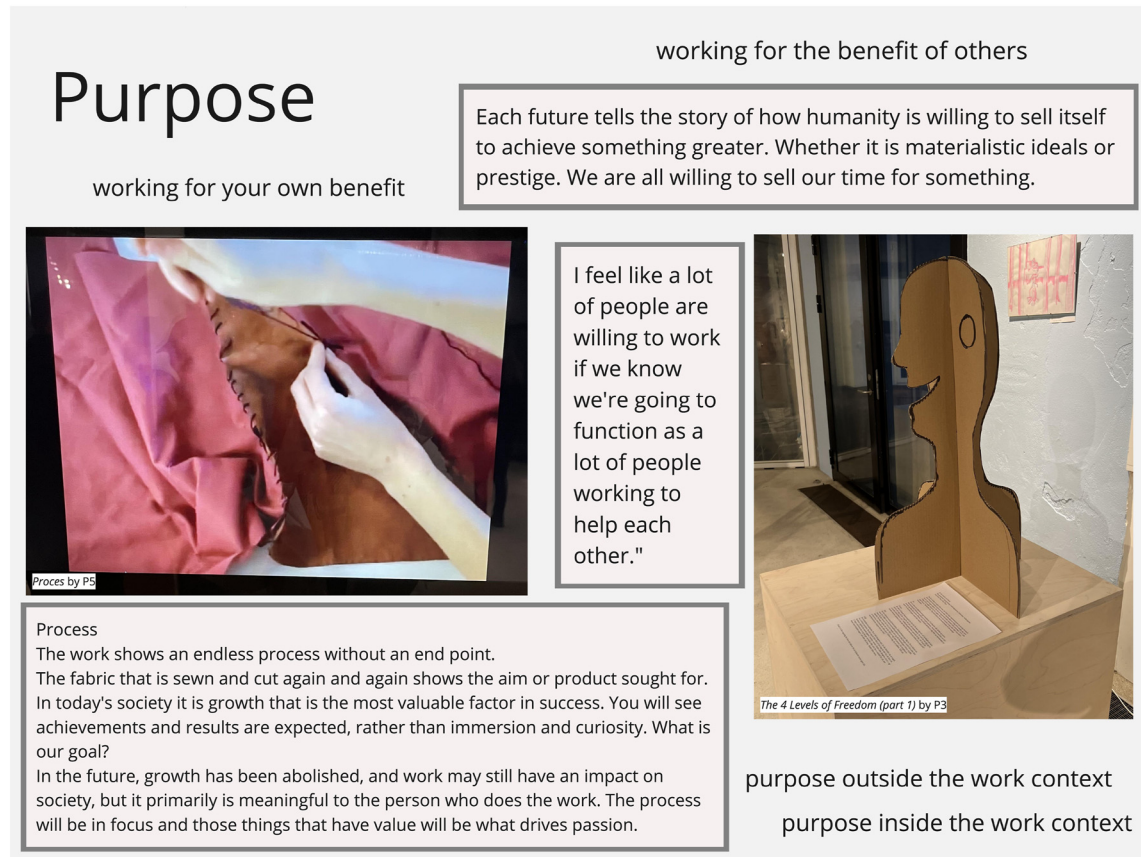


Figure 3: An annotated portfolio exploring the ambiguity of purpose. Clockwise from top left: still photo of *Proces* video by P5, excerpt of artist statement by P3, *The 4 Levels of Freedom (part 1)* sculpture by P3, artist statement by P5. Center: quote by P4. All words outside of boxes are researcher insights from thematic analysis.

Purpose in work could be a simple concept of capacity, as articulated by P1: "I'd just do what I was most capable of doing." P5 expressed frustration in her *Proces* video (on the left of Figure 3) about the futility – the purposelessness – she sees in the current state of work. Rather than proposing a well-defined purpose in response to this void, she proposed enjoyment of the process of work itself as a purpose: "What should be the goal for working? Because now I feel like there isn't a goal and we're all working for something that's never ending, or we don't get to the point where we are satisfied. So I see that work in the future [...] the goal will be that it should be enjoyable. And it should be something that you like."

Rather than finding meaning in the work itself, the purpose of a given form of work could also be outside of the work altogether, as simple as a means to an end: working in order to enable, finance, or otherwise facilitate activities in a non-work part of life, as described by P4: "I'm doing it only so I get the skills to do my own projects on the side. That's why I want to do it. And because I'm skilled in that sense, and

I will learn more about this thing that I find very interesting by also working in it, I can earn money from a thing that I'm good at, and I love."

Doing what you love, or loving what you do, seems like a good prospect for having purpose in work. However, the artists also considered the pitfalls of making your passion your career. The possibility that the thing you love doing might be drained of joy once you become dependent on it to make money, is a hazard further described by P4: "When I talk to my friends, we're all very depressed that we have to work the rest of our lives. So the thing is that we're all working towards getting to work with something that we like, but we all know that you'll get tired of that at some point, and you will also be exploited and it's wherever you go [...] it's gonna suck pretty much, so I have a really hard time about it."

There is a tinge of resignation to many of these imaginings, where personal passions might be cannibalised by the inevitability of having to become part of the consumer society. Some artists, however, insisted on holding on to their

passions and making them work. Whether or not it was desirable for a personal purpose and a work purpose to blur together varied among the artists. When speculating about a future working as an artist with a lot of freedom, P1 elaborated further: “If I want to do any work, I’ll do it. And if I don’t want to, I will still think about it, because it’s my hobby. So, I don’t really see it as my work, just see it as a thing I do.” Alternatively, P3 saw work as an impediment to the important things in life, not something that should become a life’s defining purpose: “I don’t think your work should define you. It’s cool if you like your work, but that’s sort of a fear in me that some people rather want to focus on their work than their relationships with other people or their family.”

Personal enjoyment, facilitating other parts of one’s life, or the question of blending together one’s work purpose and life purpose, are all intrinsic conceptions of purpose: purpose that is oriented inward, that feeds the workers themselves. The artists also imagined finding extrinsic purpose in work by looking outward, in doing something that matters to others. Knowing that whatever labor you are performing has a positive effect as part of a bigger whole is a point that came up several times. P4 expressed: “I would like that we all had this idea and knew that we’re actually contributing to something good as a society because I feel like a lot of people are willing to work if we know we’re going to [...] help each other. [...] But now, it’s being exploited a lot. So, that whole idea has just gotten lost because we hate

the people who hire us, when we don’t feel like we’re giving anything.”

The purpose of work is a complex topic with many dimensions to consider. It is clear that without a purpose, there is little motivation to engage with work. However, finding or creating a purpose in work could take many shapes beyond simple notions of accomplishment, productivity, or completion of a task. Is the worker’s purpose located inside or outside of the work context? Is this purpose intrinsic (for their own benefit) or extrinsic (for the benefit of others), individualized or part of a bigger whole? What are the advantages and disadvantages when work purpose and life purpose overlap? How does the sense of purpose affect the well-being of a worker?

4.3 The ambiguity of the body

Well-being is not only a mental concept, but also a physical one. Some jobs depend on the worker’s physical presence in the workspace, but even when people have the ability to appear virtually or remotely at work, our physical bodies remain part of the arrangement and need to be considered. The artists explored aspects of what it is to have a body in possible futures of work. Images and text about the body are shown in Figure 4. What do our bodies look like? What do they feel like? How do they function and not function? What are the borders of our bodies when we integrate technology into our work lives?

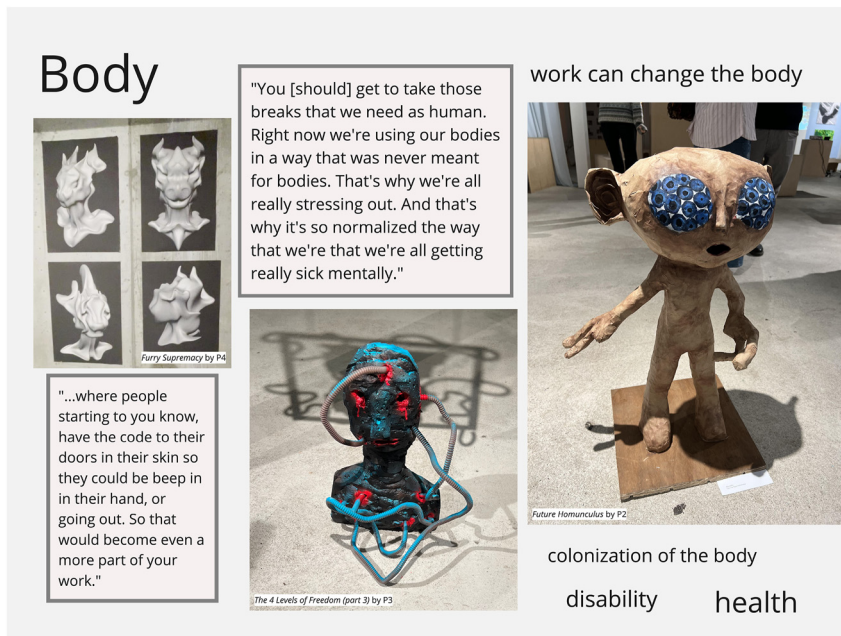


Figure 4: An annotated portfolio exploring the ambiguity of the body. Clockwise from top left: *Furry Supremacy* digital art prints by P4, quote by P4, *Future Homunculus* sculpture by P2, *The 4 Levels of Freedom (part 3)* sculpture by P3, quote by P3. All words outside of boxes are researcher insights from thematic analysis.

The *Future Homunculus* sculpture (on the right side of Figure 4), a vision of a future human who has evolved in response to the technology we all might constantly use, deals directly with this concept. It looks in some ways disturbingly weak and alien, and in other ways capable and cute. The atrophy of muscle tone and stature, as well as the loss of toes and some fingers due to disuse, is unsettling. However, the eyes, ears, and brain look much more powerful and exciting than what humans have today, almost suggesting a superpower level of sensory and mental ability. Is it desirable to become this homunculus? The artist, P2, specifically embraced the ambiguity of that possibility: “I don’t think it’s a negative thing. It’s just my thoughts about how we use our body now. How are we going to do in the future? So I’ve tried to make this as neutral as possible.” In contrast to the prospect of a natural evolution with technology, P3’s *The 4 Levels of Freedom* shows scenarios of a worker’s body being invaded by technology that is foreign to it, perhaps a dystopian progression of today’s fledgling experiments with biohacking. (Part three of the sculpture is shown in the bottom center of Figure 4). In the most extreme versions of this colonization, the worker’s body has been almost completely absorbed by the technology and isn’t recognizable as human anymore: “And then, I just took it to the next level [...] where people start to you know, have the code to their doors in their skin so they could beep in their hand, or going out. So that would become even more part of your work. [...] This one is even more submerged, to the point where you kind of just sort of sold yourself and you don’t know what you are anymore, you’re just a part of your work.”

With regard to bodies, physical health and ability informed a lot of ideas, fears, and discussions about the future of work as well. The artists spoke about disability, mental health, and burnout in relation to the larger problems of exploitation or lack of humanity in a work culture. Concurrent with a desire for people to be treated equally, was an anxiety that standardized work expectations will be applied to all people regardless of their individual bodies. P2 expressed: “I think that some people can work. And that’s just how it is. We have to respect that we are different also in the way we are built. And maybe that the fear could also be that all people have to work as much as the other person.” P4 also concurred, comparing an ideal future to the problematic present: “You don’t get burned out and [...] you get to take those breaks that we need as human. Right now we’re using our bodies in a way that was never meant for bodies. That’s why we’re all really stressing out. And that’s why it’s so normalized the way that we’re all getting really sick mentally. Which is always neglected.”

When considering future work sites, systems, and technologies, there are many aspects to consider for the physical bodies of workers beyond the traditional human factors issues considered by industries today. The ergonomics of a particular device or workspace are certainly important, but we could also take an open-minded look beyond these traditional concerns for bodies in the workplace, and consider the long term or generational physical effects of a work practice, the rest requirements of a person, the spectrum of disability (inclusive of both physical and mental health), and where the boundaries of a worker’s body truly are in any given scenario. The boundaries of bodies are also connected with our ideas of self and identity, as physical manifestations are as important as internal balance.

4.4 The ambiguity of identity

One manifestation of having a body at work is the way a worker uses that body to express *identity*. In the artists’ conceptions of identity at work, a tension emerged: how much of yourself can you bring to work, and how much of work might you bring into yourself?

To be human is to have many facets to our identities which exist simultaneously.⁷⁰ These facets are only partially displayed in different situations, depending on what aspects of our humanity are considered acceptable to reveal in given contexts. P4 commented on the unspoken rules of presenting yourself at work: “There’s quite a lot of judgment for people who go outside of the norm of the way you can look, or you can look in a workspace.” However, how you are allowed to present yourself while working goes beyond issues of physical appearance. The decisions a worker may make about their self-presentation can be an expression of who they know themselves to be and what they want to show, beyond the image narrowly defined by their workplace. As workplaces get more digital, possibilities for alternative forms of self-presentation and self-expression increase as well. Images and text related to identity are presented in Figure 5.

P4’s *Furry Supremacy* is a series of four images (on the left in Figure 4) proposed as future workplace digital avatars. The artist grappled with the concept of identity and expressed some pessimistic views about the present and the future in the interviews. However, there is also a hopefulness in the vision of the avatars as fantastical non-human expressions, the idea that we could be unlimited and able to have control over how we are perceived by others and how we express ourselves, and the desire to have complete freedom to construct an identity for the self in the future. P4 imagined how this opportunity could be part of an online workplace via the use of creative avatars: “If we

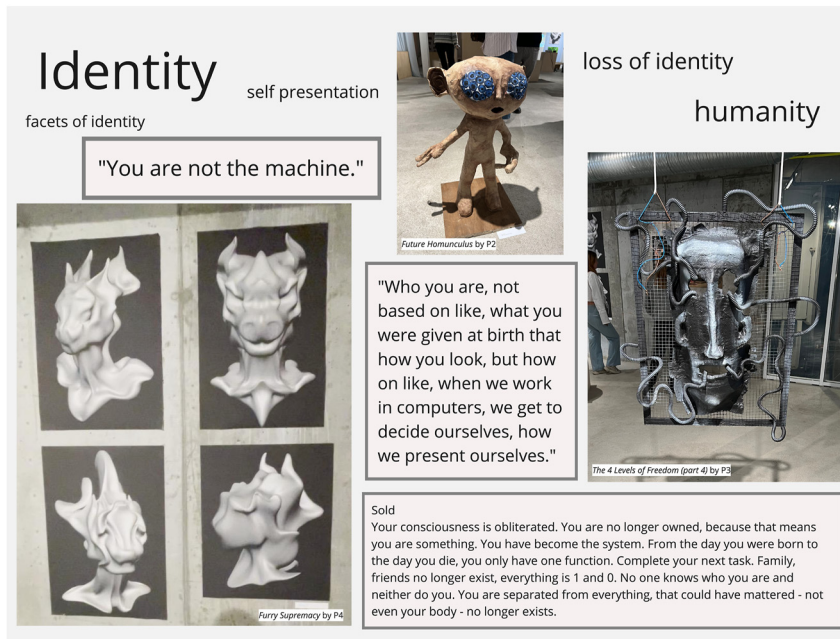


Figure 5: An annotated portfolio exploring the ambiguity of identity. Clockwise from top left: quote by P5, *Future Homunculus* sculpture by P2, *The 4 Levels of Freedom (part 4)* sculpture by P3, excerpt of artist statement by P3, *Furry Supremacy* digital art prints by P4. Center: quote by P4. All words outside of boxes are researcher insights from thematic analysis.

work in digital spaces, [...] we have a whole new thing of actually visualizing ourselves, which I think is a positive thing. Yeah, so my idea is [...] expressing yourself kind of digitally now. And who you are, not based on what you were given at birth that how you look, but how when we work in computers, we get to decide ourselves how we present ourselves." This is also a critique of the lack of imagination in present-day digital self-presentation, which P4 sees as unnecessarily limited by our preconceived norms from the physical world: "I thought that was kind of funny how these norms we have for how we look also go into the online world [...] which I find baffling because you have all this whole world of opportunities of how you want to present yourself." The artist held hopefulness about the freedom of expression in this potential future, simultaneously with doubtfulness that it would actually become a reality: "I actually, to be honest, don't really see this as a thing. [...] I'd like to see a place where people who kind of feel that way, that need to visualize themselves to show people who they are, get the opportunity to do that. [...] You know, but I don't see it happening." This hopefulness about the potential of self-expression within the workplace as something that offers myriad creative possibilities is tinged with resignation that workplace norms of self-presentation will not be so easily overcome. Can workplaces be safe for open self-expression and still take workers seriously for the work they do? After

all, why can't your lawyer be a cat online and still represent you in court?⁷¹

Expanding the identity beyond the traditional confines of what we consider to be human was a complex topic raised by several of the artists, who had very different takes on the idea. As expressed in *Furry Supremacy*, P4 finds the idea of becoming a nonhuman freeing: "I don't really vibe with the human look [...] I also do makeup, and even when I do that, I never want to do anything human. But I think that's how I see myself that always goes into my work. That's just kind of non human, because I kind of resent it. So I tried to create something else." As mentioned above, P2 described *Future Homunculus* as intentionally emotionally neutral on the idea of this evolution into a creature that appears nonhuman, or more-than-human, in many ways. And at the other end of the spectrum, P3's *The 4 Levels of Freedom* presents the prospect of becoming nonhuman not as an opportunity, but as a horrific loss of the human identity. He described part four of the piece (on right of Figure 5) as follows: "And then you come to the last stage, which is Sold, where it has lost his body and is hanging up. And it's just a big face connected with the whole thing, now it's even more submerged into the computer and work environment. So now you're just a number, and not even a person anymore. So this one doesn't nearly have feelings or know anything better." Describing an acceptable work

role and identity, P5 stated it succinctly: “You are not the machine.”

Who we are at work is a multifaceted question. How much of our identities are we able and willing to share at work? How does working change our identities and affect our humanity? What are the potential advantages, losses, and freedoms associated with this question? What aspects of ourselves must we give up to fit into our work environments, whether online or on site? How much of our workplace ideals and norms do we internalize in the end, as these convictions shape our selves and actions throughout our lives?

4.5 The ambiguity of agency

Agency isn’t only a capacity to act, it is also about the potential impact of your actions. How effective can you be? What can you effect? This is internal and also external. What power is constraining what is possible? Images and text pertaining to the ambiguity of agency are shown in Figure 6.

The artists found many ways to explore agency through the concepts of freedom, personal power, and the lack thereof at work. *The 4 Levels of Freedom* expresses this multiplicity of visions as four parts which relate and contrast with each other. These “levels” exist on a spectrum of ‘hopeful’ to ‘absolute nightmare.’ Each piece is a person, possibly the same person, expressed in alternate realities of the future ranging from a person completely unencumbered by work, to a person who has become so invaded by work technology that they no longer exist separate from their job. These pieces depict a spectrum of choice: the subject in the earlier pieces has the power to opt out of the “rat race” altogether, and in each subsequent piece that subject has chosen to engage at progressively deeper levels with the artist’s conception of a capitalist work system. It is up for debate whether this person may have lost their ability to give ongoing consent to the circumstances in the final stages.

The middle two pieces are particularly interesting because they aren’t all-good or all-bad, and leave a lot of interpretation up to the viewers. These ambiguous pieces



Figure 6: An annotated portfolio exploring the ambiguity of agency. Clockwise from top left: still photo of *Proces* video by P5, *The 4 Levels of Freedom* (part 2) sculpture by P3, *Fremtidens Dominans* sculpture by P1, *Fremtidens Dominans* artist statement card by P1, *Furry Supremacy* digital art prints by P4, excerpt of artist statement by P3. All words outside of boxes are researcher insights from thematic analysis.

can elicit a variety of reactions: for example, one of the authors was excited by part two (the person surrounded by devices, seen top center of Figure 6) as an accurate depiction of a functional ecology of devices in a work environment, whereas the artist himself described it as an uncomfortable lack of privacy and personal space, as the person has opted into a state of surveillance, choosing to “rent” out their time, privacy, and body in exchange for resources: “You’re sacrificing your time and your privacy. We see the cameras all over, and then he has his phone, in his own hand, your whole life in your phone. And there’s stamps on the back, like you are a letter or part of something bigger. So you are renting your time to buy the things you want, at the cost of your time and privacy.”

The ideas of surveillance and control as they relate to future work arrangements were explored as a personal problem (as in *The 4 Levels of Freedom*) and also as a societal problem. *Fremtidens Dominans*, a sculpture by P1 (seen on the right side of Figure 6) depicts a future cityscape dominated by an enormous surveillance tower which is connected to every building. It is a version of the panopticon, all-seeing and all-knowing. It leaves the viewer to wonder whether this is an image of the future at all, or simply an interpretation of the present: a lot of its elements (for example, being connected everywhere all the time, and negative environmental impact) are features of our current world, particularly in big cities. P1 makes the connection: “It’s about the future’s dominance, where the government is connected to every single one of the people living in the city, like in a metropol, where it’s all connected. So even though you walk around on the street, you will always be connected to something. And in this example, it’s connected to the government. [...] I mean, this example is far into the future, because it’s a whole city that is connected. But now I also see it because of our phones, or in China where they have cameras everywhere.” In the statement card accompanying the sculpture (bottom center of Figure 6), the artist describes this landscape of power and the lack of agency of the individuals in such a system, emphasizing the ruthless “dominance” of a corrupt system over the people subject to it. These works engage with some very large questions. Where do people have choices, and where are those choices made for them? Do people genuinely have agency when they exist inside different kinds of systems, some openly coercive and exploitative systems, and others busy gently nudging and motivating in the supposed right direction?

In opposition to the experience of being under the thumb of an entity which has power over you, the artists described ways that their own personal power – or agency – was relevant in a workplace. P5 related the frustrating

experience of being expected to wield agency she did not actually possess in a job: “People [...] just see something, someone that works. And they often think that we know everything and can do everything. So if there is a problem, we should just solve it. And sometimes we don’t have the power to do it. We can just call our boss and be like, we have this problem, do something.” Sometimes, having agency in work means having dignity, and being trusted by others. One participant talked about how workers need to have the power to decide how much they are able to give to a job, and described the respect of that agency as trust: “Yeah, exactly. And like trusting that each person, trusting. Right now I’m on [unemployment assistance], and that’s horrible because they don’t trust us to want to give back to society. So, we need to get a feeling of actually wanting to have a working community and that we’re working towards something together. Except that right now we’re being exploited.” Personal agency could also take the form of being your own boss, and having the ability to keep the benefit of your own labor, as expressed by P1: “I don’t want to sit in an office from 8 to 5 everyday just doing something for somebody else. I don’t. I want to do it for myself.” This is having the power to pursue an intrinsic purpose, as described earlier in this section. Taken one step further, agency could extend not just to yourself, but also to collaborations. P4 described a goal of having the agency to take a leadership role in future projects: “Working with other artists, I think working with creative people, making some ideas I have come to life and, and maybe sometime far in the future, having some authority to do a creative project with others.”

It’s easy to equate the idea of a worker’s personal agency with the simple idea of being your own boss. However, the artists highlighted that expressions of agency can exist in other hierarchies and work structures, when people are properly empowered to achieve their tasks, trusted to make decisions, and able to see paths to advancement. On the other hand, expressions of a lack of agency ask: where are the limits of our power to choose, when we work in oppressive or exploitative contexts?

5 Discussion

Traditional CSCW research has focused on identifying, defining, and describing practices, artifacts, processes, and technologies. There is no tradition in CSCW research for exploring what is undefinable, ambiguous, or yet to come. We want to push CSCW research to not only study and design for *what is*, but also to consider *what will be* – or rather *what could be*. As researchers, designers, and technologists, our natural response to ambiguity is often to view

it as a problem to be solved. We frequently try to specify, explain, and ultimately resolve ambiguities – to make them go away. However, as Gaver et al. and others have argued, ambiguities can be useful, and there are advantages to engaging with them in the field of CSCW. Our findings suggest that ambiguities are not only useful, they are inevitable and necessary. Ambiguities are a key part of exploring a complex problem space, and to eliminate ambiguities prematurely is to limit possibilities for innovation and design. We suggest to embrace ambiguities, stay with the trouble, and acknowledge that grappling with ambiguities can be a powerful practice for shaping possibilities for the future of work.

5.1 Enriching inquiry by attending to ambiguities

What qualities are important to consider about the human experience in the future of work when we design future CSCW technologies? Based upon our analyses of the artist statements, art pieces, and interview data, we identified five dimensions of ambiguity (*time, purpose, body, identity, and agency*) relevant to exploring the future of work. We depict these ambiguities and their connections in Figure 7, calling back to Donna Haraway's tangled ball of yarn from which she can metaphorically pull out different connected threads of meaning.¹⁸ Each dimension of ambiguity listed in our findings is labeled as a node in the yarn tangle. Each node represents a multifinality: a starting point which can lead to many different outcomes, conceptualized by its connection to the other nodes via the strings. In the fashion of Haraway, following any one of the strings would prompt a story: in this case, a question waiting to be asked, traversing between nodes. This exploration of multifinalities acknowledges that precision is illusory. It offers these ambiguities

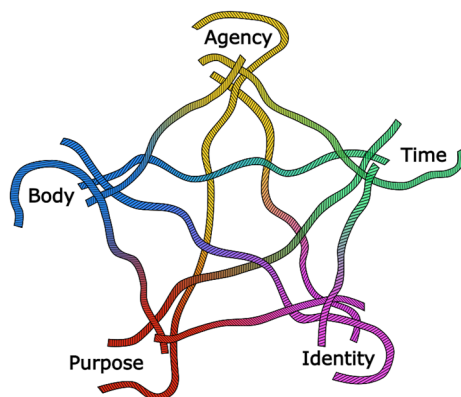


Figure 7: Multifinalities of ambiguities, depicted as tangled pieces of string.

as touchpoints to begin from, return to, and entangle with each other – and possibilities for where these ambiguities might be useful. As our goal in this process is to expand the problem space for the future of work and enrich the inquiry therein, the outcomes of these multifinalities are questions that researchers and designers can ask.

A researcher investigating the future of work might logically begin by asking questions about one ambiguity, and then move into a deeper, more nuanced exploration of the problem space by looking at the possible entanglements of these dimensions. Inquiries can start at any node in the diagram, and then join with the other nodes to form sub-inquiries, extending into new territories of ideas, questions, and concerns. The choice of the starting point will structure the resulting questions, making clear that where we begin always affects where we will end up. After all, our multiple possible futures remain defined by our present.

To illustrate how an exploration of these multifinalities about the future of work could take place, we present below a hypothetical line of questioning. To ground our example in a current work context and demonstrate how it can augment existing research practices in CSCW while orienting toward human experience in the future, we will base this line of questioning on Anastasia Sergeeva's insightful postphenomenological case study²¹ of Dutch physiotherapists practicing remote care during the Covid-19 pandemic lockdown.

Beginning our inquiry, we choose to consider the ambiguity of *the body* in the future of work, as it is a natural starting place for a case about physiotherapy. As detailed in the previous section, our findings revealed *body* ambiguities pertaining to disability or altered functionality of bodies, and the boundaries of our bodies with regard to technology, as well as issues such as rest and mental health. In this example, we choose to focus on the idea of affected ability. Inspired by the sensory evolutions depicted by P2 in the *Future Homunculus* sculpture, we choose to start by asking one specific question about *the body* related to the work experience of the physiotherapists described in Sergeeva's study:

(*body*) How might physiotherapists cope with the loss of their sense of touch when working remotely?

Exploring this question might lead us to unpack the human experience of the physiotherapist who must treat patients via videoconferencing.

We could then move a step beyond the singular focus on *body*, and look at this specific sensory deficit question entangled with each of the other ambiguities in the possible futures of work. Our question about coping with the lack

of haptic ability is, in itself, a *multifinality*, with the potential to spawn new sub-questions in multiple directions. By prompting in this way, we expand the depth of our inquiry. Here is one round of inquiry which begins with our first question, and teases out the strings connecting it to the other ambiguities in the illustration, asking a new sub-question for each string:

(*body*) How might physiotherapists cope with the loss of their sense of touch when working remotely?

1. (*body + time*) Will patients take longer to progress when physiotherapists cannot use their sense of touch to help them?
2. (*body + purpose*) If the “hands-on” (touch) aspect of physiotherapy is lost, do physiotherapists still want to do this job?
3. (*body + identity*) Does a change in how you accomplish your job tasks (without the sense of touch) impact the professional identity of physiotherapists?
4. (*body + agency*) Does the loss of precision when verbalizing instead of using the sense of touch feel like a loss of control for physiotherapists?

Any of these resultant questions could then be explored further, by repeating the above process reflexively in subsequent rounds of inquiry. For example, we could treat our final *body + agency* question as a new multifinality, beginning with it again and entangling it with the remaining ambiguities once more:

(*body + agency*) Does the loss of precision when verbalizing instead of using the sense of touch feel like a loss of control for physiotherapists?

(*body + agency + time*) How long would it take a physiotherapist to feel confidently precise at verbalizing instructions rather than demonstrating them through touch?

(*body + agency + purpose*) Does a lack of control due to the loss of touch hinder a physiotherapist's goal of helping patients?

(*body + agency + identity*) Could a physiotherapist's reduced control due to compensating for loss of touch impact how patients respect or relate to them?

In this way, we can expand questions and ideas at any node by subjecting them to the other nodes, and ultimately use the dimensions of ambiguity as a prism to reveal new connections, relationships, and entanglements related to the future of work in a given domain. As a designer of

future work technology, these questions have the potential to inform what or how you choose to design, or who you are designing for. As a researcher, these questions can inspire new research questions, or deep dives into aspects of your existing dataset or case, revealing more areas for future exploration.

We contribute the demonstration of one way to structure such an exploration. As CSCW researchers, we applied this to the problem space of *the human experience in the future of work*, and offer these multifinalities for the use of anyone engaged in futuring for CSCW. However, the process of Research through Art and qualitative analysis we used to identify these dimensions of ambiguity for the future of work could also be replicated for other domains, for example the future of education, the future of fashion, or the future of architecture, resulting in the identification of (possibly) different sets of multifinalities and entanglements to explore in those respective domains. Further, while it is beyond the scope of this paper, the explorations of ambiguities could also take the form of exploratory prototyping, utilizing prototypes as forms of inquiry unpacking the phenomenon rather than solving a concrete problem.

5.2 Extending CSCW with multifinalities

We extend the ways in which contemporary CSCW can engage with the study of work, by expanding the focus of the field from studying *what work is* to include the study of *the experience of work* and *what work can become*. Studying work is fundamental for CSCW research,¹ as the core analytical focus of the field is to design technologies which enable rather than constrain actors in their endeavors.⁷² The tradition of ethnography in CSCW, in particular, provides rich insights into work practices in the present day context. On the other hand, through artistic futuring CSCW research can produce a different set of insights into work. We identified ambiguities as particular areas of concern that are present now and that structure the artist's imaginaries of the future. These ambiguities are relevant to current and future tech development efforts because they point to fundamentally important considerations of what work is or could be. In the wake of the global pandemic and the attendant seismic shift in work practices, this is a particularly opportune time for those engaged in the study of work to reflect not just about *what work is*, but also *what we want work to be*.

The five ambiguities we present in this paper are not novel concepts on their own, because as qualities of human experience they encapsulate fundamental parts of being a person who works – parts which have often been undervalued in research. Prior CSCW research has studied and designed for *time*, and to some extent considered *purpose*,

agency and *body* as important features to explore in work, for the design of technologies and artifacts.²⁸ However, rather than seeing these as ambiguities, the conceptual understandings in prior CSCW research have been driven by an attempt to comprehend these qualities as elements or concrete features for design. In contrast, we extend the conceptual understanding of fundamental concepts such as time, agency, and body by redirecting our attention to these qualities as ambiguous *multifinalities* rather than as features for design, arguing for the benefit of keeping these ambiguities as deliberately open-ended starting points for possible futures. Exploring what we want work to be in the future through multifinalities influences our design endeavors by foregrounding fundamental concerns about human experience (such as the dimensions of ambiguity we identified), making them worthy of attention equal to traditional concerns about work such as reducing the efforts of articulation work across distance. It is not a method of problem solving, but rather a technique for interrogating which problems we might choose to solve in the first place, and why.

6 Conclusions

Seeking to extend the scope of contemporary CSCW research, in this study we adopt a broadened agenda for CSCW: growing from a focus on the mechanics of work to a focus inclusive of human experience, engaging with futuring practices that expand from the rich foundation of grounded knowledge in the present state of CSCW, and calling for a recognition of the value of ambiguity in research and design about work. We also contribute Research through Art as form of epistemic inquiry to the CSCW research toolkit.

We asked: What qualities are important to consider about the human experience in the future of work? Through artistic research engaging with young artists early in their careers, we explored the “human experience” of work: what it feels like to work, how work affects you and changes you, what a work-life means. This research question is not about how to successfully accomplish work tasks, how to structure work, or how to define work, which are more traditional CSCW questions. Instead we question what it’s like to be a person who is working, and how we might consciously incorporate that experiential knowledge into our ideas, designs, and conceptions of work for the future. We discovered that the “qualities to consider” in our research question are not a straightforward set of recommendations to “do this, not that” with an implied value judgment, nor are they a checklist of requirements to meet. Instead, we

identified five interconnected dimensions of ambiguity which, when explored, can produce thoughtful open-ended considerations about the potential experience and impact of future work technologies, systems, and scenarios. We conceive of these ambiguities as multifinalities (able to open up many different possible futures from the same starting point), and demonstrate an approach for expanding these ambiguities that CSCW researchers and designers can use for exploration about the future of work.

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