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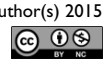

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# Technology, Affordances and Occupational Identity Amongst Older Telecommunications Engineers: From Living Machines to Black-Boxes

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## Abstract

This article explores the relationship between technology and occupational identity based on working-life biographical interviews with older telecommunications engineers. In the construction of their own working-life biographical narratives, participants attached great importance to the technology with which they worked. The article contends that workers' relationship with technology can be more nuanced than either the sociology of technology literature or the sociology of work literature accommodates. Adopting the concept of affordances, it is argued that the physical nature of earlier electromechanical technology afforded engineers the opportunity to 'fix' things through the skilled application of tools and act as autonomous custodians of 'living' machines: factors that were inherent to their occupational identity. However, the change to digital technology denied the affordances to apply hands-on skill and undermined key elements of the engineering occupational identity. Rather than simply reflecting the nostalgic romanticizing of the past, the biographies captured deterioration in the material realities of work.

## Keywords

affordances, anthropomorphism, biographies, engineers, labour process, nostalgia, occupational identity, technology, telecommunications

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## Introduction

The role of occupational identity in dealing with the challenges presented by major organizational change has been explored in this journal and elsewhere (MacKenzie et al., 2006; Strangleman, 1999, 2012). Despite the distinctive technologies of production often associated with occupational communities, there has been surprisingly little attention paid to the role of technology in the formation of occupational identity and how changes in the nature of technology impact on identity. Moreover, there has been limited engagement between the discussion of identity in the sociology of work literature and the sociology of technology debates. Based on working-life biographical interviews with older, often retired, telecommunications engineers, this article explores the role of technology in the development and maintenance of occupational identity and the centrality of technology to the occupational community that underpinned this identity.

Research participants reflected on careers spanning from the 1960s to the 1990s, spent with the UK's national telecommunications provider, BT. This period witnessed major changes in the technology and organization of production and, latterly, sectoral restructuring associated with liberalization and privatization, leading to organizational restructuring and major redundancy programmes (Ferner and Colling, 1991; MacKenzie, 2000, 2002). Throughout this turmoil, the occupational identity provided a point of reference in an ever-changing environment and, notably, in the construction of their own working-life narratives, participants attached great importance to technology. The article draws on identity debates within the sociology of work, including contributions on the role of nostalgia in identity maintenance. These perspectives are combined with insights gleaned from the sociology of technology literature, notably the concept of affordances and contributions in the labour process tradition. The labour process perspective sheds light on the erosion of discretion and autonomy associated with deskilling experienced by telecoms engineers. Focusing on technology as a means of asserting managerial control only captures part of the story, however, and overlooks the role of technology in the formation and maintenance of occupational identity amongst technically skilled workers. Drawn from another tradition within the sociology of technology debates, the concept of affordances – the opportunities presented to social agents by their interaction with technological artefacts – offers some purchase in explaining the contribution of technology to occupational identity.

The following review of the literature draws together contributions from the sociology of work debates on identity, and seeks to build links with the sociology of technology literature. The next section discusses the methodology, particularly the use of working-life biographical interviews. The findings of the research are then presented, followed by a concluding discussion.

## Work, Identity and Technology

The importance attached to work in the formation of identity has been long debated within the sociology of work literature, although the contours of debate have shifted over time. In key contributions to the debate from the 1960s and 1970s, work played a central role in identity formation (Goldthorpe et al., 1968; Salaman, 1971). As the turn of the millennium approached, so came apocalyptic declarations of the 'end of work' (Beck,

2000; Sennett, 1998), which challenged the existence of stable employment as a key reference point within modern life and even questioned its previous prevalence as anything more than rose-tinted, romanticized nostalgia. In recent years there has been a revival of interest in the role of work, or its absence, in identity (MacKenzie et al., 2006; Strangleman, 1999, 2007). The work of Strangleman (2007, 2012) and others on 'nostalgia' is of particular relevance here. Strangleman challenges dismissive portrayals of 'golden ages' of stable careers and occupational communities. Drawing on the work of Davis (1979), Strangleman (2012: 415) confronts the pejorative connotations of nostalgia, ranging from 'sentimental attachment' to the 'falsification of history', to argue that the critical assessment of 'memory around occupational community' can provide useful perspectives on industrial and social change. Rather than seeing nostalgia as a regressive desire for the restoration of the past due to the inability to adapt to change, or the melancholic longing for a past to which return is impossible (Ritivoi, 2002), nostalgia is regarded as a useful resource for maintaining identity in the context of change (Davis, 1979; McDonald et al., 2006). Crucially, the collective memory of norms and values provides the basis for critical understanding of the changes experienced in contemporary (working) lives (Strangleman, 2012). Thus, nostalgia can provide a 'more active intervention' (Strangleman, 2012: 423). The collective memory deposit in nostalgia can provide the basis for critiques of change (Brown and Humphreys, 2002) or alternative organizational narratives of change, legitimized by the occupational identity of the custodians of that memory (McDonald et al., 2006).

The insights into occupational identity offered by older railway workers in Strangleman's (2012) contribution resonate with a body of research into the role of occupational communities in identity formation. The perception of distinct attributes and values shared by members of an occupational community provide the basis for occupational identity, which in turn is supported and reproduced by the occupational community (Bechky, 2006; Salaman, 1971; Strangleman, 2001). For members of an occupational community, emotional attachment to work may be heightened by employment that is physically demanding, dangerous or highly skilled – factors that provide the basis for in-group solidaristic relationships (MacKenzie et al., 2006; Salaman, 1971). Similarly, trade union membership (MacKenzie et al., 2006; Metzgar, 2000; Salaman, 1971; Strangleman, 2001) and the values associated with public sector employment (Martinez Lucio and MacKenzie, 1999) can contribute to the collective identities reflecting, and underpinning, occupational communities. Socialization into such communities may require reaching the accepted level of technical competence (Orr, 2006; Strangleman, 2012) but is also a demonstration of adherence to unofficial, although no less codified, sets of rules and values. Occupational communities are embedded in work practices (Bechky, 2006), both formal and informal, which, for the informal particularly, new entrants rely on old hands to communicate and mentor (Orr, 2006).

Given the idiosyncratic technical skills and technological engagement required to be members of many traditional occupational communities, such as railway workers or steel workers (MacKenzie et al., 2006; Strangleman, 2012), it is surprising that there has been little discussion of the role of technology in debates around occupational identity. There has also been limited engagement between the sociology of work debates on identity and the sociology of technology literature. There are examples of the discussion

of technology *within* the identity debates in the sociology of work literature, which have identified a strong degree of attachment between individuals and the technology with which they interact (Marks and Lockyer, 2004; Marks and Scholarios, 2007). Where the sociology of work literature has coincided most strongly with the sociology of technology debates has been in contributions stemming from the labour process tradition. Contributions in this tradition often focus on the role of technology as a means of asserting management control over labour (Braverman, 1974; Edwards, 1979), with some attention to the role of technology in workers' resistance of management fiat (Gordon et al., 1982). The technology of production became the means by which management enforced technical control (Edwards, 1979), determining line speeds and prescribing the conduct of work. Braverman's (1974) seminal contribution set the parameters of a debate that associated technology with control through deskilling. Workers were robbed of discretion over performing tasks by the increased separation of conception and execution in routinized work, facilitated by the incorporation of the skill requirements into the technology of production: a process witnessed across the range of modern workplaces (Callaghan and Thompson, 2001; Taylor and Bain, 2005). Yet, although the introduction of new technology may often be associated with advances for the interests of capital, this is not necessarily an uncontested process (Gordon et al., 1982). In short, rather than deterministic, the role of technology is better understood in terms of the social relations of production and the broader social relations of the capitalist mode of production.

Labour process contributions have often been caricatured, particularly by social constructivists, as technologically determinist (Hutchby, 2001; Wajcman, 2006). Moving away from this central concern with the technology of production, social constructivists alternatively stress the way that the meaning of technology is determined by the user (Grint and Woolgar, 1997), which has led some to relate technology to identity. Grint and Woolgar (1997), for example, explore identity issues associated with differences in the social construction of the meaning of technology between its end users and those with the authority to 'speak for' that technology as representatives of its designers. The direction of causality flows from the pre-existing identity to the construction of the meaning of the technology. Such accounts, however, tend to be both individualized and detached from the social structures that shape the respective positions of these agents.

Rejecting the social constructivist notion that the meaning of technologies differ according to the interpretation of the user, the debate around 'affordances' (Bloomfield et al., 2010; Hutchby, 2001; Stoffregen, 2003; Volkoff and Strong, 2013) offers a potentially useful avenue for drawing together the sociology of technology literature with identity debates within the sociology of work. The affordances perspective views technological artefacts not in terms of inherent properties, or in terms of their socially constructed nature, but rather in terms of the opportunities they afford social agents who interact with them (Hutchby, 2001). Hutchby (2001) uses the concept of affordances to demonstrate that technology both enables but crucially also constrains the ways in which it can be used by different agents; the objective features of technologies constrain the meaning and possible uses of technological artefacts.

The concept of affordances developed from Gibson's (1979) work on the psychology of perception. For Gibson, all living creatures interact with natural objects according to their affordances, or the possibility for action they offered. The affordance offered by a

given object varies for those creatures using it; to adapt the analogies employed, a small pool of water may afford a drink for a horse or a bath for a sparrow. However, this variation is not limitless, nor is it contingent on the needs of the user, but rather is constrained by the objective properties of that pool of water. The vital quality of affordances is the opportunity for action (Hutchby, 2001). The classic example used to explain the affordances offered by an artefact is the fallen log that presents the affordance to sit, to those who can realize this opportunity. This affordance would be open to most people, although not an infant (Volkoff and Strong, 2013), but crucially may or may not be realized. Therefore, in addition to the capability to actualize the affordance offered by an artefact, there has to be an agent who has the intention or goal of doing so (Stoffregen, 2003). We would extend that list to include capacity due to knowledge or skill. To add our own, less homely, example: to the average computer user, a laptop might present the affordances of word-processing a document, sending an email or browsing the Internet; to a skilled computing professional the affordances presented by a laptop could also include programming, coding and analysis. This article employs the concept of affordances but seeks to extend its application to explore the relationship between technology and identity. Rather than the unidirectional influence of identity over technology implied in the social constructivist perspective, it is suggested that affordances allow insight into the dialectical relationship between technology and identity.

## Methodology and Background

The article examines 26 working-life biographical interviews with older, mainly retired, ex-BT telecommunications engineers. The research design was influenced by the biographical methods employed in life story and life course approaches across sociology and adjacent disciplines (Bertaux and Kohli, 1984; Bertaux and Thompson, 2006) but which are relatively under-utilized in the sociology of work (Mrozowicki et al., 2010). Biographies allow the exploration of life contexts, social roles and social relationships, and so are useful tools for accessing personal reflexivity (Caetano, 2015). In turn, accessing the reflexivity of older workers allows insight into the nuances of complex social processes (Strangleman, 2012). We draw on Bertaux and Kohli's maxim that: 'The life story approach should be based on narratives of one's life, or parts there of' (1984: 217). The working-life biographies focused on the period of participants' lives spent in employment, including the periods leading to and following their careers as telecommunications engineers.

Bertaux and Kohli (1984: 215) express the aims of biographical narratives as being to garner accurate descriptions of participants' life trajectories, for insight into patterns of social relations and social processes that shaped them. Use of the word 'accurate' raises obvious issues over recounting events that occurred decades earlier. In addition to partial or selective recall, recollection may be shaped by the collective memory of groups of peers, or influenced by organizational memory bent on the development of legends or received versions of history (Martin et al., 1985; Rowlinson et al., 2010). This is not to deny the importance of accuracy but, following Bertaux and Thompson's (2006: 13) defence of life story methods, in asking participants to describe and explain as factually as possible, the aim is to gather both factual and interpretive information. The working-life biography

approach was not intended as an objective account of indisputable facts but rather an interpretation and reflection by participants on how events shaped changes in attitude over time. Interviews explored the long-term pathway of specific aspects of the life course, and transitions between different phases. This retrospective approach was essential for providing a long-run perspective on occupational identity. The approach encouraged reflexive thought and abstraction from the discussion of daily routines or events – the recall of which illustrated broader changes in the lived experience of the workplace.

Individual interviews were supplemented by two multiple-participant interviews: first with two, then with three participants. These interviews proved extremely useful in terms of the insight generated through the interaction between participants. Multiple-participant interviews allow insight into how group values are deployed and the ways individuals jointly construct meaning, thus representing an ideal tool for researching the construction and maintenance of collective identities (Chatrakul Na Ayudhya et al., 2014; Green, 2004; Munday, 2006). Used in combination, these methods proved useful and effective in accessing individual reflexivity and locating this in the collective context.

Interviews varied in length from around an hour up to four hours, with the majority being 90 minutes to two hours. Interviews were fully transcribed and NVivo software was used in coding the data. Coding was undertaken by two members of the research team in order to provide contrast and triangulate perspectives on the developing of codes. Interview participants were all male, which reflected the historic occupational gender division within the organization, and ages ranged from late-50s to early-to-mid-70s. The majority had started their careers as apprentices in the 1960s; most had then left BT as a result of mass redundancy schemes introduced in the early 1990s. The interviews allowed the participants to structure the narratives of their working lives in whatever way they chose. Although a chronological structure was perhaps encouraged by the initial 'grand tour' question inviting participants to recount their working lives, starting with entry to the organization, the subsequent narrative was structured by the recollection of the individual interviewee. These spontaneous narratives were supplemented with specific questions, for clarity (Mrozowicki et al., 2010). Interestingly, there were no pre-planned questions relating to technology. Technology was an emergent theme introduced by the participants.

## Technology and the Occupational Identity

All participants, to a greater or lesser extent, used technology to periodize the narratives of their working lives. The majority used relatively broad periods relating to the electromechanical exchange systems that came into service in the 1960s, to the replacement of electromechanical by digital technology in the 1980s. The broad periodization by technology provided the route into the discussion of working practices, workplace relations, attitudes towards their jobs and their employer, and, ultimately, in terms of their occupational identity, what it meant to be a telecommunications engineer. That technology loomed so large in the construction of the individual working-life narratives of these engineers demonstrated the importance of their relationship with technology in the formation of their occupational identity. Notable within the periodization of electromechanical and digital technologies was the tendency to represent the passing of a golden

age. This was both implicit in the recollections of careers that for most represented a source of pride, and explicit in the shared reflexive discussions regarding careers at BT. As Alan recalled:

> When I started with BT it was a big family – it really was a big family. And I don't know what it is but I found that most engineers get along with each other. You must be of a like-minded person, if you know what I mean. With BT, as long as you did your job, as long as you didn't do anything criminal or anything, you had a job for life. That's what you knew and I've got to say, I've talked to my colleagues about this and we feel that period from the late 50s, maybe early 60s, through to the beginning of the 90s was *the* best time to work for BT.

There were other material realties attached to this periodization. Changes in technology broadly coincided with the restructuring associated with privatization, the combined effects of which produced a major downsizing programme. The intensification of work and the erosion of the public service ethos were also reflected in the passing of the golden age, but it was the changes in job content associated with the move away from technology that provided a multilevelled sense of satisfaction that underscored all the other changes experienced.

The representation of the golden age was not simply a sentimental attachment to the past, but rather was based in the material realities of work as an engineer, and the aspects of that work that contributed to their occupational identity. There was a tension here between elements of the engineers' identity: one relating to the celebration of technological advances, and the more prevalent aspect relating to the physical interaction with technology. The concept of affordances is useful for understanding this tension. Electromechanical technology afforded engineers the opportunity for action (Hutchby, 2001), the ability to affect change through the skilled application of tools, reflecting both dexterity and knowledge accrued through training and experience: affordances subsequent technology would deny. The crucial issue was the nature of the interaction with the technology. Building on the notion that the same artefact presents different affordances to different users (the thirsty horse or maculated sparrow) (Gibson, 1979; Hutchby, 2001), analysis can be extended to differences in agential capacity associated with skill, expertise or experience. Agents are not only constrained by the inherent properties of an artefact, but also by their own capacity to realize its affordances. Specialist knowledge and dexterity built up through practice meant that the affordances presented by the electromechanical plant to a skilled telecoms engineer were clearly far greater than those available to someone lacking this expertise. To the non-engineer, without such possibilities for action, the affordances offered by the technology were constrained: the possible courses of action – and their consequences – were circumscribed by a lack of expertise. It is not a matter of an unskilled individual failing to realize the opportunity for action, as the opportunity for action does not exist; the opportunity for action is not afforded any more than the pool of water affords the opportunity to bathe to the horse that may be afforded the opportunity to drink. Thus, affordances can be applied to the contradistinction between the engineers and non-engineering grades within BT.

Their relationship with technology was the basis of the engineers' distinction from other workgroups within the organization, providing a sense of superiority over clerical and operator services staff. As masters and custodians of the technology on which the

organization was built, there was a sense of proprietorship over the broader organizational identity. There was some recognition of the public-facing role of operator services staff, which lent a popular perception of operators being synonymous with telecommunications work; but little mention was made of BT's large clerical workforce. There was an interesting duality in the way in which their relationship to technology mediated the contradistinction between the engineers' perception of themselves and other workers in the organization. This distinction often involved projecting a negative perception of engineers onto the other occupational groups. The importance of the hands-on relationship with the technology of production was repeatedly expressed in terms of 'getting your hands dirty', a phrase with multifaceted connotations. The phrase depicted the barbarous 'other' – the industrial worker with dirty hands that posed a threat to the sanitized office environments non-engineering workers occupied. As Eddie reflected:

> I mean, when I started on BT the clerks got paid more than we did. By the time I left, of course, we got a lot more than they did. White collar post at the time was looked up to, y'know. Get your hands dirty and you were just a scrubber really (laughs).

The symbolic nature of the phrase resonated regardless of the considerable variation in the nature of tasks performed by different engineers and just how dirty their hands actually became. By turn, the distinction of getting your hands dirty reinforced the superiority of engineers as the only ones doing a 'proper job', a job on which all other groups were dependent; performing the work without which the other grades would not exist. As Peter explained:

> [T]he clerical people and the traffic people, they were the operators, they were very separate from us and, err, they didn't like us and we didn't like them (laughs). Well, I mean the clerical people … We always thought that they got their money for nothing, whilst we had to work like the devil for ours (laughs). And the traffic people, erm, well, I suppose they were doing a job really …

The historic experience of the workplace tended to be represented in interviews as a technocracy. Apprentices spent their first three years working on a wide range of technical tasks relating to different aspects of the telecommunications network. Technical instruction went hand-in-hand with the initial socialization into the value system and informal rules that made up the occupational identity. On a number of occasions participants made reference to the men who had socialized them into the occupation. Much was made of the wartime military service background of this previous generation, to which both camaraderie and, crucially, a derisorily attitude towards management were attributed. These values underpinned the alternate code of the rank and file, in which engineers were imbued through their apprenticeships.

Subsequent career progression was a predictable, technocratic process. Recalled using militaristic terms that reflected the civil service heritage of the organization, the senior rank on the engineering career ladder, Technical Officer, was seen as the pinnacle of this technocratic process. Crucially, technocracy could also provide a pathway into the management grades. Historically, the first tiers of management, those in direct contact with engineers, would have followed this path.

Although there was a clearly expressed 'them and us' contradistinction from management, this was over-layered with the technical competences aspect of the engineer identity; 'they' were not engineers they were management, but managers with an engineering background were rendered more respect than those without. Over time, however, promotion through the ranks became displaced by graduate recruitment schemes. When managers were no longer ex-engineers they were no longer equipped to deal with the daily challenges to their authority that reflected the 'them and us' divide between management and non-management. Technical knowledge provided both a point of reference for the engineer contradistinction and the opportunity to challenge management authority. As Jack recalled:

> Before, the managers would have worked their way up, they were always from within. But then you had a senior manager's post and you had young chaps coming in from university. Nice chaps but they knew nothing about the basic end of the industry because before, in the past, you would have the area engineer who would turn around and say, 'You know I could have done that job myself', and they [new managers] don't know what you were talking about, so you could get passed them, they didn't know what you were on about.

## *Technology and Autonomy*

Invoking experience in the resistance of management fiat reflected a more defensive aspect of the empowerment historically associated with specialist technical knowledge. The organization of work had traditionally bestowed, and relied upon, a considerable degree of autonomy, which contributed to the occupational identity – to the sense of what it meant to be an engineer. For field engineers, work usually required the movement between a series of locations to perform a list of tasks allocated at base each morning. Planning the order of jobs was the engineer's responsibility and, importantly, work was performed without direct supervision or monitoring by management. Other engineers maintained switching equipment within exchange buildings, being either itinerant between several small exchanges or statically located within major exchanges in large urban areas. Exchange-based work brought a heightened sense of autonomy: the interviews celebrated a virtual absence of management involvement, monitoring or measurement. Participants reported the sense of being assigned responsibility for maintaining the exchanges, without direct supervision or a prescribed set of tasks to perform. As Alan explained:

> It was almost like, if you did your job, all that BT seemed interested in at that time was that the system worked, it all worked well, you didn't get a lot of faults. And as long as you kept the thing working nobody was really on your back, if you know what I mean. They were quite happy. And we did have some quite good times … I mean the only time that you'd maybe get into trouble was if there was a fault and it wasn't cleared. But the staff worked with that system, so if there was a fault that developed everybody would drop everything and muck-in and get it cleared – even if you didn't go home till 8 o'clock at night, if you know what I mean. So it worked both ways: we were keen to keep the system working and BT were keen that we could keep it working, if you see what I mean …. I mean there were rules – don't get me wrong – and you did have a boss that came round, but nobody was over your shoulder all the time.

Engineers working at various stages of the network were tasked with finding individual faults and, crucially, enjoyed the autonomy of dealing with them in the way they saw fit.

This discretionary application of skill reflected another key feature of the engineering occupational identity, the notion of 'fixing' things, which in turn reflected the celebration of the engineer's role as being inherently 'hands-on'. Direct physical contact with the technology and affecting changes in its state through the skilled application of tools was presented as being central to what it meant to be an engineer for many participants. Crucially, it is here that the concept of affordances interacts with the occupational identity: what it was to be an engineer was intrinsically linked to the opportunities for action (Hutchby, 2001) afforded by the electromechanical technology. The electromechanical technology afforded the opportunity for physical interaction, for being 'hands-on' – 'for getting your hands dirty'. This was not just a matter of exercising skills and thereby demonstrating the basis of their sense of distinctiveness but, fundamentally, about engagement in behaviours that were central to the makeup of the engineering occupational identity.

Discretionary decision-making over the appropriate way to tackle a fault was a valued part of engineers' jobs and underpinned their relationship with the technology they worked on. Contriving solutions to problems based on the discretionary application of acquired knowledge and experience reinforced the sense of control over their work, and a sense of stewardship over the technology. Recollection of this work, and of the technology that was central to it, was often expressed in very affectionate terms, particularly by exchange engineers. There was a notable process of anthropomorphism in the way the exchange equipment was described. The electromechanical technology of the switching equipment, which was huge in size and made up of thousands of intricately interconnected moving pieces, was bestowed with the characteristics of living beings; these were machines with a life-force running through them, in terms of electronic signals, which needed to be cared for and sustained. The maintenance the engineers provided was articulated in terms of the health and wellbeing of the machinery, rather than its effective functioning. As Paul enthused:

> I mean, it was interesting. Well you've been in a telephone exchange haven't you? And the roar of it, right? And it talks to you does that noise – and it really does. And if there's something wrong, a click, a squeak or a rattle as you're walking through, and you think, 'Ahh!'. And you go into the racks until you find it again and you find the fault and take it out. Something like that, so erm …, it was for the sake of … maintaining a living thing really. It told you when something was wrong and it told you when everything was alright. It didn't grumble, it didn't squeak, it didn't moan, it didn't groan.

The process of finding faults was, therefore, a valued part of the traditional make up of the engineer's role. Variously represented as 'detective work' or 'hunt and find', the traditional problem-solving approach to fault detection relied upon the skill of individual engineers. The challenges and constant variety associated with fault detection was celebrated as one of the most enjoyable aspects of the job, and seen as one of the defining characteristics of the engineer's role. As Albert explained, the detective work was pivotal:

> Well, it was pitting your wits against … You had to do a fault report. Now it could be in your exchange; it could be in any one of thousands of selectors, y'know. Or it could be in another exchange.

### *The Changing Relationship with Technology*

As digitalization of the network grew through the 1980s, electromechanical exchange equipment was replaced by digital switching. Mechanical moving parts gave way to circuit boards, and the large-scale, noisy equipment was replaced by much smaller digital switching units, which with no moving parts ran near silently. The language used to describe the new technology was notably less affectionate than that used in recollections of the electromechanical equipment: 'clickity-bang' machinery was replaced by 'black-boxes'. Individual mechanical components were no longer 'fixed'; rather, faults were rectified through the replacement of sealed units, or 'cards', a process requiring far less physical intervention and less application of discretion or skill. As Eddie lamented:

> Well, they took responsibility off you. The technology changed, so your technical ability … requirements wasn't the same. In the old days, the telephone exchange, you were as an engineer responsible for it totally, every component. I went through the electronic exchange period. I was one of the first to be trained up on that … All that was great stuff. And then when digital came in you got into a black-box area. Within a black-box it's like a computer; you don't have anything to do with it really. If it goes faulty you just swap it, so you got into that sort of area … where your technical ability wasn't stretched …

In labour process terms, digitalization represents a classic process of deskilling through the embedding of skills within the technology of production. The changes in job content that accompanied digitalization also undermined key aspects of the engineering occupational identity associated with the affordances lent by the electromechanical technology. The ability to physically manipulate machinery through the knowledgeable application of tools was being increasingly rendered obsolete. Yet in turn, the new technology accommodated other elements of what it meant to be an engineer.

Negative accounts of digitalization were not a result of resistance to change: the embracing of change was inherent to the engineering role and celebrated as part of the challenge of the job. Participants made repeated reference to the pride felt at working at the 'cutting edge' of telecommunications technology; by experience, new technology brought opportunities for training and skill acquisition. For some, their initial reaction had been that digital technology essentially required the same attitude to engineering as electromechanical plant. The essence lay in the 'hands-on' approach to 'fixing' faults, even if this no longer afforded the opportunity to exercise skill through applying tools to mechanical apparatus. As Mick explained:

> In the heyday it was great – it was nice to think that you were on the cutting edge of it … We did all that training, bearing in mind that we did the factory training so we were hands-on, we were fixing kit hands-on. We were doing software stuff hands-on and we were actually fixing the processes. That's my job as an engineer. If there was a problem, we used to go and do diagnostics; we'd fix it, change cards and fix it.

Such accounts focused less on the passing of the physicality of maintaining electromechanical equipment and more on the continuation of the 'problem-solving' nature of the engineer's role. Even if faults were not repaired through the physical engagement of tools, thereby diminishing the 'fixing' element of the process, the 'hunt and find' aspect

of the work remained. Engineers were still required to pit their knowledge and experience against the challenge of diagnosing and locating a fault. However, this aspect of the role was also subsequently undermined. Digital technology facilitated the reorganization of work to relocate the detection of faults from the onsite engineers to remote specialist support teams – a classic separation of conception from execution of tasks (Braverman, 1974). For engineers who had adapted to the diminished physical interaction with technology, the loss of the 'hunt and find' aspect of their role undermined another element of the occupational identity. As Don recalled:

> Maybe two years after we did the training, [when] they put the new cabinets in, installed all the cards, looked at it remotely and we weren't even allowed to open the door on the cabinet without permission. So they did all the diagnostics … I was sat on a desk literally this far from where the kit was and all the flashing lights stuff, then you would get a phone call and [it] says 'Right you can now go into Shelf 2, Rack 4, open the door and change that card because we have diagnosed a problem on it and the spare card is in that cupboard'. I said to my boss, 'This is not what I want to do. I am not a remote-controlled card changer; you could train a monkey to do this'.

Again, the concept of affordances is useful in understanding attitudes towards these changes in technology. Different technologies possess different affordances which constrain the way that users interact with them. The intended purpose of the technologies may be the same – the switching and transmission of voice (and latterly data) abstracted into electronic or digital signals – but the way in which the engineers oriented (Gibson, 1979) to these technologies varied greatly. The shift from the electromechanical to the digital technology represented a loss of affordances; digitalization deprived engineers of the opportunity to physically engage and manipulate technical artefacts, to change their state through the appliance of knowledge and dexterity. The very affordances presented by the electromechanical technology, so central to the engineers' occupational identity, were now closed off by the inherent properties of the new technology. Although for a time digital technology afforded some opportunity for action (Hutchby, 2001), in terms of 'hunt and find' activities, this was later denied through the reorganization of work.

The changing nature of the relationship to technology was brought into sharp relief in the early 1990s by the introduction of the 'Work Manager' – or 'Work Mangler' as it became known to the engineers. Via Work Managers, engineers could receive their daily allocation of jobs via remote transmission, removing the need for the traditional morning visit to their base of operations, thereby reducing the opportunities to interact with colleagues and making work more individualized. The system also made individuals more accountable for the completion of specific tasks and, crucially, removed the autonomy to plan the order in which jobs were performed. The relationship with this technology was wholly different from the affection expressed for other technological artefacts. The Work Manager was not a technology of production or the object of the labour process, which could be manipulated through the skilled application of tools, or required the stewardship of engineers. There were no issues of affordances, no opportunity for action in the coming together of skilled agent and technological artefact. Rather than technology that provided a source of pride or job satisfaction, Work Managers were mechanisms for monitoring and accountability that subjugated those who used them. This distinction is

not to suggest a broader division between the technology of production and technologies for monitoring; the embedding of monitoring and control over the labour process within the technology of production is a well-established phenomenon (Edwards, 1979). The distinction from the technology of production is in order to highlight the engineers' changing relationship with technology and its implications for their occupational identity. The Work Manager was a technological artefact that was alien and threatening to the traditions of the engineering occupational identity, rather than contributing to this identity through the opportunities for action it afforded.

## Conclusion

It would be folly to be dismissive of the accounts of these older telecommunications engineers as nostalgia, reflecting an inability to change (Ritivoi, 2002). Change was inherent to the occupational identity of these workers; historically, change was embraced as part of the job and was seen as inevitable, even desirable. The occupational identity that celebrated autonomous, technically skilled work was mobilized to deal with change by taking pride in working at the cutting edge of technology. It was when the relationship with technology began to have negative connotations – when the practices at the heart of the occupational identity could no longer be exercised – that change was seen as problematic. McDonald et al.'s (2006) study of medical professionals suggests invoking the past can be used as a means of critiquing organizational change that diverted from the real business of being a doctor. This account chimes with nostalgia for the old way of working in BT – when engineers were responsible for keeping things running, fixing things, for the autonomous stewardship of the network rather than following management instruction. The new way of working reflected a shift in culture associated with privatization, away from providing a service towards a more profit-oriented logic, that threatened the traditional ethos of a technocracy in which engineers held a unique status. So nostalgia for the period of their careers based on the electromechanical system, in preference for the digital technology that superseded it, was not merely disdain for change per se but change that had materially negative consequences. These working-life biographies were not mythologized accounts of the past but rather reflections on the material realities of the lived experience of work at different stages of their careers. The engineers' accounts were not simply nostalgia for a romanticized golden age but rather the ascribing of a golden age to a period in which the key components of the occupational identity were at their zenith.

How do these recounted changes in the engineers' relationship with technology shed light on their occupational identity? Returning to labour process contributions to the sociology of technology, digitalization provides clear examples of the appropriation of skill through the technology of production – although it could also be routinely argued there were examples of reskilling associated with the new technology. Furthermore, the 'work mangler' system was central to a reorganization of production that stripped away autonomy and discretion in decision-making. However, this provides only a partial view of the engineers' relationship with technology, one that reflects important concerns of the labour process perspective but sheds little light on the role of technology in the formation of the occupational identity of these workers.

Can the concept of affordances shed further light on the issue of occupational identity? Whether individuals experienced the deskilling or reskilling of their jobs, the differences in the engineers' relationship to electromechanical and digital technology reflected a change in affordances. The physical nature of the machinery and the accessibility of moving parts that afforded the opportunity for the skilled application of tools and 'getting your hands dirty' – part and parcel of the engineering occupational identity – were lost with the black-boxes of digitalization.

This does not suggest a technological determinist relationship between technology and identity: the relationship between technology and identity is mediated through the skills and experience of the agents, in this case telecommunications engineers, utilizing the technology. The occupational identity observed in this study was created by the interaction of agency and structure, a process in which affordances were both the product and the mechanism of reproduction. The electromechanical technology of the telecoms network provided the material substrata (Hutchby, 2001) that afforded the engineers the opportunity for 'hands-on' application of their skills, for the 'detective work' of fault-finding and for 'fixing' problems – crucial aspects of their labour process that underpinned their occupational identity. This was not a deterministic or unidirectional relationship; in turn, the occupational community had been central to the reproduction of the skills needed to maintain the technology. This should be seen as a process rather than an end state (Bloomfield et al., 2010). The affordances presented by the technological artefacts may have been based on embedded properties, but these in turn were a reflection of previous encounters between technology and skilled agents, dating back to the artefact's creation and design. Therefore, it is no accident that the affordances were embedded in technological artefacts as this reflected previous social processes. However, this does not equate to a socially constructed definition of technology but rather reflects the way in which agency and structure interact in the creation of technology, and the affordances it represents. The existence of affordances was contingent on the skills of the engineer, but also on the skills of previous generations of technical agents who developed and maintained the technology. The existence of these skills-sets reflects the social structures that created them, including, inter alia: the existence of advanced training programmes and organizational apprenticeship schemes; the existence of the telecommunications network; and, ultimately, governments willing to invest in the development of national economic infrastructure at particular moments in history.

Developed in the way suggested by this article, to include variations in capacity for action associated with skill and expertise, affordances provide a useful lens for understanding the relationship between technology and identity. For future scholars of work and technology, affordances offer a means to look beyond the focus on control that dominates the labour process perspective, and encourages sociology of work research towards more nuanced insight into issues of technology and identity. Furthermore, affordances also offer a useful tool for reconciling the relationship between agency and structure, and so countering social constructivist assertions of technological determinism.

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