

# Middlesex University Research Repository

An open access repository of

Middlesex University research

<http://eprints.mdx.ac.uk>

Moore, Phoebe Veronica and Robinson, Andrew (2016) The quantified self: what counts in the neoliberal workplace. *New Media and Society*, 18 (11). pp. 2774-2792. ISSN 1461-4448

First submitted uncorrected version (with author's formatting)

This version is available at: <http://eprints.mdx.ac.uk/17840/>

## Copyright:

Middlesex University Research Repository makes the University's research available electronically.

Copyright and moral rights to this work are retained by the author and/or other copyright owners unless otherwise stated. The work is supplied on the understanding that any use for commercial gain is strictly forbidden. A copy may be downloaded for personal, non-commercial, research or study without prior permission and without charge.

Works, including theses and research projects, may not be reproduced in any format or medium, or extensive quotations taken from them, or their content changed in any way, without first obtaining permission in writing from the copyright holder(s). They may not be sold or exploited commercially in any format or medium without the prior written permission of the copyright holder(s).

Full bibliographic details must be given when referring to, or quoting from full items including the author's name, the title of the work, publication details where relevant (place, publisher, date), pagination, and for theses or dissertations the awarding institution, the degree type awarded, and the date of the award.

If you believe that any material held in the repository infringes copyright law, please contact the Repository Team at Middlesex University via the following email address:

[eprints@mdx.ac.uk](mailto:eprints@mdx.ac.uk)

The item will be removed from the repository while any claim is being investigated.

See also repository copyright: re-use policy: <http://eprints.mdx.ac.uk/policies.html#copy>

## ***The Quantified Self: What counts in the neoliberal workplace***

### **Lead author: Dr Phoebe Moore**

Senior Lecturer, School of Law, University of Middlesex London, The Burroughs, NW4 4BT  
p.moore@mdx.ac.uk

Bio: Trained as a social scientist Dr Moore is one of the sole scholars in the area of international political economy to write about the ever-changing worlds of work and labour and the impact of technology and changing regulation within the global neoliberal political economy. Phoebe is a Senior Lecturer in the Department of Law and Politics at Middlesex University London and has published several pieces on corporeal capitalism and the quantified self; peer to peer production; labour struggle in East Asia; and global governance over 'decent work'. She is the Primary Investigator for the British Academy/Leverhulme project entitled *Agility, Work and the Quantified Self* (2015 – 2017) and is writing her third monograph on the *Quantified Self at Work* (Routledge).

### **Co-author: Dr Andrew Robinson**

Independent Scholar, ldxar1@gmail.com

Bio: Andrew Robinson is an activist, precarian, and independent scholar, currently based in Nottingham. He is co-author of *Power, Conflict and Resistance in the Contemporary World* (with Athina Karatzogianni, 2010) and solo or joint author of over 20 articles and chapters on topics including autonomous social movements, everyday resistance, post-left anarchy, militarist and securitised discourses, education, Negri, Sartre, Zizek, Stirner, Deleuze, Laclau, Spivak, and Gramsci, as well as a number of activist pieces dealing with issues such as precarity. His column *In Theory* appears intermittently in *Ceasefire* e-magazine. His current research interests focus on the intersection of neoliberalism, precarity, psychological insecurity, and autonomous social movements.

### ***Abstract***

Implementation of quantified self technologies in workplaces relies on the ontological premise of Cartesian dualism with mind dominant over body. Contributing to debates in new materialism, we demonstrate that workers are now being asked to measure our own productivity and health and wellbeing in art-houses and warehouses alike in both the global north and south. Workers experience intensified precarity, austerity, intense competition for jobs, and anxieties about the replacement of labour-power with robots and other machines as well as, ourselves replaceable, other humans. Workers have internalized the imperative to perform, a subjectification process as we become observing, entrepreneurial subjects and observed, objectified labouring bodies. Thinking through the implications of the use of wearable technologies in workplaces, this article shows that these technologies introduce a heightened Taylorist influence on precarious working bodies within neoliberal workplaces.

Key words: quantified self, new materialism, labour process, self-tracking, wearable technologies, big data, neoliberalism, surveillance, control society, Taylorism

***Acknowledgements:*** *We would like to sincerely thank Editor Steve Jones and Section Editor Jenny Korn for New Media & Society for your ongoing support in the process of this publication and to our excellent reviewers who have provided unparalleled guidance in its intellectual contributions.*

***Pre-print version. New Media & Society DOI: 10.1177/146/4448/5604328***

## ***The Quantified Self: What counts in the neoliberal workplace***

*Phoebe Moore and Andrew Robinson*

### **Introduction**

The ‘future normal’ involves more and more tracking devices (Ramirez, 2013) and in relation to wearable and other self-tracking devices (WSTT), the term *quantified self* was coined in 2008 (Lupton, 2013: 26). What differentiates the new genre of WSTT from non-smart watches or phones is that they have a sensory feature, allowing users to quantify specific aspects of their experiences using duration and division. WSTT place responsibility into the hands of productive bodies, but could simultaneously remove autonomy through transferring control of activity directly to those devices that produce extensive data, which is used in ways that users may not feel they have consented. While medical and consumer uses are the best known, workplace use is a major growth area and will be the focus of this paper where we set out to theorise the quantified self at work (QSW).

Here, we contribute to debates in new materialism by maintaining that assumptions driving the QSW rely on the ontological premise of Cartesian dualism with mind dominant over body. Contemporary research on quantified bodies from new materialist approaches draw on both Marxist and poststructuralist authors including Foucault, Marx, Fracchia, Irigaray, Deleuze/Guattari, Spinoza, and Bergson (see van der Tuin and Dolphijn, 2010: 154). Braidotti and DeLanda separately named this shift ‘new materialism’ in an effort to oppose the prioritization of ‘mind over matter or culture over nature’ (van der Tuin and Dolphijn, 2010: 156), instead exploring the ‘embodied structure of human subjectivity’ (Braidotti, 2005/6, see Braidotti, 2006). QSW is an attempt to quantify the affective field so as to render it more predictably exploitable, transgressing mind-body dualism from the side of the mind and eliminating possibilities for experience except as efficient, rational, masculinised, managed subjects (Moore, 2015).

The embodied worker is central to understanding the quantified, precarious self at work. In conditions of precarity, austerity, intense competition for jobs, and anxieties about the replacement of labour-power with robots and other machines as well as, themselves replaceable, humans, workers are compelled to squeeze every last drop of labour-power from their bodies. Indeed, Hardt and Negri argue that, like earlier forms of capitalism which taught workers to ‘act like machines’, the current wave of technologies means that, ‘as general social knowledge becomes ever more a direct force of production, we increasingly think like computers’ (2000: 94-5). The effects on workers’ psychological and physical health are significant, as we will see in the cases of Foxconn, Amazon and Tesco. A line of subordination goes from the economic system to the ego-ideal or subjective image, to the mind, to the body. In effect, each person is commanded (or seduced) to use their mind to subordinate their body to the ego-ideal, and hence to the economic system. Capital encourages universal communication, but only in quantified terms, and thus, anything that cannot be quantified and profiled is rendered *incommunicable* – meaning that it is marked and marginalized, disqualified as human capital, denied privilege.

According to Rose, the ‘self-controlling self’ of neoliberalism ‘calculates about itself, and... works upon itself in order to better itself’ (1996: 164), a process increasingly supplemented by machines that expand processes of workplace discipline (Moore and Taylor, 2009). Such processes are increasingly displaced from the enclosed workplace into the expanded spaces of home-based work, outsourced work, and the social factory. Psychological changes arising from precarity contribute to the formation of anxious selves who have internalized the imperative to perform, a two-part subjectification of workers as observing, entrepreneurial subjects and observed, objectified labouring bodies. Deleuze and Guattari suggest that in capitalism, only capitalists are subjects of enunciation whereas proletarians are subordinated to technical machines (1987: 457). The QSW is an aspect of subjectification as understood by Foucault, as the ‘modification of individual conduct, not only skills, but also attitudes’ (Foucault, 1988). Subjectification takes a particular form in neoliberalism, in which subjects self-define in terms of their status for the external quantified gaze. However, Rolnik argues that, in the neoliberal period, the same individual is now split into both of these components, the entrepreneurial self and the self-exploited proletarian (2011: 48). As split selves, with an inner manager exploiting an inner worker, workers are induced to quantify and regulate their own bodies.

The rise in the use of WSTT is linked to the rise in the precariat (Raunig, 2007; Standing, 2011) involving unstable working conditions characteristic to contemporary capitalism. We show this by comparing the discourses and practices of quantification of the self at work to Marxist and poststructuralist critiques of quantitative thought. From a new materialist stance and using Marxist and poststructuralist insights we challenge both the varieties of poststructuralism that neglect underlying structures of domination, and those varieties of Marxism which ignore changes in the contemporary economy and dismiss questions of affect as merely discursive thus contributing to a growing new materialist literature. We theorise neoliberalism as an affective regime exposing a risk of assumed subordination of bodies to technologies and specific precarious logics that we discuss in the following sections.

### **Wearables and self-tracking as management of precarity**

ABI Research predicts 13 million wearable fitness devices in workplaces by 2019 and a range of companies are now trialling wearables in workplaces. Led by companies such as BP and Autodesk, more than 13 million fitness tracking devices will be incorporated into employee wellness programs by 2019 (Nield, 2014). One employee can create more than 30GB of data per-week based on three wearable devices, 'clearly a huge amount of information that needs to be captured, stored and analysed' in order to 'learn how human behaviours [measured by WSTT] impact productivity, performance, well-being, and job satisfaction' (Goldsmiths, 2014). WSTT are worn around wrists, set within fabrics or sewed under the skin. Devices also take the form of wearable cameras taking location specific pictures, or lanyards and badges that generate a 'social sensing platform' across users. WSTT measure and track arousal and performance both mental and physical via accelerometers, Bluetooth, triangulation algorithms and infrared sensors, allowing managers to monitor workers beyond the enclosure of a specific workplace and beyond traditional hours logged, introducing questions about workplace surveillance. Health and psychology literature argues that healthy people tend to be happier but as yet, little academic analysis has been conducted to look at the impact of bringing the quantified self to workplaces whether in wellbeing initiatives or for straightforward productivity measure. Moore (2015) argues that too much focus on the cognitive dimensions of labour in the new world of work overlooks enduring physicality of labour. Till indicates that specific aspects of self-tracking and gamification of everyday practices can lead to valuable work going unpaid (2014). Not specifically about work, Lupton has identified issues around 'function creep' in self-tracking realms in the areas of 'selfhood, citizenship, biopolitics and data practices and assemblages' (2014). Whitson (2013) warned that the gamification trend, of which QS is a part, ignores the 'messy actualities... in intrusive user monitoring'. Moore and Piwek (2015) have looked at the dark side and 'unintended consequences' of WSTT.

The QSW emerges in white collar and dirty, dark and dangerous workplaces, art-houses and warehouses alike, as a response to precarity. Neilson and Coté ask, 'are we all cultural workers now?' given expressive value has become a key terrain of capture (2014). Management appears to take its foot off a paradoxical pedal both removing explicit control over, but also guarantees of, work. The situation of the precarious worker is one whereby qualified, expressive, creative work is subsumed, where areas of activity formerly considered non-productive are increasingly incorporated in market economies, under the remit of the 'knowledge economy' and 'cognitive capitalism' (Boutang, 2011). With the elevation of workers across industries to 'entrepreneurs' this discourse arguably recognizes only one class: the managerial, entrepreneurial bourgeoisie. Precarity is associated with reduced welfare and informal, flexible contracts (Berlant, 2011: 192), enabled by lean, just-in-time production, telepresence and outsourcing (Berardi, 2009: 75-7; Virno, 2004: 56-9; Negri, 1998: 210-11). It can be defined as a work regime of 'non-self-determined insecurity' (Raunig, 2004), which leads to dependence on capital for survival (Mitropoulos, 2005), disposability (Lorey, 2010), and a 'hell of the absence of guarantees' (Guattari and Negri, 1990: 76). It is an 'epochal recomposition of capital and labor' (Brophy and de Peuter, 2007: 177; c.f. Van Veen, 2010) which uses disposability to re-subordinate workers (Bourdieu, 1998: 85; Lorey, 2010; Federici, 2008), and it is often contrasted in the literature with Fordism. The connection to quantification is that precarity generalizes affects of insecurity that increase the drive to regulate and predict. Precarity manifests psychologically as generalized hopelessness (Berardi, 2009: 30), a 'chronic state of near collapse' (Invisible Committee, 2009: 31), overstimulation and 'attentive stress' (Berardi, 2009: 42), 'present shock' and time-space collapse (Foti, cited Neilson and Rossiter, 2005), all of which push workers towards adopting quantification and wearables as a means to control the uncontrollable. From an autonomist viewpoint, precarity is seen as a systemic capture of the hopeful movements of exodus of the 1960s/70s, when resistance often took the form of 'refusal of work', by the 'slacker' or 'dropout' (Shukaitis, 2006), with refusal to submit to Fordist work routines (Brophy and de Peuter, 2007: 180-1). Capitalism is said to have pursued this exodus into the field of life beyond work, and captured escaping flows by expanding labour into these spaces (Mitropoulos, 2005; Neilson and Rossiter, 2005); Federici, 2008; Frassanito Network, 2005), and appropriating radical ideas, introducing a wave of *flexibilisation* and selling it as *liberation* (Berardi, 2009) and blurring work-life boundaries in the process. In effect, capitalism followed the fleeing workers into the autonomous spaces of the qualitative, and restructured these spaces along quantitative lines, so as to bring the workers back into capitalism. Continuous appropriation manifests capitalism's continued capability to re-invent itself when faced with resistance (Berardi, 2009: 77).

The 'new economy' discourse, which idealises creative workers is often a pretext for imposing precarity (Kapur, 2007: 163-4; Brophy and de Peuter, 2007: 177) or concealing labour exploitation (Dyer-Witford, 2005; Neilson and Rossiter, 2005). Both the 'creative class' discourse, and the case for QSW as self-empowerment in any industry, depend on what Smal (2009) has criticised as 'magical voluntarism', an ideology which elides the reality of class exclusions, blocked opportunities and structural decline by insisting on a miraculous power of each individual to be whatever they want to be with the corresponding assumption that what they 'want to be' is a localised variant on the neoliberal subject. In concrete terms, this belief in compatibility with precarity leads to widespread depression as workers contrast their actual achievements with the myth of what they are able to achieve without social transformation (Fisher, 2014). This is the context for the introduction of quantifying wearables in the workplace in an attempt to bridge the gap between workers' ego-ideal of managerial autonomy and the reality of psychologically debilitating precarious labour. Psychologically, the main effect of such quantification is rising anxiety. Although discourses on the creative industry celebrate a supposedly amorphous, autonomous force of creativity, in practice they rely strongly on quantification, 'enclos[ing] the knowledge and skill of workers and scholars as objectified knowledge and skill' (Raunig, 2010: 21). No wonder, then, that capital seeks to quantify the fields of cultural production and consumption

where work has long been underpaid and undervalued (Terranova, 2000). Critics deem such approaches a kind of gentrification and de-radicalisation of culture, promoting cultural markets at the expense of critical arts, public provision, and economic security (Mokre, 2011; McRobbie, 2011). In earlier periods, the cultural industry was limited to ‘the rationalization of distribution techniques... [not] the production process’ (Adorno, 2005:100). Today, capitalism seeks to rationalize the process of cultural production through expanded quantification. Alongside manufacturing and retail industries, in the creative industries, capitalism has taken over (Raunig et al., 2011: 2) or simulated and cloned (Rolnik, 2011) the dynamics of these struggles and the QSW is symptomatic of this process.

Attentive stress and disposability are intensified by unrealistic expectations fostered by a quantified, machine-like image of human productivity, further intensified by permanent indebtedness leading to a sense of permanent inadequacy (Gill, 1995; Graeber, 2011). WSTT appear to provide objective data on human capabilities, but this claim elides their social context. WSTT measure only users, creating an illusion that the precarian worker – constructed by a particular affective and social field of which these technologies are a part – is identical with humanity, the defining point of human bodily capabilities, and the point from which we should start – an outer limit of ‘human nature’ which restricts political and social possibility. WSTT only measure variance *within* the range defined by precarian affect, providing an illusory, pseudo-objective view of what might be possible *outside* this range. The anxious, depressed, precarian worker’s body, flayed by the reactive affects of precarity, is capable of less and different things, than the empowered, conscientised, actively desiring worker (or work-refuser) – or perhaps even than the Fordist worker or the nineteenth-century worker, the peasant or the hunter-gatherer. Human possibilities are arbitrarily closed off by the reification of measurements which are, in circular fashion, measuring the very system they constitute.

If there is a modern equivalent to Ford, a company pioneering the intensive production methods of the future in the 1930s, then it might well be the giant Taiwanese outsourcing firm Foxconn whose almost million-strong workforce produce many of today’s technological gadgets in a production regime which ‘sacrifices dignity for corporate profit in the name of economic growth’ (Chan and Pun, 2010: 3). Stress and psychological breakdowns, as well as physical health problems, are routine effects of such production conditions (Chan and Pun, 2010; Chan et al., 2013). Workers report they are ‘losing their futures’ (2010: 4), and effects include a well-documented wave of suicides which labour scholars categorise as a form of resistance. Among the characteristics of Foxconn’s regime are rigid internal surveillance systems such as identity checkpoints, frequent body searches and the use of extreme forms of quality control (Chan et al., 2013: 109). Unsurprisingly, wearable and quantified technologies – ranging from low-tech colour-coding of uniforms to the use of fingerprint scanners, electronic smart cards and alerting devices – are central to this regime (Chan and Pun, 2010: 10-11). Foxconn launched a \$6.8 million incubator fund to develop wearables, which it is already producing for its clients including the Apple Smartwatch (Musil, 2013).

Similar trends are apparent in companies in the Global North. One common adoption involves the addition of electronic technologies to name badges and smartcards. Olivetti Research’s Active Badge and successors such as the Sociometric Badge and Wearable Sensor Badge, can trigger automatic doors, transmit wearer identities and forward telephone calls. Some can also record workers’ movements, speech, proximity and interactions, and analyse voice patterns and nonverbal cues to deduce mood and interpersonal influence (Mohan et al., 2009: 45). The Citizen Evolution Process Organism (C3PO) aims to make workers ‘happier and more productive’, showing ‘employees how they can improve their work through better personal habits’ (Finley, 2013) by uploading information about daily activities (including eating, sleep, exercise) to a central database. A central aspect of such technologies is the quantification of what were formerly treated as immeasurable, qualitative aspects of the labour process or the self – such as mood, fatigue, psychological wellbeing, the desirability of cultural products, and the worker’s breaks and time-off. This renders workers permanently visible to management, and renders the sites of everyday resistance, such as worker-to-worker communication penetrable by management, as well as producing data to study the efficiency of communication styles. Some companies even embed RFID chips into workers themselves – a practice initiated by Citywatcher.com in 2006.

Amazon and Tesco warehouses monitor every minute zero-hour contracted workers spend on the performance console using arm-mounted terminals. The ‘wearable terminal’ is in effect a streamlined replacement for the clipboard, allowing workers to scan barcodes on packages from a small scanner worn on the finger. Information from barcodes, or location information is listed on the upper section of the terminal that is strapped to the forearm. Devices operate on a local WiFi network and can further adopt Bluetooth for syncing with other devices. Adam Littler, undercover reporter, took a position through an employment agency as a ‘picker’ in the Amazon warehouse in Swansea. The wearable device he was given told him what to collect and gave him requisite number of seconds within which to find the product, tracking his picker rate with a warning that he could be disciplined and beeping if mistakes were made. For 11 hour shifts workers ‘are machines, we are robots, we plug our scanner in, we’re holding it, but we might as well be plugging it into ourselves... literally work to the bone and there doesn’t seem to be any reward or any let-up... the pressure’s unbelievable’ (Bennett, 2013). Another employee stated that the conditions were like a ‘slave camp’ (Bennett, 2013). Working conditions have become so intolerable that Amazon is offering unhappy employees up to 5,000 USD if they would like to leave their jobs (Cockburn, 2014).

In a similar experiment, Tesco tracked productivity as part of a 9 million dollar investment into similar wearables adopted in 300 locations across the UK. At a distribution center in Ireland, warehouse workers gather products from 87 aisles of three-story shelves with the incentive to free up time spent writing on a clipboard workers wear armbands that track goods. The band allocates jobs to the wearer, forecasts a completion time, and quantifies movements among the area's 9.6 miles of shelving and 111 loading bays. A 2.8-inch display gives analytical feedback, verifying the order or otherwise 'nudging a worker whose order is short' (2013). If workers meet targets, they are awarded a 100 per cent score, rising to 200 per cent if they work twice as fast. A worker reported 'the guys who made the scores were sweating buckets and throwing stuff all over the place' (Rawlinson, 2013). Warehouse workers are at risk of being penalized if they do not record toilet breaks on devices (2013). The investment was specifically oriented around efficiency and lean production, and led to reducing the need for full time employees by 18 per cent (Wilson, 2013).

### Thinking about quantification

The philosophy behind WSTT and the overwhelming desire to record and regulate one's body was revealed in publicity for the world's first Quantified Self (QS) Conference in 2007. Kevin Kelly of Wired magazine stated that 'real change will happen in individuals as they work through self-knowledge... of one's body, mind and spirit... a rational [path]: unless something can be measured, it cannot be improved' (Kelly, 2007). This telling case indicates the wider ideology of rational improvement of human performance through knowledge of the body. On one level, self-quantification transgresses the mind-body split, however, it also places the mind firmly in control. In this binary, the mind determines rational knowledge and quantification. The body (and 'spirit') are passive objects of this process, subject to being improved whether they like it or not. The body has no agency of its own accord. It also creates contradictions, because the Cartesian split is maintained even while recognizing the inseparability of body and mind. In this section, we investigate Marxist and poststructuralist debates on quantification to show that QSW contains elements of Taylorism where a Cartesian ontology predominated but goes further in its pervasiveness as considered in the following. In response to Bruff's call for 'a renewed phenomenology of our lived, corporeal experiences as situated in capitalist conditions' (2013: 80) we map ontologies of poststructuralism across Marxist claims, to identify ways to advance a study of the QSW in the era of 'corporeal capitalism' (Smith and Lee, 2015; Moore, 2015).

Von Osten describes Taylorism as the 'rationalization of body-machine-management relations' (2011: 135), a process taken further in the quantified self movement. The core technique of Taylorism is the external regulation of working bodies through cost accounting, time-motion measurement, and record-keeping, a process opposed by trade unions at the time it was introduced, but hailed by managers as a 'path to prosperity, efficiency and social betterment' (Stone, 2004: 35). Examples include the Bedaux system and Gilbrith's time-motion studies. Taylorism undermined the tacit, qualitative knowledge that empowers workers, instead concentrating knowledge work within the planning division. The division of the work process into precise tasks removed skill, and tacit knowledge, from the work process itself. This approach was widely criticized by labour process theorists (e.g. Braverman, 1974; Thompson and Smith, 2010; Newsome et al., 2013). Labour process theory focuses on labour power's ongoing transformations in the context of capitalism (Thompson and Smith, 2010) and is committed to identifying how the 'qualitative intensification of labour' seen in emotional, affective and aesthetic labour impacts working lives and the capturing of employees' tacit knowledge (Thompson, 2010). However, other than Upchurch's recent work (2014) Marxist and labour process perspectives have not fully considered the use of the newest forms of surveillance and monitoring technologies in workplaces.

Contemporary workplace uses of tracking devices are subtly different in that the worker often holds knowledge accumulated, but in many cases she is not permitted to fully express nor use it. Whereas traditional Taylorism targets external performance within enclosed factories, QSW allows control of microsocial and inner processes in open-ended working environments. Drucker (1992) observed that 'knowledge workers' work cannot, by definition, be measured by traditional Taylorist devices. The QSW is thus part of managerial efforts to control and extract value from creative as well as physical labour in more precise, quantified ways. WSTT may raise productivity and hopefully, workers' wellbeing, but like Taylorism, it raises new demands on workers, potentially intensifies workloads, and leads to rationalization of staff, whilst displacing accountability. The measure of *physiolytics* is a way to extract information from wearables data 'to improve performance' (Wilson, 2013). While physiolytics is predominantly used in sport it is 'spreading to workers in factory and office settings as well' (Wilson, 2013: 1). This is an updated version of time and motion studies originally endorsed by Taylor with enhanced recognition of the corporeal dimensions.

There are theoretical and philosophical problems with the reduction of qualitative aspects of life to quantification. In poststructuralism, the critique of the Cartesian mind-body split can be traced to Foucault's observation that the modern gaze entails a split between the observing subject (mind) and the captured, observed object (body) (Foucault 1970: 144). The self-managed worker is expected to incarnate both of these positions in a dialectic of self-observation and self-exploitation (Schmiz, 2013), subsumed within technologies of power that result in a 'kind of prisoner's dilemma: how to calculate the likelihood that the individual will be observed at any given moment, as well as, the seriousness of the deviation and the severity of the resulting punishment' (McKinlay and Taylor 2014: 8). The

QSW is atomized, focusing on the level of individual productive performance and affective/psychological responses. Quantification becomes a form of *mediation*: personalised, atomised subjects are denied direct relations among themselves such as when workers are isolated in carrels, or work from home in a purely dyadic relation with managers and this direct relation is replaced by quantitative measures which compare them to one another. This echoes closely the Marxist analysis of the mediating role of exchange-value as a substitute for recognised relations among workers (Rubin, 1928/1972: 10). Similar critiques appear in the work of Spinoza, Bergson, Baudrillard, and Deleuze. Spinoza's questioning of ontological binaries challenges the quantifiable/measurable assumptions and methodologies of modernity. Processes of quantification as processes of measure assume equivalence and comparable value across objects (Bergson, 1913/2001), functions of mental and imaginary processing, not of the world. The actual world is 'substance... infinite, one and indivisible' (1676/2003: Prop XV). Spinozian substance bears a family resemblance to Bergsonian time, and both of them to Marxian species-being. Each refers to a substantial aspect of human subjectivity that is fundamentally non-quantifiable, and thus counterpoised to the QSW and the discourses of the creative economy. These concepts operate against the divisibility, personalisation, and essentialisation of particular quantified representations of affect and social relationships. The concept of affect is crucial in enabling or disabling our ability to act, and bodies are unquantifiable, since their capacities are known only *in action*: capable of doing things which minds cannot comprehend (2003, section III Prop 2). Hence a body is actually an 'ensemble of relations' and a 'power of being affected' (Deleuze, 1988), thus not universally quantifiable.

Quantification 'has always served to gain mastery over matter, to control its variations and movements... to submit them to the spatiotemporal framework of the State' (Deleuze and Guattari 1987: 389). Capitalism then relies on 'the determination of a state or standard' (1987: 291; c.f. 105), which determines what counts for one. Neoliberalism in its most advanced form becomes a 'society of control' (Deleuze, 1992), the latest phase of an axiomatic capitalist system (Deleuze and Guattari 1987: 434, 453) which is inherently anti-creative (1987:144). Deleuze differentiates between the disciplinary dimension of Foucault's 'environments of enclosure' (1992: 3) whereby disciplinary enclosures exercise power through closed institutions like factories, prisons and schools. Each enclosure, or 'mold', contains its own set of rules and laws. Controls, on the other hand, are modulations, like a 'self-deforming cast that will continuously change from one moment to the other, or like a sieve whose mesh will transmute from point to point' or symptom-by-symptom (1992:4), dividing up the mass which otherwise resists, through a 'numerical language... made of codes that mark access to information, or reject it' (1992: 5). Precarity is disguised as smooth spaces of time, but as numbering becomes subject we enter striated experiences as we quantify our 'selves'. Workers as self-controlling interiority are part of a work assemblage. Workers using WSTT enter into a collective assemblage of enunciation, incorporeal transformation attributed to bodies. Workers enter into a local assemblage as pulse, step and temperature are recorded by devices and inputted into software becoming a machinic assemblage where person becomes machine becomes person. At the point that the autonomic self is measured as related to work and production it becomes striated and made abstract: a physicosocial model of work, an invention of the State apparatus. The number has 'always served to gain mastery over matter, to control its variation and movements... to submit them to the spatiotemporal framework of the State'. Capitalism is a system of disjunction that constantly decomposes social relations (Guattari 1984, 20) and capitalist expansion requires axiomatisation or the subjection of qualitative processes of desire and becoming to particular quantitative systems of formal value.

Deleuze and Guattari develop a theory of *machinic enslavement* as an alternative to traditional, disciplinary social subjection (1987: 456-60). These are distinguished in that the former includes humans as constituent parts of machines or assemblages, whereas the latter constitutes them as a subject related to an outer object (1987: 457). To the extent that people provide feedback into the makeup of institutions, as in today's 'cybernetic and informational machines', they are enslaved rather than subjected (1987: 458). Machinic enslavement rests on perpetual participation and the administration of knowledge (Raunig, 2010: 28), including themes like lifelong learning and constant connectedness (2010: 112). This is a good description of the QSW, which encourages people to identify with a representational, molar image of the self that emphasises self-branding and social performance, and neglects desire and becoming. Machinic enslavement can operate even where there is no visible hierarchy or subjection, as a particular kind of systemically inserted machine (Raunig 2010:16-17). In this system, 'control and self-control interweave as modes of subjectivation' (Raunig 2010: 94). A type of 'extensive' machine, or social relation, allows an escape from 'identity closing effects' and leads to a flight from stratification (Raunig, 2010:34).

Against the majority, which can be quantified and counted, Deleuze and Guattari counterpose a power of the 'nondenumerable' (i.e. what cannot be quantified), associated with flows and becomings (1987:469).

Similarly, some Marxists argue that the 'deformation of the body, the flip side of which is that the free cultivation of bodily attributes and capacities is essential to any historical materialist notion of freedom' (Fracchia, 2005: 41). In Bergson, a similar counterpoint appears in the concept of intuition. This is a type of qualitative awareness of the field of becoming, which has its roots in the inner life, and orients to the creative becoming of life (Carr, 1912: 21). Intuition arises in holistic experiences, awareness of unique moments or beings, and in creative emotions such as joy, sympathy and love. Bergson portrays creative processes – including art and music – as occurring within the field of intuition, driven by the creative emotions (Bergson, 1997: 13-15, 175; Guerlac, 2006: 51). A more sympathetic post-Marxist take on the affective turn typically emphasises affective labour, sometimes as part of a

broader account of immaterial production (Hardt and Negri, 2000; Lazzarato, 1996; Virno, 2004). Affective labour is often seen as part of the process of human liberation through socialisation of production (e.g. Virno, 2004; Holmes, 2004; Hardt and Negri, 2000; Dowling, 2007). However, this take on affectivity risks reproducing the ‘creative worker’ discourse and the neglect of the body that it entails.

Without access to the qualitative, capitalism becomes a system of empty self and social reproduction, where data simply affirms the order it has already prefabricated. The system is circular and beset by a contradiction; functional, but lacks a functional *goal*, because it does not recognise the qualitative, or use-value, the unconscious, symbolic exchange. It is a functional *system* whereby everything functions to reproduce the system. Meaning and value, as subjective phenomena, are irretrievably lost, and distinct institutions become functionally equivalent. It becomes, paradoxically, a functionalism without functions (see Baudrillard, 1981: 77-8). This process reflects the saturation and implosion of capitalism, rather than its dynamism as an expanding system. Increasingly, this requires that the formerly inaccessible qualitative field be quantified so as to bring it in line with the economy. On a world scale, global cities, as command and control hubs for the world economy (Sassen, 1991: 3-4), arguably reproduce the Cartesian model by serving as the ruling brain and ego of the world system. A quasi-monopoly on processes of quantification and financialisation allows the continued dominant position of such sites. Quantification does not generate independent facts. The relationship between questions and answers within the system’s quantitative reasoning is circular: the system receives answers which affirm it, because the questions are less a free choice than a ‘test’ or because they present false choices which lead back to the system (Baudrillard, 1987: 28-9).

Specifically, neoliberal capitalism ‘must constitute itself subjectively.... develop the desires and habits necessary for it to perpetuate itself’ (Read, 2010: 114). Neoliberalism remains a Cartesian subjectivity and system, abandoning rigid separations of Fordism and insisting on processual, systems-level thinking. It continues to subordinate such thinking to the project, as defined by a managerial self, effectively replacing truth with instrumentality as the main epistemic criterion. The managerial self, who manages both her/his subjectivity and the outer world, reproduces the Cartesian trope of the subordination of (risky) body to (rational) mind. Rolnik describes it as a process of each self, envisioned as an entrepreneur, ‘managing all its relationships, choices, behaviours according to the logic of a costs/investment ratio and in line with the law of supply and demand’ (2011: 47). She terms neoliberalism as a ‘mirage of a smoothed-over, stable life under perfect control’, a refusal of life as immanent difference-production (Rolnik, 2011: 28-9). In the process of self-precarisation, ‘everyone had to develop a relationship with the self, to control one’s own body, one’s own life by regulating and thus controlling oneself’ (Lorey, 2006: 85). Seeking one’s inner self or creativity is a ‘dominant feature of contemporary governmentality’ (McRobbie, 2011: 127). Such discourse is prevalent in authors such as Florida (2002) who celebrate the supposed transformative power of the knowledge-based economy despite its contradictions (Jessop, 2000). The result of this process is a reified reality in which observable quantitative facts are actually fetishised effects of class power. Quantification creates a gap between material relations and the dominant, capitalist perception of these relations (De Angelis, 1996: 16, 20). This misperception becomes real because it serves as the basis for how people actually act (Ollman, 1971: 202). Such quantitative effects operate as observable, regular social laws, but the laws that are observed ‘are only those which capital succeeds in imposing’ (Cleaver, 1979: 66), reflecting Cartesian dualisms which are foundational in modern culture, which subordinate observed bodies to observing minds. The state of indeterminacy underpinning such binaries shows the difficulties in maintaining the primacy of the quantitative in a world where the qualitative, immaterial, affective and creative are increasingly central to production. The vivisection of the self into different component parts – observer and observed, public and private, worker on different projects and so on – is crucial to neoliberal production, even as it blurs all clear epistemic criteria for such separations, rendering them increasingly arbitrary effects of an ungrounded corporeal capitalist command.

While neoliberal precarity is a new recomposition of capitalism, it repeats processes that were already present in Marx’s classic critique. As Marx (1990 [1867]) argues, fetishised quantification bears ‘the unmistakable stamp of belonging to a social formation in which the process of production has mastery over man, instead of the opposite’ (pp. 174–175). Since such relations are effects of a form of social life, they can be changed along with the form that grounds them (Cohen, 1978: 127). Quantification affects subjectification through the creation of a certain kind of possessive individual, partly by personalising social problems as questions of individual responsibility, prudence or morality (MacPherson, 1962; Skillen, 1978), an effect of a process of repression, through which the ‘passions’ are subordinated to the ‘interests’ (Hirschman, 1997). Quantification allows individual workers to relate to the total of social labour without forming direct connections among themselves and without relying on community or state planning. The medium of quantitative exchange itself connects and regulates the distribution of labour (Marx, 1990 [1867]: 165), ‘serving as a connecting link between people’ (Rubin, 1972 [1928]: 10). In addition to allowing horizontal and vertical economic integration without horizontal connections among workers, this also allows workers to be pitted against one another as different quantities of labour, even when their real activity is coordinated and cooperative. Without quantification, production could not be disguised as exchange, and surplus value could not be extracted. Although Marx (1990 [1867]) argues that the exchange value of commodities arises from real quantities of labour expended in their production, this labour is itself only comparable on the basis of an illusory quantitative equivalence (pp. 142, 150).



Social labour is reduced to the quality of being abstract human labour, ignoring its other attributes so as to render it quantifiable (Marx, 1990 [1867]: 150). As De Angelis (1996: 13) argues, this process brackets out both differences among types of labour and the life experiences of workers. It also turns workers into objects (Meszaros, 1970: 144) since it renders their labour equivalent to a series of objects.

## Conclusion

While to some degree measuring emotion, feeling and bodily responses, the QSW does not have access to the field of *affect stricto sensu* – the social and psycho-structural underpinnings of affective responses or interpersonal interactions. Worker tracking technologies tell us which working conditions or interactions appear to cause which emotions or social performances – not how or why. They claim to show us what a body can do, but in fact they only show us what bodies have been seen doing, in a particular, determinate social formation which they co-constitute. This is characteristic of a shift from ‘truth’ to empty functionalism, from deductive science to a raw, inductive ‘it-works’ orientation. Coding ‘dividual’ material then opens the distinct possibilities for control such as selling and misusing data produced by WSTT (Moore and Piwek, 2015). Contemporary neuroscience confirms the Deleuzian–Bergsonian contention that sense organs have a double capacity, part of which is oriented to participatory knowledge. The qualitative level ‘allows us to apprehend the world as a field of forces that affect us and make themselves present in our bodies in the form of sensations’ (Rolnik, 2011: 25). The denial of flow and becoming, of all the singularities of life, is crucial: it does not matter to capital if we laugh, cry, fear or go mad, it ‘counts for nothing’ – it is ‘noise’ in the information-theory sense (Guattari, 1996: 137). The epistemic underpinning of QSW perpetuates the image that the mind controls the body, and thus, from a Spinozian perspective, serves to *contain* the body’s power within a *mental* frame largely constituted by neoliberal ideology and subjectivity (the managerial self, quantified productive performance, magical voluntarism). Potentially repressing and denying the qualitative aspects of bodily experience, tracking the self at work is an affective phenomenon in its own right, constructing certain kinds of bodily possibilities.

From the new materialist perspective, what may be missing in emerging discussions about quantifying the self at work is any awareness of the dimension of life *as such* – the field of the temporal, of becoming and differentiation, of the unique experience of life – in Marxian terms, of labour-power prior to its equivalential capture by capital. If quantifying the precarious self is *not* providing a unique expression of ‘life itself’, it is a deepened, extended and uniquely repressive form of discipline and repression of life/labour. The very existence of life itself, as something unrepresented within the system, is rejected; life is exiled from social life, assigned the abyssal status of ‘bare life’ (Agamben, 1998) or assigned a position of absolute incommunicability. At the point that the autonomous self is measured as related to work and production, it becomes striated and made abstract. It is easy to see how this operates in practice, as the value of social performances is entirely reduced to managerial metrics without remainder. Yet, the repressed force of the qualitative returns in the form of psychological symptoms and problems borne by precarious workers. Future research should identify an emerging digital double movement like those seen in emergent practices of social movements: people who are responding to the ‘problem arising out of modern [post]industrial conditions ... aimed and safeguarding of some public interest against dangers inherent’ (Polanyi, 1957 [1944]: 153; insert by present authors).

To conclude, therefore, WSTT are part of an emerging form of neo-Taylorism which risks subordinating workers’ bodies to neoliberal, corporeal capitalism. In the short term, quantification helps corporations and self-employed precarians to keep up with cut-throat competition. In the long term, this approach undermines life to capital to an unsustainable degree, destroying the qualitative outside, which both provides the basis for capitalism (as use-value, labour-power, consumer desire) and the basis for resistance. At a minimum, we can speak of declining welfare for workers and the associated regime of total mobilisation and surveillance corrode workers’ health and safety, creating anxiety, burnout and overwork. Neoliberalism continues to portray such problems as failures to adapt, personal psychological shortcomings or educational deficits. They seem, rather, to be systematic effects of a particular labour process. Labour movements will need to combat such corrosion or risk the generalisation of the types of psychological collapse seen at Foxconn.

More deeply, and if not checked, the spread of wearables in the workplace may be seen as an extension of a control society (Deleuze, 1992) based on a strengthened Cartesian dualism and a subordination of precarious workers’ qualitative being to capitalism in the form of a Taylorism which reaches into the body. Vaneigem (2003 [1972]) argued that ‘[l]ife quantified becomes a measured route-march towards death (p. 35) ... rigorously quantified, first by money and then by what you might call sociometric units of power, exchange pollutes all our relationships, all our feelings, all our thoughts’ (p. 29). But ‘there remain things unmeasured by the current, changing modes of capital accumulation’ (Colman, 2014: 3). Against a new regime of quantification, social movements can be expected to seek new forms of refusal and exodus, which must increasingly take the form of a refusal of data – a refusal to track the body, a refusal to subordinate the qualitative to the quantitative, a refusal of surveillance, a refusal to share data with corporations and the state. Scholars have celebrated the potential of smartphones and social media for social protest (Castells, 2012) and

autonomous identity formation. But the use of big data now being generated by WSTT indicates a significant shift to logics that potentially works to circumvent protest. There is now an entire industry devoted to big data and finding correlations that work in an instrumental sense and informed consent is increasingly difficult to obtain. Refusing to share data is becoming a political act.

## Bibliography

Adorno, T (2005) *The Culture Industry: Selected Essays on Mass Culture*, London: Routledge.

Agamben, G (1998) *Homo Sacer: Sovereign Power and Bare Life*, Stanford, CA: Stanford University Press.

Baudrillard, J (1981), *Simulacra and Simulation*, Paris: Editions Galilee.

Available from: <http://fields.ace.ed.ac.uk/disruptivetechologies/wp-content/uploads/2011/10/Baudrillard-Jean-Simulacra-And-Simulation2.pdf>

(accessed 12/08/15).

Baudrillard, J (1987) 'In the Shadow of the Silent Majorities... or the end of the social and other essays' trsnl P Foss, P Patton and J Johnston, Semiotext(e), Inc. Available at:

[http://autonomousuniversity.org/sites/default/files/Baudrillard\\_Shadow-of-the-Silent-Majorities.pdf](http://autonomousuniversity.org/sites/default/files/Baudrillard_Shadow-of-the-Silent-Majorities.pdf) (accessed 12/08/15).

Bennett, A (2013) 'Amazon Warehouse Staff in Slave Camp Conditions, Workers Say' *The Huffington Post* 25/11/13

Available at: [http://www.huffingtonpost.co.uk/2013/11/25/amazon-staff-investigation\\_n\\_4335894.html](http://www.huffingtonpost.co.uk/2013/11/25/amazon-staff-investigation_n_4335894.html) (accessed 12/08/15).

Bergson, H (transl. FL Pogson) (1913/2001) *Time and Free Will, an Essay on the Immediate Data of Consciousness* New York: Dover.

Bergson, H (1997) *Essai sur les donnees immediates de la conscience*, Paris: PUF.

Berardi, F (2009) *Precarious Rhapsody* New York: Minor Compositions.

Berlant, L (2011) *Cruel Optimism* North Carolina: Duke University.

Boltanski, L and Chiapello, E (1999) *The New Spirit of Capitalism*, London: Verso.

Bourdieu, A (1998) *Acts of Resistance: Against the Tyranny of the Market*, New York: The New Press.

Boutang, YM (2011) *Cognitive Capitalism*, Cambridge: Polity.

Braidotti R (2005-6) Affirming the affirmative: on nomadic affectivity. *Rhizomes*, Issue 11/12 2005-6. Available at: <http://www.rhizomes.net/issue11/braidotti.html> (accessed 12 August 2015).

Braidotti R (2006) *Transpositions*: Cambridge, UK and Malden, MA: Polity Press.

Braverman, H (1974) *Labour and Monopoly Capital New York*, Free Press.

Brophy, E and G de Peuter (2007) 'Immaterial Labor, Precarity and Recomposition', in C. McKercher and V. Mosco (eds.), *Knowledge Workers in the Information Society*, Lanham, MD: Lexington, pp. 177-92.

Bruff I (2013) The body in capitalist conditions of existence: A foundational materialist approach in Cameron A, Dickinson J and Smith N *Body/State* Surrey, UK: Ashgate, pp. 67 – 84.

Carr, H W (1912) *Henri Bergson: The Philosophy of Change*, London: TC and EC Jack.

Castells, M (2012) *Networks of Outrage and Hope: Social Movements in the Internet Age*. Cambridge: Polity Press.

C derstrom, C and Spicer, A (2015) *The Wellness Syndrome*. Cambridge, UK and Malden, MA: Polity.

- Chan, J and N Pun (2010) 'Suicide as Protest for the New Generation of Chinese Migrant Workers: Foxconn, Global Capital, and the State', *The Asia-Pacific Journal* 37-2-10. Available at: <http://japanfocus.org/-Jenny-Chan/3408> (accessed 12/08/15).
- Chan, J, N Pun and M Selden (2013), 'The Politics of Global Production: Apple, Foxconn and China's new working class', *New Technology, Work and Employment* 28 (2): pp. 100-15.
- Cleaver, H (1979) *Reading Capital Politically*, Brighton: Harvester.
- Cockburn, H (2014) 'Amazon offers staff up to \$5000 to quit' *London Loves Business* 16/04/14 Available at: <http://www.londonlovesbusiness.com/business-news/tech/amazon-offers-staff-up-to-5000-to-quit/7926.article> (accessed 12/08/15).
- Cohen, G A (1978) *Karl Marx's Theory of History: A Defence* Oxford: Oxford University Press.
- Colman, F (2014) 'Digital Feminicity, Predication and Measurement, Materialist Informatics And Images' *Artnodes* no 14 Available at: <http://journals.uoc.edu/index.php/artnodes/article/view/n14-colman> (accessed 12/08/15).
- Deleuze, G (1988) *Spinoza: Practical Philosophy*, San Francisco, CA: City Light Books.
- Deleuze, G (1992) 'Postscript on the Societies of Control', *October* 59, Cambridge: MIT Press 3-7.
- Deleuze, G and F Guattari (1987) *A Thousand Plateaus: Capitalism and Schizophrenia* London: University of Minnesota Press.
- De Angelis, M (1996) 'Social Relations, Commodity-Fetishism, and Marx's Critique of Political Economy', Available at: <http://homepages.uel.ac.uk/M.DeAngelis/FETISH6.pdf> (accessed 12/08/15).
- Dowling, E (2007) 'Producing the Dining Experience: Measure, subjectivity and the affective worker' *Ephemera* 7(1): pp. 117 – 132.
- Drucker, P F (1992) *Managing for the Future*, London: Routledge.
- Dyer-Witford, N (2005) 'Cyber-Negri: General Intellect and Immaterial Labour', in T.S. Murphy and A.K. Mustapha, *The Philosophy of Antonio Negri: Resistance in Practice*, London: Pluto, pp.136-62.
- Federici S (2008) Precarious labor: a feminist viewpoint. In: *In the Middles of a Whirlwind This* (Notes from her lecture on 28 October 2006 at Bluestockings Radical Bookstore in New York City, 172 Allen Street as part of the 'This is Forever: From Inquiry to Refusal Discussion Series'). Available at: <https://inthemiddleofthewhirlwind.wordpress.com/precarious-labor-a-feminist-viewpoint/> (accessed 12 August 2015). **AQ14**
- Finley, K (2013) 'What if your boss tracked your sleep, diet, and exercise?' *Wired*, 18 April Available at: <http://www.wired.co.uk/news/archive/2013-04/18/quantified-work-citizen> (accessed 12/08/15).
- Fisher, M (2014) 'Good for Nothing' *London Occupied Times* 19/03/14 Available at: <http://theoccupiedtimes.org/?p=12841> (accessed 12/08/15).
- Florida, R (2002) *The Rise of the Creative Class and how it's transforming work, leisure, community and everyday life*, New York: Perseus Book Group.
- Foucault, M (1970) *The Order of Things*, London: Routledge.
- Foucault, M (1988) *Technologies of the Self: A Seminar with Michel Foucault*, ed by L H Martin, H Gutman, P H Hutton, London: Tavistock.
- Fracchia, J (2005) 'Beyond the Human-Nature Debate: Human corporeal organisation as a 'first

- fact' of historical materialism' *Historical Materialism* 13(1): pp. 33 – 61.
- Frassanito Network (2005) 'Precarious, Precarization, Precariat?' Available at: <http://precariousunderstanding.blogspot.com/2007/01/05/precarious-precarization-precariat/> (accessed 12/08/15).
- Genosko G (ed) (1996) *The Guattari Reader*. Oxford: Blackwell.
- Gill, S (1995) 'The Global Panopticon? The Neo-Liberal State, Economic Life and Democratic Surveillance', *Alternatives* 20(1): pp. 1-49.
- Goldsmiths (2014) 'Wearable technologies can boost employee productivity by up to 8.5%' 22/09/14 *Goldsmiths University of London News* Available at: <http://www.gold.ac.uk/news/homepage-news/wearabletechnologiestocanboostemployeeproductivitybyupto85.php> (accessed 12/08/15).
- Graeber, D (2011) *Debt: The First 5000 Years*, New York: Melville.
- Guattari F (1996) Institutional practice and politics in Genosko G (ed) (1996) *The Guattari Reader*. Oxford: Blackwell, pp. 121 – 138.
- Guattari, F (1984) *Molecular Revolution*, Harmondsworth: Penguin.
- Guattari, F and A Negri (1990) *Communists Like Us*, New York: Semiotext(e).
- Guerlac, S. (2006) *Thinking in Time: An Introduction to Henri Bergson*, New York: Cornell University Press.
- Hardt, M and A Negri (2000) *Empire*, Harmondsworth: Penguin.
- Hirschman, AO (1997) *The Passions and the Interests: Political Arguments for Capitalism before its Triumph*, Princeton: Princeton University Press.
- Holmes, B (2004) 'The Spaces of a Cultural Question' Available at: [http://www.republicart.net/disc/precariat/holmes-osten01\\_en.htm](http://www.republicart.net/disc/precariat/holmes-osten01_en.htm) (accessed 12/08/15).
- Invisible Committee, the (2009) *The coming insurrection*, Semiotext.
- Jessop, B (2000) The State and the contradictions of the knowledge-driven economy. In J R Bryson, P W Daniels, N D Henry and J Pollard (eds) *Knowledge, Space, Economy* London: Routledge, pp. 63 – 78.
- Kapur, J (2007) "'New" Economy/Old Labour: Creativity, Flatness, and Other Neoliberal Myths', in C. McKercher and V. Mosco (eds.), *Knowledge Workers in the Information Society*, Lanham, MD: Lexington, pp. 163-76.
- Kelly, K (2007) 'What is the quantified self?' Quantified Self homepage, Available at: <http://quantifiedself.com/2007/10/what-is-the-quantifiable-self/> accessed (accessed 12/08/15).
- Lazzarato, M (1996) 'Immaterial Labor', trans. P. Colilli and E. Emery, in M. Hardt and P. Virno (eds.) *Radical Thought in Italy: A Potential Politics*. Minneapolis and London: University of Minnesota Press, pp., 133-147.
- Lorey, I (2010) 'Becoming Common: Precarization as Political Constituting' *E-Flux Journal* #17 06(2010), Available at: <http://www.e-flux.com/journal/view/148> (accessed 12/08/15).
- Lorey, I (2006) 'Governmentality and self-Precarization: On the normalization of cultural producers' *EIPCP: European Institute for Progressive Cultural Politics* 01(2006), Available at: <http://eipcp.net/transversal/1106/lorey/en> (accessed 12/08/15).
- Lupton, D (2013) 'Understanding the human machine' *IEEE Technology and Society Magazine*, winter: pp. 25 – 30.
- Lupton, D (2014) 'Self-tracking modes: reflexive self-monitoring and data practices' *Social Science Research Network*, Available at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2483549](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2483549) or <http://dx.doi.org/10.2139/ssrn.2483549>

- MacPherson, C B (1962) *The Political Theory of Possessive Individualism: Hobbes to Locke*, Oxford: Clarendon Press.
- Marx, K (1990) [1867] *Capital*, Volume 1, Harmondsworth: Penguin.
- McKinlay, A and P Taylor (2014) *Foucault, Governmentality, and Organization: Inside the Factory of the Future*, New York and London: Routledge.
- McRobbie, A (2011) 'The Los Angelesation of London: Three Short Waves of Young People's Micro-Economies of Culture and Creativity in the UK', in G Raunig, G Ray and U Wuggenig (eds.), *Critique of Creativity: Precarity, Subjectivity and Resistance in the "Creative Industries"*, London: MayFly, pp. 119-32.
- Meszaros, I (1970) *Marx's Theory of Alienation*, London: Merlin.
- Mitropoulos, A (2005) 'Precari-Us?', *Mute* 29, p: 88-92. Available at: <http://www.metamute.org/en/Precari-us> (accessed 12/08/15).
- Mohan, A, K Ara, A Pentland, with D Olguin, and K Waber (2009) 'Sensible Organisations: Technology and Methodology for Automatically Measuring Organisational Behaviour' *Systems, Man and Cybernetics, Part B: Cybernetics IEEE Transactions On* 39(1): pp. 43 – 55.
- Mokre, M (2011) 'GovernCreativity, or, Creative Industries Austrian Style', in G Raunig, G Ray and U Wuggenig (eds.), *Critique of Creativity: Precarity, Subjectivity and Resistance in the "Creative Industries"*, London: MayFly, pp. 109-18.
- Moore P (2015) Tracking bodies, the quantified self and the corporeal turn. In: van der Pijl K (ed.) *The Handbook of International Political Economy of Production*. Cheltenham: Edward Elgar, pp. 394-408.
- Moore, P and Piwek, L (2015) 'Unintended Consequences and the Dark Side of the Quantified Self', Sustainable Societies Network commissioned paper, Available at: <https://phoebevmoore.wordpress.com/2015/06/15/unintended-consequences-the-dark-sides-of-quantifying-selves/>
- Moore, P and Taylor, P A (2009) 'Exploitation of the Self in Community-based Software Production - Workers' Freedoms or Firm Foundations?' *Capital & Class* 97, pp. 99–120.
- Musil, S (2013) 'Foxconn reportedly to launch startup fund for wearable tech', *CNet News*. <http://www.cnet.com/uk/news/foxconn-reportedly-to-launch-startup-fund-for-wearable-tech/> (accessed 12/08/15).
- Negri, A (1998) *Revolution Retrieved: Selected Writings on Marx, Keynes, Capitalist Crisis and New Social Subjects, 1967-1983*, London: Red Notes.
- Neilson, B and Coté, M (2014) 'Introduction: Are we all Cultural Workers Now?' *Journal of Cultural Economy* 7(1): pp. 1 – 11.
- Neilson B and Rossiter N (2005) From precarity to precariousness and back again: labour, life and unstable networks. *The Fibreculture Journal* 5 Available at: <http://five.fibreculturejournal.org/fcj-022-from-precarity-to-precariousness-and-back-again-labour-life-and-unstable-networks/> (accessed 12 August 2015). **IAQ17**
- Newsome, K, Thompson, P and J Commander (2013) 'You monitor performance at every hour: labour and the management of performance in the supermarket supply chain' *New Technology, Work and Employment*, 28 (1), 1-15.
- Nield, D (2014) 'In corporate wellness programs, wearables take a step forward' *Fortune.com*. 15/4/2014 Available at: <http://fortune.com/2014/04/15/in-corporate-wellness-programs-wearables-take-a-step-forward/> (accessed 12/08/15).
- Ollman, B (1971) *Alienation: Marx's Conception of Man in Capitalist Society*, Cambridge: Cambridge University Press.

- Polanyi, K (1944/1957) *The Great Transformation: The political and Economic Origins of our Time*, Boston, MA: Beacon Hill Press.
- Ramirez, E (2013) 'Future normal: Quantified self tools at the Apple store' *Quantified Self* 15/01/13. Available at: <http://quantifiedself.com/2013/01/future-normal-quantified-self-tools-at-the-apple-store/> (accessed 12/08/15).
- Raunig, G (2004) 'La inseguridad vencera: anti-precariousness activism and mayday parades' Available at: [http://www.republicart.net/disc/precariat/raunig06\\_es.htm](http://www.republicart.net/disc/precariat/raunig06_es.htm) (accessed 12/08/15).
- Raunig G (2007) *The monster precariat. Translate: Beyond culture, the politics of a transition*. Available at: <http://translate.eipcp.net/strands/02/raunig-strands02en#redir> (accessed 12 August 2015).
- Raunig, G (2010) *A Thousand Machines*, Cambridge, MA: MIT Press.
- Raunig, G, G Ray and U Wuggenig (2011), 'On the strange case of "creativity" and its troubled resurrection', in G Raunig, G Ray and U Wuggenig (eds.), *Critique of Creativity: Precarity, Subjectivity and Resistance in the "Creative Industries"*, London: MayFly, pp. 1-6.
- Rawlinson, K (2013) 'Tesco accused of using electronic armbands to monitor its staff' *The Independent* 13/02/13 Available at: <http://www.independent.co.uk/news/business/news/tesco-accused-of-using-electronic-armsbands-to-monitor-its-staff-8493952.html> (accessed 12/08/15).
- Read, J (2010) 'The Production of Subjectivity: From Transindividuality to the Commons' *New Formations: A Journal of Culture/Theory/Politics* 70: pp. 113 - 131.
- Rolnik, S (2011) 'The Geopolitics of Pimping', trans. B. Holmes, in G Raunig, G Ray and U Wuggenig (eds.), *Critique of Creativity: Precarity, Subjectivity and Resistance in the "Creative Industries"*, London: MayFly, pp. 23-40.
- Rose, N (1996) *Inventing Our Selves*, Cambridge: Cambridge University Press.
- Rubin, I I (1972) [1928] *Essays on Marx's Theory of Value*, Detroit: Black and Red Available at: [http://www.marxists.org/archive/rubin/value/ch01.htm\\_\(accessed 12/08/15\)](http://www.marxists.org/archive/rubin/value/ch01.htm_(accessed%2012/08/15)).
- Sassen, S (1991) *The Global City: New York, London, Tokyo*, Princeton, NJ: Princeton University Press.
- Schmiz, A (2013) 'Migrant Self-Employment between Precariousness and Self-Exploitation', *Ephemera* 13 (1), pp. 53-74.
- Shukaitis S (2007) Whose precarity is it anyway? *Fifth Estate* #374. Available at: <http://www.fifthestate.org/archive/374-winter-2007/whose-precarity-is-it-anyway/>
- Skillen, A (1978) *Ruling Illusions: Philosophy and the Social Order*, Atlantic Highlands, NJ: Humanities Press.
- Smail, D (2009) *Power, Interest and Psychology: Elements of a Social Materialist Understanding of Distress*, Ross-on-Wye: PCCS Books.
- Smith, N and D Lee 'Corporeal Capitalism: The Body in International Political Economy' *Global Society* 29(1), 64 – 69.
- Spinoza, B (2003) [1676] *Ethics*. Available at: <http://www.gutenberg.org/files/3800/3800-h/3800-h.htm> (accessed 12/08/15).
- Standing, G (2011) *The precariat: The new dangerous class* Bloomsbury.
- Stone, K V W (2004) *From Widgets to Digits: Employment Regulation for the Changing Workplace* New York: Cambridge University Press.

Terranova, T (2000) 'Free Labor: Producing Culture for the Digital Economy', *Social Text* 18 (2), 33-58.

Till, C (2014) Exercise as Labour: Quantified Self and the Transformation of Exercise into Labour. *Societies*. 4(3): 446-462. Available at: <http://www.mdpi.com/2075-4698/4/3/446>

Thompson, P and C Smith (2010) *Working Life: Renewing Labour Process Analysis*, London: Palgrave.

Upchurch, M (2014) 'The Internet, Social Media and the Workplace' *International Socialism: A quarterly journal of socialist theory* Issue 141 (09/01/14) Available at: <http://isj.org.uk/index.php4?id=951&issue=141> (accessed 12/08/15).

Van der Tuin, I and R Dolphijn (2010) 'The Transversality of New Materialism', *Women: A Cultural Review* 21(2), pp. 153 – 171.

Vaneigem R (2003 [1967]) (trsl D Nicholson-Smith) *Revolution of Everyday Life*. London: Rebel Press.

von Osten, M (2011) 'Unpredictable Outcomes / Unpredictable Outcasts: On Recent Debates over Creativity and the Creative Industries', in G Raunig, G Ray and U Wuggenig (eds.), *Critique of Creativity: Precarity, Subjectivity and Resistance in the "Creative Industries"*, London: MayFly, pp. 133-46.

van Veen, TC (2010) 'Technics, Precarity and Exodus in Rave Culture', *Dancecult* 1 no. 2. Available at: <http://dj.dancecult.net/index.php/journal/article/view/9> (accessed 12/08/15).

Virno, P (2004) *The Grammar of the Multitude*, New York: Semiotext(e) Available at: <http://www.generation-online.org/c/fcmultitude3.htm> (accessed 12/08/15).

Wilson, H J (2013) 'Wearables in the Workplace' *Harvard Business Review* 09/13 Available at: <http://hbr.org/2013/09/wearables-in-the-workplace/ar/1> (accessed 12/08/15).