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Servants and masters: An activity theory investigation of human-AI roles in the performance of work

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Abstract

Organizations considering AI adoption must be mindful of media that portrays dystopian future scenarios. While machine sentience remains philosophically and ethically moot, the future implications of AI adoption are unclear. The issues that surround AI adoption need to be examined but there are a lack of implementations cases around which empirical research can be undertaken and practical experience can be gained. AI adoption needs to be considered from multiple viewpoints including, but not necessarily limited to the social, ethical and legal issues, and not merely be reduced to questions of financial return or organizational efficiency.

KEYWORDS
activity theory, artificial intelligence, intellectual property rights, machine sentience, systems of work

JEL CLASSIFICATION
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1 | INTRODUCTION

The path of human development can be marked by the emergence of tools and technologies that have enabled further technological progress and disrupted existing social norms (Kittel, 1967; Lewandowsky, 2016; White, 2017). The digital revolution is perhaps the most significant sociotechnical change that has occurred in the last two centuries, and its impact has not yet been concluded (Agarwal, 2015; Feldman, 2002). Among the many technologies this phase of rapid technological development has fostered, Artificial Intelligence (AI) promises (or threatens) to deliver change unlike any seen before. Whereas new technologies have previously afforded the means of replacing skilled labour with machines, or enabled seamless communications to take place over global distances, AI is anticipated to revolutionize every aspect of work and society and even potentially remove human physical involvement from both (Tegmark, 2017).

This research was undertaken in an organization that has begun to trial and implement AI solutions and is considering how it should formulate its future AI strategy. Amidst a wealth of subjective media content but a dearth of empirical literature, the organization commissioned the study that aims to understand the employees' perceptions of how AI systems have affected, and are expected to continue to affect, the performance of work.

The paper is organized thus: first, an overview of AI systems and challenges is presented that conceptualizes humans and AI agents as elements of systems of work. The Activity Theory literature is then reviewed before the study's methodology is detailed. Next, the thematic analysis of the interview data is presented and a discussion of the key findings is made. The paper closes with statements of contribution, limitations and suggestions for future research.

2 | ARTIFICIAL INTELLIGENCES

Artificial Intelligence (AI) has undergone a lengthy gestation period, arguably much longer than any other technological development. From the earliest notions of "*programs with common sense*" in 1959 (Sabanovic et al., 2012; McCarthy, 1989: p. 99), it is only in the last few years that human-like intelligent systems have become a technical possibility, if not a practical reality. In 2017, the US introduced the 'Future of Artificial Intelligence Act' (Cantwell, 2019), and in 2018 the UK's House of Lords issued a report on AI (Lords, 2019). Both of these identified the lack of a universally accepted definition of AI and adopted the concepts of 'Narrow' and 'General' AI. Narrow AI (AIn) pertains to those systems that can demonstrate human-like or higher, levels of cognition within a limited set of functions. General AI (AIg) refers to systems that can replicate human-like, or higher levels of cognition across all domains and are thereby indistinguishable from humans (Moor, 2003).

Due to the lack of universally accepted definitions of AI there is considerable debate over whether such systems already exist: adopting one definition over another leads to inconsistencies in classification (Kaplan and Haenlein, 2019). Jarrahi (2018) and Gartner (2019) identify several areas where AIn systems are currently utilized, including 'super-vised learning' in healthcare, 'robo-advisors' in finance, visual recognition in security, and data surveillance on the internet. Similarly, many case study examples of AIn application have been reported (Duchessi et al., 1993; Hengstler et al., 2016). However, it is interesting to note the practical realities and limitations of AIn systems. Samasource for instance employ impoverished Kenyan's as 'data trainers'—continually observing images of roads, cars trees and people that are fed into the digital mental models of driverless car systems (BBC, 2019), while an automated chatbot that is used to respond to customer telephone queries still requires augmentation by human operators should the discussion become too complex (Friedman, 2019). Contrastingly, examples of AIg are much more difficult to discern and even "*may never exist*" (Gartner, 2019, p. 14). AIg scenarios, at present, tend to be hypothetical and are often linked with 'doomsday prophecies' (Atkinson, 2016; Buntinx, 2019; Collins, 2018; LaSane, 2018).

The development and use of AI systems affects how work is done and requires new skills to develop further implementations (KPMG, 2019; SIA, 2019). Whether the adoption of AI systems will ultimately result in the permanent loss of jobs or a change in the types of jobs that are required in the future remains a moot point (Choudhury, 2019; Rees, 2019). Whatever the outcome, such an emerging technology's legal and ethical implications will influence and shape its impact on the workplace (Stahl et al., 2017).

3 | ACTIVITY THEORY

Activity Theory has been widely used as a framework for academic research (White et al., 2019). It is "*essentially a learning theory*" (Jarzabkowski, 2003, p. 27) that enables the understanding of processes such as expansive learning that occur over relatively long periods
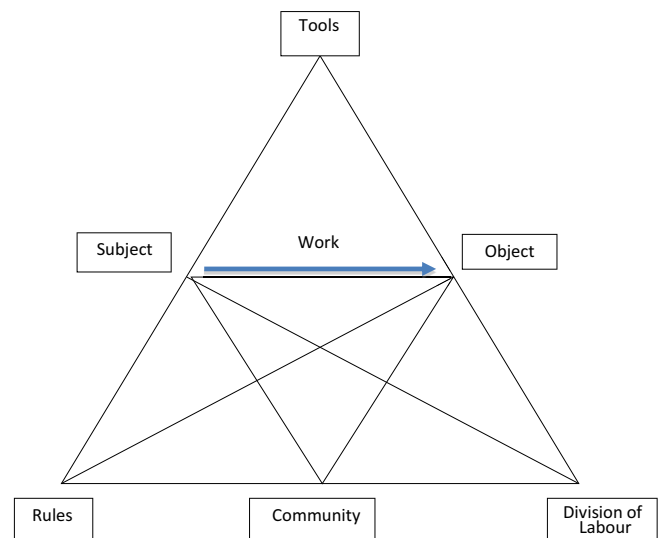

FIGURE 1 Activity theory

(Engestrom, 1987, 2000a; Engestrom et al., 2005). Bedny et al. (2001: 414) concur, stating "*action is the basic unit of learning activity.*" Thus, the processes of mental cognition and work behavior can be interpreted as the processes of human learning, since "*through activity a person...[obtains] knowledge*" (Bedny & Karwowski, 2004: 151).

Blackler (1995) and Benson and Whitworth (2007) maintain that in the study of work activities, it is the identification of stresses or contradictions or 'disturbances' that are sought. The continual forging, relaxing and reforging of relationships between actors and artifacts, termed 'knotworking' by Engestrom et al. (1999), become the focus of attention during Activity Theory enquiry. Kain and Wardle (2005: 122) note the value of Activity Theory in identifying these conflicts and contradictions in work-based systems that "*interfere with the realisation of individuals' and communities' goals.*"

Ardichvili (2003) details the component elements of Activity Theory shown in Figure 1. Tools are those implements that Subjects use to perform an Activity in the pursuit of the Object. An Object may be the "*focus of study of some discipline (e.g., general accounting rules in financial accounting)*" (Ardichvili, 2003: 9). Bedny et al. (2004) define a further type of Object that is artificial, created by individuals to regulate their actions and termed Artifacts. The process of performing an Activity, or 'doing work', is influenced by several organizational factors. Rules are those conditions in the workplace that govern how work is performed. These may comprise governing regulations, standards or procedures. The Division of Labour pertains to the relative roles of people within the process, including trainers, trainees and experts. Finally, Community refers to the wider social network comprising other employees and individuals linked to the work being performed.

Bedny et al. (2001) identify the main focus of Activity Theory as the Activity that is comprised of one or more Actions. By performing these actions an individual achieves a conscious goal. An Activity is said to begin when an Object or event emerges or becomes apparent that can satisfy a need: "*A motive compelling a man to work may come from the need to earn a living for basic sustenance*" (Bedny et al., 2000,

177). "*Goals represent imaginary and logical components of future results of one's own actions*" (Ibid.), thereby an Object may be the goal for an Activity. In other words, an Activity begins when it is possible to act, which (if successful) results in achieving a goal (desired state or outcome) that satisfies a need.

4 | RESEARCH CONTEXT

Established as the Anglo-Persian Oil Company in 1909 (Ferrier, 1982), BP is a global energy business with operations in Europe, North and South America, Australasia, Asia and Africa. The company has 74,000 employees and operates in 70 countries worldwide. It is one of the world's "supermajors' (Davis, 2006), recording a turnover in 2017 of $244.582B (USD) (and has around 20,000 barrels of oil equivalents in its reserves).

BP has committed to digital transformation, and AI is regarded as a key near-term source of value creation both inside and outside the company's boundaries, as demonstrated by the investment of $5m (USD) in Belmont Technology for their cloud-based geoscience platform (Ali, 2019; BP, 2019a). Increasing global demand for energy, particularly in China, India and throughout Africa is driving the requirement for significant investment (BP, 2019b). Across the industry, there has been an increasing push to utilize emerging technology (Jacobs, 2019). Areas, where the deployment of AI is envisaged to be able to deliver benefits, include data analytics, customer service solutions, and complex documentation assessment at both upstream and downstream points to optimize production, manufacture and sales (IEA, 2017).

4.1 | Theoretical framework

Figure 2 presents the Activity Theory framework populated with AI systems as Tools. That is, they are devices that are utilized to aid in the performance of work. The Subjects of the work system are the 'Employees' that perform work to achieve some organizational or individual Object or outcome. The Rules of the work system, the Community and the Division of Labour are elements that influence work performance. In accord with Thompson (2004) and Engestrom's (2000b) assertions, it is the individuals that perform the work that is the focus of the investigation of systems of work, and the Employees are, therefore, the sources of data that are utilized in this study.

Through exploring individual insight into the utilization of AI, and the Activity System surrounding their implementation, this study discovers the 'knotworking' that occurs in the performance of AI-facilitated work. These tensions are examined and provide indications about the challenges that the further adoption of AI present and thereby aid in guiding the organization's strategic planning.

5 | METHODOLOGY

Semi-structured interviews were used in this study to gain deep insight into participants' positions (Denscombe, 2010; Fox, 2009).
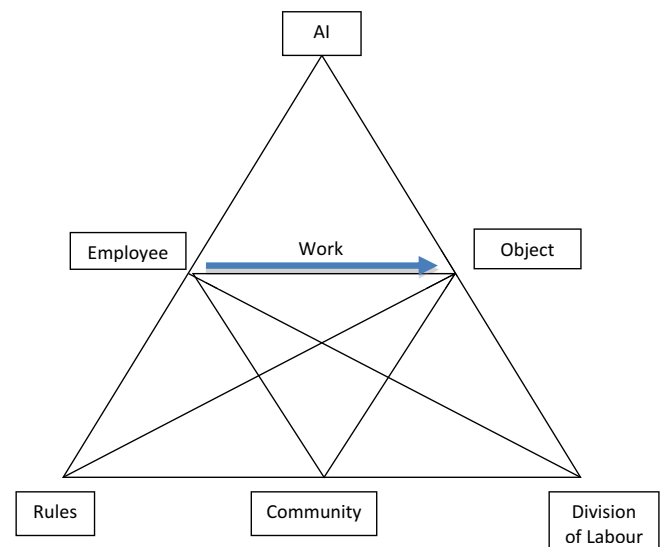

FIGURE 2 AI as tools in the performance of work

The questions were operationalized from the literature and broadly conformed to the structure of Activity Theory: that is, questions were based upon Tools, Subjects, Objects, Work, Rules, Community and the Division of Labour (Charmaz, 2006). Open-ended questions were used to elicit broad responses and guide the development of further probing questions around emergent and interesting subjects (Halcomb & Davidson, 2006; Lynch, 2000; Schwartz & Schwartz, 1955; Strauss & Corbin, 1998). The cyclic development and refinement of interview questions is a crucial approach to improving the reliability of interpretive research (Becker, 1958; Bositis, 1988; Miles, 1979; Sanday, 1979; Schwartz & Schwartz, 1955).

Interviews were conducted with 11 key stakeholders of the host organization. Each participant had at least 2 years of experience within the field, and their gender profile reflects that of the company in general (see Table 1 for details). The interviews were captured using a digital voice recorder and accompanied by field notes of pertinent issues and comments (Paolisso & Hames, 2010). The lead researcher transcribed the interviews, and two researchers independently analyzed the data using thematic analysis (Guest et al., 2012). The analyses were cross-compared with reach a consensus and then member-validated (Sandelowski, 1993).

The interviewees were invited to participate in the study with the option to withdraw at any time. The participants have been anonymised throughout: participants are indicated in the analyses with the convention P1, P2, … P11.

6 | ANALYSIS

This section presents the thematic analyses of the interview transcripts. It begins with an account of the participants' notions of what constitutes AI and the remainder of the findings are grouped

TABLE 1 Participant details

Participant	Time in profession (years)	Role	Gender
P1	11	Strategic Sourcing	M
P2	2	Category Manager	M
P3	2	Sourcing Manager	M
P4	5.5	Category Manager	M
P5	4	Category Manager	M
P6	15	Category Manager	F
P7	14	Category Manager	M
P8	10	Category Manager	M
P9	4.5	Category Manager	F
P10	4	Category Manager	F
P11	10	Strategic Sourcing	M

according to the structure of Activity Theory. The results indicate that the respondents have a broad understanding of AI and have considered its potential role and influence within the organization. While many recognize the immediate potential of AIn systems, they are unsure of the possibility of AIg and their prognostications reflect sensational media. What appears most important for the organization that is considering future AI adoption is the respondents' perceptions that it would affect the majority of current roles but that their own role would not be impacted.

6.1 | Notions of AI

The participants' notions of what constitutes AI and how it may be employed varied widely. For instance, some conceived of it as AIn that would perform elements of work that humans currently undertake,

P1 *AI for me I think is...the enhanced capability of using software and hardware to do things which at times humans can do.*

P10 *Administrative, tendering contract admin, maintenance. I could see those kind of tasks going away which would be welcomed.*

Whereas others recognize that AI comprises much more than the simplistic automation of activity and may take the form of AIg,

P5 *First thing that comes to mind is a robot of some description performing certain tasks—and maybe start doing things differently because it sees an easier or quicker way of doing it.*

P7 *It's humans interacting with computers and getting that realistic human response.*

Several of the respondents also alluded to the notion of AI possessing some form of sentience but expected such a development to be a distant realization and a potentially challenging situation to be able to define,

P4 *It's aware, it can think and respond to questions.*

P2 *Until they become cognisant and want their own...till the age of Terminator, I do not think they will understand market value or share value of what they have generated.*

Overall, while there were uncertainties over the precise ways in which AI would disrupt the workplace, all of the respondents were convinced that AI would have a substantial effect upon their lives in some way,

P9 *On a more simple level look at the way Alexa and the Google hubs and the likes of Siri have really developed over the last few years. I think AI is going to be very significant.*

6.2 | A.I. as tools

In accord with the participants' perspectives of what constitutes AI presented in the previous section, and recognizing that many of them considered AI to be something that will only become "*tangible and real*" (P1) in the future, their ideas about how AI may be utilized were fairly limited. The majority of responses considered AI as a sophisticated form of automation,

P4 *There's all repetitive parts of our roles that we maybe find annoying or do not particularly like doing and it's around those repetitive mundane tasks that if we could get a robot or computer of some description to take an element of burden away from those tasks.*

P10 *I see more as automation e-discovery.*

A few participants considered the current role of AI outside their workplace. However, they tended to focus on the limited capabilities of such systems and briefly mentioned that there also needs to be trust in order to support greater implementation,

P1 *I have to ask Siri what's the time of day or how's the weather forecast or something like that.*

P7 *I cannot trust the thing* [ALEXA] *to tell me the weather in the morning. Why would I trust it to buy a new car?*

6.3 | Subjects using A.I. as tools

Once again, the participants' disparity of concepts of AI is reflected in their discussions of their usage of such devices as Tools within their work. Some respondents identified AI simply as a means of undertaking large volumes of 'mechanistic' work,

P4 *It's very much more the replacement of manual tasks.*

P9 *It will take away a lot of the volume of transactional type activities that you do.*

Contrasting this view, occasionally they identified the deeper insight that may be gained from AI that could be used for "*supplementing decision-making*" (P1),

P1 *I could see AI getting into a place where it provides me a lot more recommendations based on analysis.*

One even volunteered the benefits of human-like AI,

P2 *I'd want an AI system to start thinking and dictating to me what should I be looking for.*

However, this viewpoint was again qualified with reservations about the future impact of AI being integrated with business decision-making to such an extent,

P1 *That's very clever, that helps me make my job better. But making decisions on that could be quite dangerous.*

6.4 | Objects of the use of AI

Despite many participants having a rather limited view of current AI applications, their projected understanding of its utilization was much more impactful. Their responses included the identification of industry sectors where AI may be fruitfully employed,

P1 *Use it in defense industry or work environment.*

P5 *Trawling through a list of data to say which supplier here should be a preferred supplier. I think that's something that could be done for us.*

In addition, they also specified particular functions that may benefit, including,

P3 *A big part of my role is negotiating and so I've heard or read that potentially in the future machines could negotiate with machines.*

P7 *I would design an AI system that simplifies the life of a procurement professional across the lifecycle of a sourcing event.*

A few, however, were skeptical of its ultimate value and warned of the need to be critical of AI developer's claims,

P6 *There has been a big sell on AI and this raises questions about whether it can do what sellers are saying it can do.*

P7 *You can buy lots of systems and tools that are kind of half-baked right now.*

P10 *A lot of providers claim to be everything to all needs.*

6.5 | Rules of the use of AI

The vast majority of respondents focussed on the issue of Intellectual Property Rights (IP & IPR) as the major aspect of AI implementation that would require careful consideration. In particular, the question of who would own the IPR of any solutions that arose from using an AI system was a cause of consternation for all. Most participants were adamant that the IPR would belong to the organization that utilized the AI system,

P1 *In service and in need of the answer is very clear—I own you, whatever you do, I own it.*

P3 *If the machine develops the IP there'd have to be something contractual that says it belongs to us.*

P5 *[If] we have commissioned this robot or machine to develop something for us and typically we would want to own the IPR for that product.*

P8 *Who is going to own the IP generated by something that AI thinks up on its own, so to speak—it is going to be owned by the owner of that AI technology, by whoever it is buying it.*

On reflection, some respondents admitted that the issue was perhaps less clear than they had originally thought,

P1 *But in a world where AI becomes an entity, that's a difficult one to answer is not it? ... In that case I think you need to give credit to them.*

P3 *In a scenario where the company who develops the AI that then does something—does that company* [The Developer] *or does* [The User] *own the IPR?*

Some also ventured that there may be instances where the company that develops the AI may be warranted with the ownership of the IPR,

P2 *I think at first more companies will be open to AI companies keeping the IPR and findings.*

P4 *I think it would come down to who created it, who owns the piece of AI.*

P10 *Nine times out of ten I will say the AI provider.*

6.6 | Community around AI

The social impact of technologies, both within organizations and upon society at large, has been historically significant. The respondents in this study pointed toward several interesting ways in which AI was perceived to have an influence on them. For instance, in terms of the organization and their work,

P3 *I think it does not matter who drafts the contract in a sense it could be AI or a person—what matters is who ultimately is responsible for it—that cannot be a machine I think.*

Some, therefore, raised the question of risk and liability,

P9 *Let us just say there is a disaster and it places a trade that goes hideously wrong—it's very difficult to then say was it something in the data diet that effectively caused that or was it the software company. It's difficult to apportion blame.*

Interestingly, some pointed out the potential problem of trying to access any novel insights, such as IPR, that an AI system may generate,

P3 *As machines learn how to be difficult so...how do you incentivize a machine to give you the information?*

Some solutions that were offered were somewhat redolent of the doomsday scenarios that have been portrayed in the media,

P2 *I do not want a system to have a tantrum or be in a mood or a bad day or a good day.*

Others indicated the view that AI may become aware and proffered alternatives. However, the quasi-moral issue of shutting down a potentially sentient AI system was then posed,

P4 *I wondered if it's ultimately up to the person who can pull the plug—you say give me this* [information] *or I'll unplug you.*

P4 *I guess if you really need it you cannot pull the plug out can you?*

Further moral and ethical positions were also divulged that indicate the complexity of the problems that the adoption of AI in the workplace presents,

P3 *I do not feel threatened by it I think there are moral issues potentially with it. What are the boundaries and who sets up those boundaries? The people who set the boundaries will have their own set of morals and who's to say they are the right set of morals. I would not feel threatened by it. But I would be concerned around how it works.*

Collectively, it was widely recognized that none of these issues would be easy to resolve,

P9 *Back to the IPR question—you'd have to go into the algorithm and work out where it got the data. Did it get that little bit of data software from the software house or was it from dodgy data that it got from the customer. I think that's where you are going to have the arguments really.*

6.7 | Division of labour around AI

The respondents' perceptions of how AI may disrupt the performance of work reflected their definitions or ideas of what comprises AI. For instance, most thought that AI would have some valuable role within an organization but that its capabilities would be limited in some way,

P1 *My job will become a lot easier if I would have AI assist me.*

P2 *The end would be to...to free up capacity within an organization for people to do more work.*

P5 *Maybe those creative type skills that maybe a machine will not be able to learn how to perform.*

P7 *You can buy lots of systems and tools that are kind of half-baked right now. They'll do some of the stuff really well and some of the stuff really, really badly. So, is it a complete replacement for a human—no it's not.*

The majority of participants therefore predicted that the implementation of AI would have some impact on future roles in general,

P2 *They'll be a lot of jobs that people do now that an AI or well-functioning AI can limit that support staff to someone who just retrains the AI.*

P9 *I take a step back and think 'this is a technology revolution and in the mid-19th century machines were brought in and people just changed their skill sets accordingly. Maybe that's massively optimistic.*

Some even thought that AI would be capable of replacing many existing roles,

P5 *I guess the issue being that actually how far does it go and does it start to replace what we are doing...people lose their jobs a result, that will inevitably happen at some point.*

However, it is interesting to note that all of them thought that AI would have an impact on other people's roles but that their own would not be one that would be significantly affected,

P2 *I work in professional services. Business consulting. A lot of it is very intangible. I do not think a system could take so much linguistic data.*

P4 *I have not seen anything really that I feel could come in and take that away because it still very much relies on that human interaction.*

P5 *Particularly in procurement some of the things that we do that really set us apart from a machine or a robot is around the creative stuff. I think that's the stuff that it would be very difficult for a machine to do and that's the stuff that gets me out of bed certainly on a daily basis is the creative stuff.*

P7 *A lot of my role is human interaction and stakeholder engagement; relationship building and I do not believe a computer will ever replace that.*

P8 *Not in my area no. I do not think it's delivered anything in business process outsourcing. I have not seen anything underpinned by AI at the moment.*

7 | DISCUSSION

This section considers the challenges that AI presents to the adopting organization that were identified in the analysis. In keeping with an Activity Theory approach, the focus of the discussion is those tensions that affect the nature of the performance of work. Termed 'knotworking' by Engestrom et al. (1999) and 'disturbances' by Blackler (1995), these tensions affect the achievement of individual and collective goals.

7.1 | Concepts of AI

As discussed in the literature review, AIn applications are relatively easy to visualize. This capability may be due to there being more instances where AIn has already been implemented, and people can therefore draw upon concrete examples. It may also be due to the notion that AIn is thought to largely comprise methods of automating existing forms of work. The empirical evidence certainly supports the idea that many individuals perceive AIn as an approach that could undertake the mundane, repetitive elements of their own jobs.

Contrastingly, AIg applications are considerably more difficult to appreciate. In accord with the literature review, many individuals pictured future or advanced forms of AI as precursors to some dystopian scenario (Sections 6.1 and 6.6). This viewpoint may be due to their lack of exposure to AIg and may also be due to bias through being exposed to media-generated doomsday prophecies.

This study suggests an alternative interpretation of the impact of AIg, that is, individuals consider AIn applications as presenting less of a threat to their own job security than AIg. For instance, many of the participants volunteered examples of AI as an 'augmenting technology' that would improve their own performance of work, mainly through undertaking the routine operations (Section 6.1, 6.2 and 6.3). However, when they were prompted to discuss how future AI could be utilized in the organization, they all identified that it could entirely replace existing jobs (Section 6.7). This perspective could simply be a 'fear of the unknown' or a fear that AIg is a threat to their job security, however, since all participants identified that future AI would be a threat to everyone else's jobs but not their own, we interpret it as an indication of the sense that AIg is perceived as a threat to their job security.

Whether our interpretation that AIg presents a threat to job security is correct or not, individuals' perceptions of AIg have implications for the organization. The current fear of AIg indicates an internal resistance to this technological change. Such resistance is likely to be further entrenched by sensational media content and the absence of concrete examples of beneficial AIg implementations. It may also inhibit the desire to explore further opportunities for AI adoption. Consequently, the organization risks lagging behind the industry and its competitors. The organization may therefore be caught in a 'catch 22' situation whereby the lack of AIg case examples precludes the ready adoption of more advanced AI, which, in turn, further embeds the reasons to be fearful of future AI. AI developers and potential adopters may need to justify the expenditure on AI systems not merely by fiscal measures but also in knowledge acquisition and through improving the company's readiness for change.

7.2 | Intellectual property rights

The issue of IPR ownership featured highly in all of the discussions with the respondents (Sections 6.5 and 6.6). While the emphasis placed upon IPR may be due in part to the nature of the adopting organization, which relies heavily upon the development of new insight and technologies, it is not an issue that is unique to this company or sector. Consequently, IPR within AI scenarios is likely to be an issue that affects a broad range of organizations and industries.

The empirical evidence indicates that the IPR that AIn systems may generate would be perceived to belong to the organization. The arguments for this viewpoint ranged from comparison to human workers whose IPR belonged to the employing organization and the notion that anything that arose from the analysis of the company's data would similarly belong to that organization.

However, the perspective of ownership changed when considering cases of AIg-generated IPR. Arguments were made for viewing AIg systems as being comparable to human workers and, therefore IPR ownership rested with the organization, while others considered whether the developer of the AI system would have legitimate claims to IPR ownership. Many participants recognized that these would be contractual issues, similar to other commercial projects that are carried out.

The discussion around the ownership of IPR became more complicated when the respondents considered AIg systems that were also 'sentient' or 'human-like' (Section 6.6). At this juncture, many raised the (potential) problem of motivating an AI system—to 'hand over' any IPR or intelligence it may be capable of generating. Activity Theory considers the subject of the work system, the human worker, to be the agent that possesses motivation to carry out work. However, AIg potentially introduces the need for the dimension of motivation to be considered in the Tool within the work system, which is discussed further in the following section.

7.3 | Disruption of activity systems

The potential for both AIn and AIg to radically alter the ways of working is indisputable. Even if AIg systems fail to become a reality, AIn affords the means of transforming the nature of work through the automation of routinised activities and analyzing data sets that are beyond human capabilities. However, it would be remiss not to consider how future AI systems that approach or become AIg may impact the ways of working. To this end, Activity Theory affords an apposite lens for this study, and its use indicates that AIg adoption has significant implications for the performance of work in the future.

The previous section raised the notion of sentient AI systems posing a unique set of problems for their adopting organizations regarding IPR ownership. In particular, it suggested that AIg systems require the dimension of motivation to be recognized within Tools in the Activity Theory framework. The literature review and empirical evidence also point to further development that Activity Theory may require. For instance, the respondents discussed how their current

roles could be augmented by using AI systems, primarily through the automation of repetitive tasks (Sections 6.1 and 6.2). They also identified the likelihood of future AI systems replacing many current jobs, although interestingly, not their own (Section 6.7). Additionally, they recognized the potential for future AI systems to undertake mission-critical work such as strategic decision-making and directing the activities of human workers. The literature review identified instances where human workers are already employed as data sources for AI systems that make 'intelligent' decisions based on mental models derived from human inputs.

Collectively, we posit that such developments would require the structure of the systems of work, as depicted by Activity Theory, to be reformulated. Figure 3 presents our reconfiguration of Activity Theory that exchanges the role of human and AI agents. In doing so, it satisfies the requirement that Tools now possess the dimension of motivation since it now represents human workers motivated by the base needs to be satisfied by employment. The Subjects of work, that is, the agents that perform work now represents AIg systems. As Subjects, Activity Theory attributes those agents with the motivation to perform work.

At this juncture, it is necessary to reaffirm that in this case, the Subjects are AIg systems that possess human-like intelligence and, thereby, human-like behaviors. While their basic needs may be different to those of human workers, there is no reason to expect that such systems would not possess some internal motivation or even 'desire'. We should also reconsider human workers' motivations in this scenario, since their ability to self-actualise through the performance of work has been removed now that they are Tools and serve AIg Subjects. Will the large-scale replacement of human workers with AIg systems enable society to enjoy greater free time and thereby enable the pursuit of other life-affirming goals?

While this future scenario may seem rather far-fetched, AI presents a technological leap unlike any other that has come before and
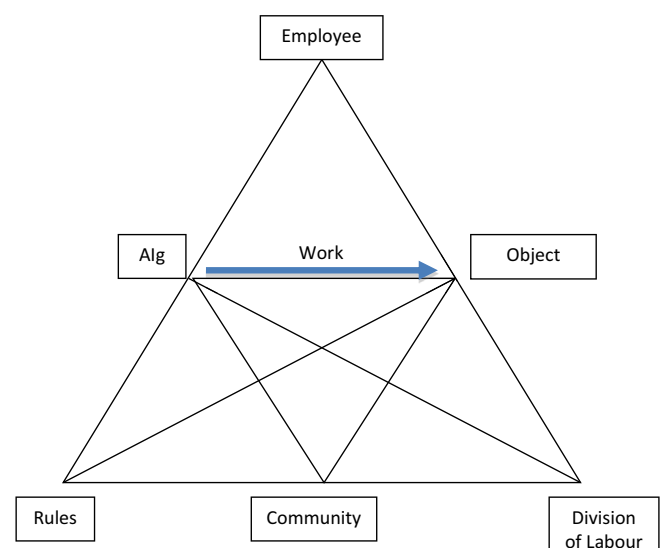
FIGURE 3 AI as subjects in the performance of work

is likely to become one of society's 'wicked problems'. Only relatively recently have higher order primates been granted rights that recognize them as intelligent 'non-human persons' (Barnes, 2015; Mazie, 2015; Sentience Politics, 2018; Sommer, 2017). Primates have also been argued to possess a sense of property (Brosnan, 2011). One can question at what point similar concepts may be applied to sentient AI systems.

This question has, in part, already been addressed. For instance, the AI robot 'Sophia' has been granted citizenship in Saudi Arabia (Galeon, 2017), and citizenship tests for future systems are being developed (Independent, 2019). In the U.S., corporations have been granted certain rights, and there are arguments that AI systems should be granted similar (Yampolskiy, 2018). However, there are also arguments against such a move (Conversation, 2017), but these seem to be based upon 'trust' and lack of understanding rather than being theoretically or empirically grounded. Fundamentally, is there anything that prevents AIg systems from demanding holiday entitlements or claiming ownership of IPR? Could an AI system with UK citizenship refuse to, or be prevented from relocating to another part of the world should the organization choose to restructure?

8 | CONCLUSION

This study is one of very few that makes an empirical exploration of the potential impact of AI upon systems of work. Informed by Activity Theory, it examines the perceptions of key stakeholders of the impact of AI in a large global petrochemical organization. Having begun to trial and implement AI solutions in a limited range of situations, the company is now considering how to develop its future AI strategy. In the absence of guiding theoretical and empirical research, and encumbered by sensation media stories, the organization commissioned this examination.

This research highlights three areas that require due consideration in developing and implementing AI strategy. Firstly, while more modest examples of AI implementation are relatively easy to visualize since there are concrete examples for individuals to draw upon, the utilization of more advanced forms of AI are much more difficult to envisage. Dialogues around the future potential of advanced AI systems tend to reduce to generic anti-utopian scenarios, but discussion of their application in work-based environs appears enlightening. There is a unanimous and fearful appreciation that advanced AI systems will replace the majority of roles, however, most interestingly, nobody considers that their own function is at stake. Second, for this organization, the question of who owns the intellectual property generated by an AI system is important. Generally, this problem is seen as a commercial question to be addressed in any contracts for the procurement of AI systems. However, it becomes highly problematic when considering that such future AI systems may be sentient. Third, current changes in legislation have granted AI systems citizenship, and this trend may develop to encompass other inalienable rights. Collectively, these pose significant problems for society at large as well as for organizations that adopt or develop the technologies. The

emergence of more advanced forms of AI, along with the current utilization of human workers as data sources for intelligent systems, suggests that future systems of work may substitute human and non-human workers within the framework of Activity Theory.

Through adopting systems of work as the lens through which the impact of AI has been examined this study proffers a contribution to Activity Theory. Traditional Activity Theory identified human workers as the subject of the systems of work, that is, they possess the motivation to perform work. The extant literature and the empirical evidence suggest that intelligent AI systems may become the Subject of systems of work in which human workers become the Tools. While this scenario is redolent of a dystopian future, we posit that it is not necessarily the case. Contrastingly, the broader application of AI systems may enable human workers to focus on the creative elements of organizational work or afford them the time and opportunity to pursue more enriching social activities.

The focus of this study has been the perceptions of key stakeholders within a single company. While their perceptions ought to be indicative of the issues that face many 'non-tech' companies it must be recognized as a limitation of the generalizability of the findings. Future research should contribute to the corpus of empirical work that tackles this emerging 'wicked problem'. Valuable explorations can be made of case examples of AI implementation, particularly those that examine the perceived and actual effect on job roles and performance. Studies of the implementation of advanced forms of AI are particularly valuable and should seek to understand their societal impact and operational efficacy.

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