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Circuits of Labour: A Labour Theory of the iPhone Era

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Abstract: This paper questions the binary of material and immaterial labour in the information era. Instead, we propose a "circuits of labour" model, a holistic framework that helps connect various concepts and traditions in the study of labour and ICT (information and communication technology). Inspired by du Gay et al's "circuit of culture", we argue conventional frameworks need to be synthesized and updated to reflect fundamental changes and persisting issues of labor in our contemporary era, of which the iPhone is emblematic. On the one hand, our model consists of formal circuits, in which hierarchical domination is imposed by capital over the body of labour. On the other hand, it consists of informal circuits where relationships are defined communally between embodied practices and social and communicative capital. The informal and formal circuits of labour are "short-circuited" by survival labour and 'playbour', meaning either circuit may absorb productive energy from the other. This article then uses the case of Foxconn, the world's largest electronic manufacturer that also produces iPhones, to illustrate the usefulness of the "circuits of labour" model. We finally discuss the broader implications and questions for future research.

Keywords: labour, iPhone, circuit of culture, Foxconn.

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1. Introduction

The last fifteen years have seen an expansion of studies on the relationship between labour and the information and communication technologies (ICTs). While there has been a distinct "turn to labour" in ICT research (Fortunati 2007; Huws 2003; Wajcman 2008), the scholarship remains disconnected and fragmented across disciplines, methodological approaches and national particularities. New conceptual frameworks have been applied to the forms of labour in ICTs, from "free labour" and "playbour" (Terranova 2000; Kücklich 2005) to a focus on "networked" and "creative" labour (Brouillette 2009; Fuchs 2010; Xiang 2007). However, such terms have tended to focus on forms of paid and unpaid information work. Less attention has been paid to blue collar, "gray collar" (Qiu 2010), and "survival circuit" workers (Sassen 2004) also known as "generic labour" (Castells 1998).

In this project, we seek to bring together these threads of research into a single holistic framework which we call "circuits of labour". We take inspiration from a defining moment in the field of cultural studies, which took the arrival of the Sony Walkman as an iconic and rupturing event in the study of contemporary media and society (Du Gay et al. 1997). *Doing Cultural Studies: The Story of the Sony Walkman* introduced a "circuit of culture" model to illustrate the mutually linked considerations necessary to produce rich, veritable and convincing empirical and theoretical data. Following in this tradition, we propose to engage the iPhone as both a historic signifier and a rich empirical source for theory building, in order for us to better grasp persisting issues of labor, as well as their characteristics and adaptations, within the interconnected "circuits of labour".

The iPhone is not just a smartphone. Rather, it "represents a distinctive moment, both in the very short history of mobile media and in the much longer history of cultural technologies" (Hjorth et al. 2012, 1). We take it as symbolic of a set of practices, both personal and industrial, in the contemporary era. This is not to aggrandize the iPhone's commercial success as "the most popular Apple product by far" (Beech and Jiang 2012, 32), or to champion "digital capitalism" (Schiller 2000). Nor do we intend to reject the device as simply a means of exploitation (Chan and Pun 2010), a "cult" (Belk and Tumblat 2005), or another techno-cultural "myth" (Mosco 2004; Turner 2004). Instead, we begin by taking the iPhone as representative of "a key moment of metastasis, when an already intimate, popularized technology expanded to encompass a host of media forms" (Crawford 2012, 219). We analyze the iPhone as a device that is used for various forms of communication, care-work, and micro-organization as well as a product that draws on multiple forms of labour in order to function and thrive.

While du Gay et al. used the term "circuit" to refer to a set of connected ideas, another common meaning of a circuit is "[t]he course traversed by an electric current between the two poles of a battery; the path of a voltaic current" (Oxford English Dictionary 1989, 229). Taking these notions together, our account of the circuits involved in the assembly, distribution and consumption of the iPhone will address some notable limitations in current theories of labor in media and communication studies today. Our "circuits of labour" theory reads the iPhone as (a) a vertical circuit of capital accumulation, (b) a horizontal circuit of social networking and body politics, and (c) the links, or short-circuits, between (a) and (b). Metaphorically speaking, the iPhone is our "battery", whose two poles are capital and the body, respectively. But this is more than a simple circuit. Instead, the "circuits of labour" is conceptualized as an "integrated circuit", a circuit comprised of many separate components.

This article elucidates this "circuits of labour" mode of understanding, why we need it, how to use it. In order to do so, we conduct a review of the significant literature on labour and ICTs, and outline how our approach can be used to reflect on and draw connections among the research currents. To illustrate our thinking, and critique it, we draw on data and fieldwork observations from the world's largest electronics manufacturer that produces most Apple products—including the iPhone—Foxconn (Chan and Pun 2010; Qiu 2012; Sandoval 2013). For more than two years, participatory action research has been conducted in China following a startling spate of employee suicides at Foxconn in 2010. Finally, we discuss the research results and their broader implications, given the global campaign against labour abuse at Foxconn (SACOM 2010; 2011).

In sum, the iPhone acts as a symbol for the amalgam of labor issues we tackle. This symbol is tangible yet powerful: it comes from far away, but becomes something intimate in our daily work and life (Gregg 2011). It expands conventional modes of exploitation, but also stands for alternative developments of the future. It draws on mythic imaginaries of constant connection and individual control, while silently extracting data about the user: sometimes with their knowledge and consent, sometimes without (Crawford 2012). For good or for bad, its enormous centrality in our era makes it an appropriate metaphor for the "circuits of labour" that surround us, subsume us, and substantiate us.

2. Labour and ICT: An Overview

An important change in recent years is the outpouring of labour studies conducted in the context of, or in relation to, ICTs. This should be fairly clear to readers of this tripleC special issue. The trend has become particularly notable since the global financial crisis of 2008–2009, probably because, for too long, "labor remains a blind spot of western communication studies" (McKercher and Mosco 2006, 493). In cultural studies and sociology we have also observed a similar "turn to labor" among leading ICT scholars (Fortunati 2007; Huws 2003; Wajcman 2008).

What, then, is labour? What are the kinds of labour issues being examined in this growing body of literature? What questions can now emerge, after labour meets ICTs?

First, there are studies of new media workers or "digital labour", whose delineation is above all technological. This is essentially about wage labour in ICT-based "new economy"

environments, either in the particular sectors of so-called new media, Internet or digital industries (Heeks 2008; Neff et al. 2005; Xiang 2007), or in contexts where ICTs have disseminated in the larger labour market, at work and beyond (DiMaggio and Bonikowski 2008; Freeman 2002; Gregg 2011). The diffusion of ICTs for work and the importance of the IT industry for contemporary economy make it imperative to study labor relations in Internet companies (eg, Mayer-Ahuja and Wolf 2007), media organizations (eg, Deuze 2007), as well as other emerging sectors of work, including Indian software programmers (Xiang, 2007), Chinese "gold farmers (producers of virtual goods and services for online gamers)" (Heeks 2008), and Amazon Mechanical Turk workers (Irani 2013).

Despite sectoral and national difference, these studies all examine wage labour, how their work affects and is affected by ICTs, with increasing flexibility, and what are subsequent changes in their income and bargaining power. But which sector is completely untouched by ICTs today? Are there real differences between employees who work directly with computers and those who do not? While many studies find ICTs do contribute to improving welfare and upward mobility (eg, DiMaggio and Bonikowski 2008), others show that the rise of digital "piece work" is part of a broader shift toward outsourcing and casualization, hence weakening the labor market positioning of employees overall (eg, Deuze 2007; Xiang 2007).

A second thread of research goes from the celebratory "creative class" (Florida 2002) to the more critical "knowledge workers" (McKercher and Mosco 2006; Mosco and McKercher 2009) and "immaterial labour" (Lazzarato 1996; Fortunati 2007). Here, labour is defined, not by technologies or wages, but by its immateriality, meaning the symbolic, informational, or affective products and services generated through a wide range of work processes. While Florida and his followers argue the new "creative class" represents a higher level of modernity at work, others see "immaterial labor" as the deepening of capitalist domination from workplace to everyday life, from the corporeal to the cerebral (Brouillette 2009).

Does it really make sense to separate material labour from the immaterial, and to assume the former belongs to the Industrial Era, the latter the Information Era? Are the "creative" or "knowledge" workers a new labor aristocracy? How does this type of labour relate to capital? These are some of the gaps that exist in the current literature.

One tradition of theorizing "immaterial labour" began with Lazarrato (1996) and was further developed by Hardt and Negri (2000; 2004), as well as Terranova in her essay 'Free Labor: Producing Culture for the Digital Economy' (2000). This notion has been very influential among critical studies of user-generated content (UGC) in recent years (Fuchs 2010; Paasonen 2010; Suhr 2009). In studies of online games, Kücklich (2005) introduces the idea of "precarious playbour", or the forms of unpaid labour (such as computer game modification or "modding"), which are done by players and are cost-free from the perspective of online game companies. Kücklich points to how certain activities are veiled by the perception that they are just "leisure activities" while they are simultaneously part of a wider economy of industrial innovation and value-generation.

This tradition is, however, criticized by post-Marxian scholars such as Arvidsson and Colleoni (2012), who argue against applying Marxist "labour theory of value" to online production practices because doing so would underestimate the importance of affect-based labor and financialization. For Hardt and Negri, "affective labour" and "caring labour" constitute a subset of "immaterial labour" (2000, 8). But feminist scholars contend this conceptualization is too limiting in that "the domestic sphere and more extensively the sphere of social reproduction" are more important bases for the growth of "immaterial labour", from the very beginning of its conceptual roots in Italian academia and activism (Fortunati 2007, 139).

Yet another line of research is about volunteer labour, now also adopting digital tools in social enterprises (Fish and Srinivasan 2012), online activist campaigns (Tatarchevskiy, 2011), nonprofit organizations (Mook et al. 2007), and "commons-based peer production" (Benkler and Nissenbaum 2006). Here, the labour at stake is not defined by its subordination to capital or power in the domestic sphere. Rather, individuals and communities expand existing gift economies, and create new ones online and off, with the hope of forming alternative power structures in global and local civil societies. One step further into the more radical leftist direction, we get to the much older ideals of digital anarcho-communism (Barbrook

1997) and "cyber-Marx" (Dyer-Witheford 1999) that perceive the struggle over ICTs as the ultimate battle through which labor will be emancipated.

Finally, one can define labor by its relationship to the network society, whether workers are included as "self-programmable labor" or excluded and "downgraded" into "generic labour" (Castells 1998). This is a dichotomous model. On one side, there are bankers, realtors, famous artists, those well-paid, including self-employed, workers who do projects by themselves, although they face high risk and insecurity typical of "work in the new capitalism" (Sennett 1999). On the other side, there are nannies, janitors, sex-workers, and those dispossessed and underemployed struggling to make ends meet in the "survival circuits" (Sassen 2004) of this same era. If those in the former category exercise and enjoy more social and cultural capital relative to the latter, in each case workers "program", train and coax bodies, minds and performances to match the affective bearing of physically and emotionally demanding work.

The binary conception of networked labor has been complicated in recent years by studies such as Mayer (2011), which spans Brazil and the US. In the context of China, Zhao and Duffy echo Langman's notion of "internetworked social movements" (2005) and maintain that the institutional constraints over China's labor, from migrant workers and laid-off workers to low-level media workers, have been increasingly "short-circuited" (2007). Members of the "generic labour" category, although still in "survival circuits", have started to inter-connect, with each other and with other concerned citizens in China and beyond, through public intellectuals, NGOs, and transnational networking. This trend has accelerated since the global economic crisis (Hong 2010). Meanwhile, Qiu demonstrates that the phenomenal diffusion of "working-class ICTs" in Chinese cities has led to the rise of the "information have-less", a new lower-middle stratum in the country's network society, generating a new class of "network labor" (2009; 2012), ie, "a materializing pillar of the network society, parallel to the emergence of the network enterprise and the network state, globally and regionally" (2010, 81).

3. The Need to Connect

The above review shows that the overall picture of ICT-related labor studies consists of scattered pieces of knowledge, strung together by quite different approaches, dominated by loose fragments at national and local levels, disconnected from each other and from global contexts. There are many dividing cleavages: material or immaterial labour, affective or mechanized labour, networked or isolated labour, wage labour or "free" "volunteer" labour, creative or not-so-creative labour, suppressed/suppressing labour or liberated/liberating labour. It is a growing body of research, some with more classic Marxian lineage than others, often conducted by graduate students and emerging scholars. How shall we make sense of all these concepts and arguments, not only individually, but also in a way that enriches ICT research as well as labour studies as a whole? Indeed, if all the studies above are taken as products of "intellectual labour", one may well lament its lack of labour solidarity.

The "circuits of labour" model we propose is designed to connect conceptual developments at the crossroads between labor and ICTs, and to do so without discounting the significance of the corporeal and affective dimensions of the formal market sphere for labour. The impasse in attempts to theorize so-called "immaterial" labour stems from a largely Western notion of separate public and private spheres for labour, which removed waged labour from the home, and feminized many aspects of reproductive and domestic labour in the process. Our model seeks to disrupt this binary just as its circuit logic enables a systematic interrogation of the empirical case centered on the iPhone and Foxconn.

The metaphor of the circuit has long been present in scholarship that takes a network approach to labour, especially when this involves dispossessed and disadvantaged workers (Sassen 2004; Zhao and Duffy 2007). By contrast, du Gay et al's "circuit of culture" (1997) draws on a formulation first outlined by Johnson (1986) in the essay 'What is Cultural Studies

Anyway?'[1] The model connects five moments of cultural practice: representation, identity, production, consumption, and regulation. The five moments are organized in a circle, in which cultural practices can relocate from any one moment to any other. This is a parsimonious and prominent framework. But if applied to issues of labor and ICTs, it would be too general, free flowing, even idealistic, to capture either entrenched power inequalities or possibilities of change.

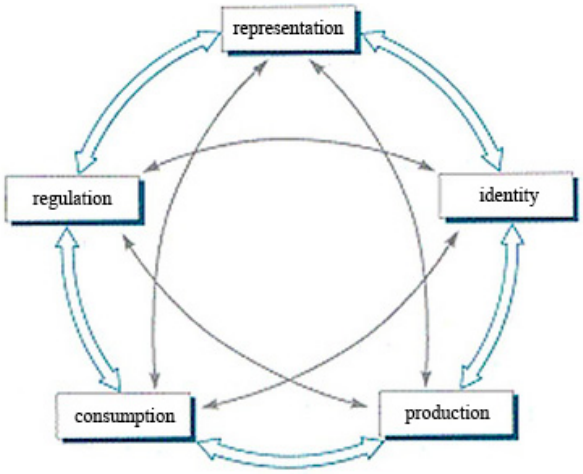


Figure 1: du Gay et al's circuit of culture (1997)

In the two examples—the Sony Walkman, an iconic device of the 1980s, and the iPhone, an icon of the early 21st century—the "cultural circuit" depicts only one circle of events. Suppose the circuit of mainstream culture is problematic, how can one escape and start an alternative circuit? On the other hand, by calling it a "circuit of culture", there is the covert assumption that cultural labor deserves more scholarly attention vis-à-vis material labour. One of our goals is to bridge this gap between immaterial culture and material manufacture, in a similar move to Mayer's analysis of the New Television Economy (2011).

Much has changed since the neoliberal turn of the 1980s in both the culture of personal electronics and its manufacture. Consumption has been expanded; national regulation corroded; representation more infiltrated by corporate marketing; identity more contested; material production outsourced to countries like China and India (Castells 1998; Dyer-Witheford 1999; Gregg 2011; McKerner and Mosco 2006; Qiu 2009; Schiller 2005). A subsequent trend is the spatial separation between production and consumption in the global commodity chain, whereas in terms of content, a rhetoric of "prosumption" has also emerged especially with the diffusion of personal, portable devices. Typifying both trends is the iPhone, a flagship Apple product.

Apple Inc. is the "the largest U.S. company ever, measured by stock-market value" (Browning et al. 2012). At the end of 2011, Apple earns 53% of its total revenue, and 67% of its gross profit, from the iPhone alone (Ray 2012). This is the best of times for capital. Is it the worst of times for labour? Following our description of the "circuits of labour", we posit the iPhone era is characterized by a remarkable regime of domination that exacerbates social inequality. At the same time, however, we note that the iPhone—and similar ICT products—also stimulate and enable alternative developments toward change.

[1] Thanks to an anonymous TripleC reviewer, who points out Johnson grounded this essay in a reading of Marx's Grundrisse (1973), although du Gay et al (1997) made no reference to Marx. The analytical focus of their "circuit of culture" model is also clearly placed on audiences, rather than political economy structures, a pattern that is not uncommon in cultural studies.

4. The Circuits of Labour

4.1. Formal Circuit of Labour

While many emphasize the "immaterial" and therefore, "revolutionary" and "weightless", aspects of the IT industry (Coyle 1998; Negroponte 1996), structural continuities can be clearly observed if we examine its formal industrial system and compare it with the history of Fordism. Despite the new spatial and temporal characteristics of "flexible accumulation", capital continues to dominate labour, which is centrally expressed through the persistent and fundamental subjugation of labourer's body into the hierarchical circuit of capitalist production and consumption.

At stake here is the entirety of the formalized IT economy, including hardware and software, electronic manufacturing, marketing, sales, services, and the processing of e-waste (Maxwell and Miller 2012). While some of these work processes may be more virtual than others, all of them necessarily rely on physical labour from hardware manufacture to infrastructure construction, from the transportation of parts and products to repair and e-waste processing.

Even the least material forms of labor input—for instance, by employees of software or advertising companies—have a physical dimension: they have to position their bodies in front of the computers and/or telephones, and expect to remain so for certain hours of the day. It is for this reason that software engineers from Hyderabad, India, called their wage labor system "body shopping" (Xiang 2007).

The body is the key, to be subjugated and subsumed, on this decentralized, globalized, and deceptively "immaterialized" shop floor of the IT industry. What is extracted from these bodies and their bodily movements (or non-movements) is, however, the same thing: surplus value, measured by time, and sometimes affect as well (Arvidsoon and Golleoni 2012; Fuchs 2010).

The essence of labour input remains time. Labour power is most formidable if it reclaims its control over time. If we use this classic labour theory of Marx's (1973) *Capital*, we can say labor politics has always been immaterial in a fundamental sense from the very beginning of modern capitalism. The iPhone era of the global IT industry does not challenge the established power structure of capital dominance in this regard. What we see is the reverse, as surplus value continues to be extracted and labour continues to have little agency regarding production and redistribution. The logic of capital domination has even been strengthened with the rise of financial capitalism and global outsourcing, both contributing greatly to the shaping of the IT industry today. Traditional trade unions and public authorities are left behind in their limited, usually local or national, sphere of governance. The IT industry facilitates the flight of capital. In so doing, it becomes a stronghold of new capitalism itself (Ross 2006; Schiller 2005).

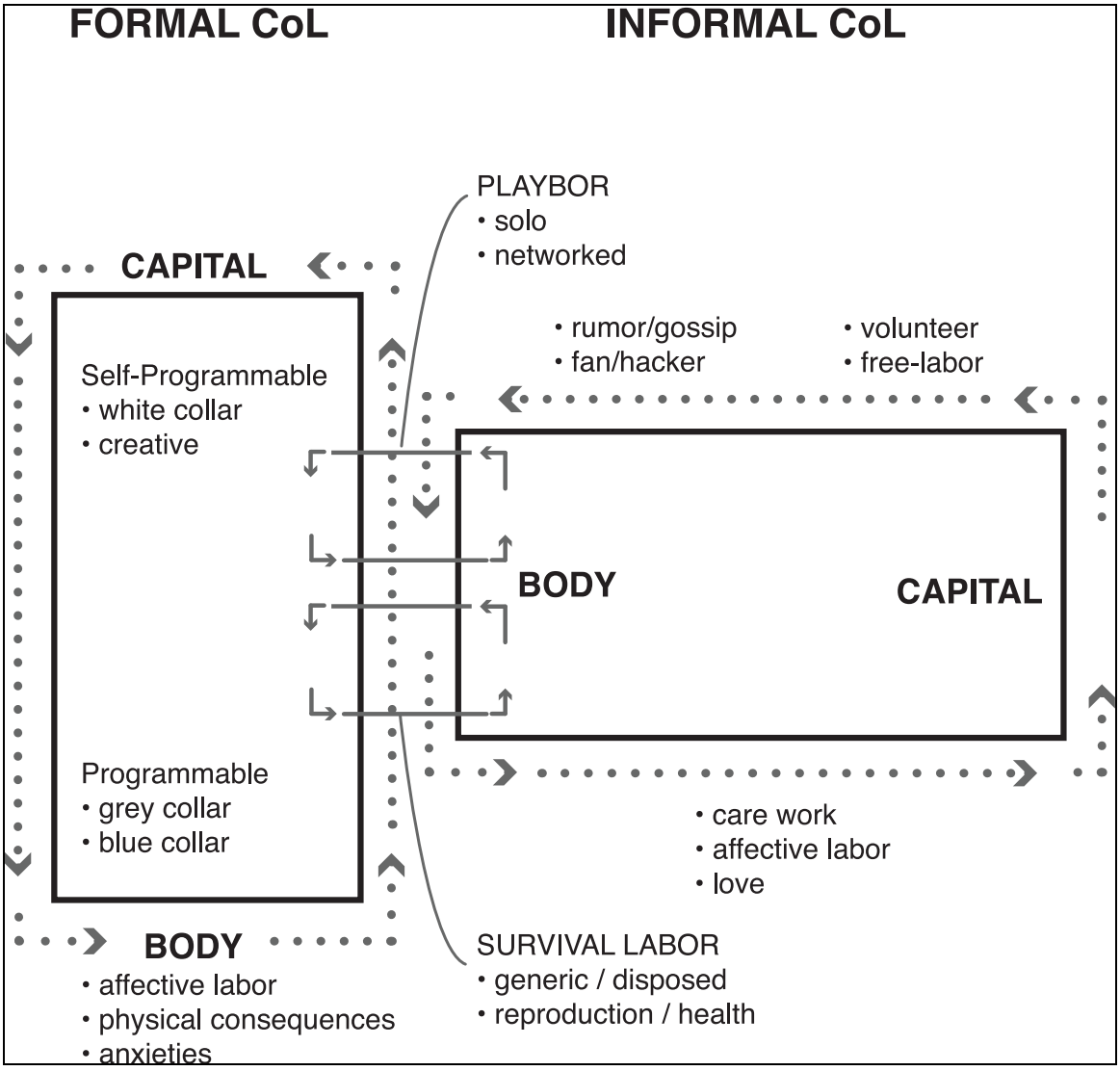


Figure 2: The formal and informal circuits of labor. To the left, the body and capital form a top-down circuit and a class-based hierarchy of constraint. To the right, the worker draws on internal resources and self-made networks to develop new avenues for pleasure, survival and resistance.

The hierarchical circuit of labour on the left of the diagram is not entirely new, although its specific expressions reflect the overall structural transformation of global capitalism as well as the peculiarities of the IT industry. The top-down domination of capital in formal labour processes—in this case protected and locked down by contracts, intellectual property rights regimes, and education/credentialing systems—is expressed through the increasing polarization and internal stratification of labor itself. Some of these are durable patterns, for example, the differentiation of labour aristocrats from ordinary members of the working class, of white collars from blue collars, and of self-programmable labor from generic labour (Castells 1998). Yet there are also new patterns with a particular spatial spin. While in the West, including Japan and the Asian "tiger" economies of South Korea, Taiwan, Hong Kong, and Singapore, the contradiction between well-paid self-programmable labour and disposable generic labor has become more acute, middle-rank jobs in the global IT industry have moved to the more globalized regions of the developing world, most decisively China and India. This has given rise to a new category of the "information have-less" (ie, people caught in between the haves and the have-nots of the digital divide), which constitutes the social basis for "programmable labor": people who perform "simplified tasks in the new information industry" (Qiu 2009, 9).

Examples for such programmable labour, also known as "gray collars" in the Chinese context, include software testers, low-end graphic designers, quality control personnel, and database input personnel. They are called "gray collars" because allegedly their company uniforms are often gray in color and their work, while often performed using computers, is repetitive and labor-intensive in nature (Qiu, 2010). Applying the notion of gray collars to India, it would include such positions as lower-rank software engineers and call center personnel. The term "programmable" highlights the ruthlessness and inhumanity of the labor process, determined in classic Taylorist fashion, which still constitutes much of the production process in this iPhone era, as in Foxconn.

In our illustration of the formal and hierarchical circuit, white-collar self-programmable workers are positioned higher than gray collars, who in turn enjoy more benefits than blue collars. Generic labour may enter the formal circuit when demand exceeds supply at the very bottom of the system, although they can also enter the rank of survival labor that acts as a reserve army, whose existence supposedly helps discipline those who remain in the formal economy. Indeed, white collars can also be ejected from the formal circuit at critical moments like the dot-com crash of 2000–2001. Hence, even these presumably more "treasured" workers of the self-programmable rank are not necessarily better off than gray collars and blue collars in terms of their sense of risk, level of stress, and social isolation (Sennett 1999; Gregg 2011). The pervasiveness of such a disempowerment effect from the white collars to generic labor betrays the hierarchical nature of this formal circuit of labor, hidden behind the rosy camouflage of the New Economy rhetoric. After all, the logic of capital comes from the top down, imposing control across all labor strata—or so is its aim—so that surplus value can be ensured to flow from the bottom up, enabling the next round of accumulation and continued subsumption of body politics in its profitable circuit of labour.

4.2. Informal Circuit of Labour

The limitations of this "formal" circuit of labour have long been evident, not least due to substantial feminist critiques of the 1970s and 80s.[2] The more integrated, global economy of the present calls for still further theoretical refinement. Recent work on the international trade in surrogacy, clinical trial testing and cell harvesting (eg, Cooper and Waldby 2014) shows how the body can be used productively for profit—often by women and others suffering minority status in particular contexts. This remains the case for other "informal" or dubiously regulated sectors of the market economy, such as prostitution, which has a long history of association with "white-collar" as much as other "formal" labour categories (Allison 1994).

For our purposes, the informal circuits of labour attached to the iPhone produce a lateral circuit between social or communicative capital on one hand and the "creative" or "reproductive" body on the other (see Figure 2). On the user/consumption side, the communicative capacity of the device provides new avenues for the gendered experience of care work, which now not only includes the actual provision of companionship but new social and psychological dependencies. The full extent of women's affective labour, which in the domestic sphere includes "affect, care, love, education, socialization, communication, information, entertainment, organization, planning, coordination, logistics" (Fortunati 2007, 144), finds new coherence through the iPhone. For working women, regardless of their position in the hierarchy of the formal circuits of labour, the iPhone annihilates prior separation between the paid and unpaid labour obligation. Spatial distinctions dissolve in a loop of competing communicative demands which Gregg (2011) describes as "presence bleed". The affective labour of the intimate device is a feature of work in cognitive capitalism.

If women's growing centrality to the formal and informal economy makes their experiences representative (Morini 2007; McRobbie 2010), what remains to be acknowledged are the forms of capital such workers accrue through sometimes highly gendered expertise (Hakim 2010). The gradual feminization of the workplace through increased participation is mirrored

[2] If political movements often drove recognition of these inadequacies—for instance, in the "wages for housework" campaigns in the UK and Italy (see Oakley, 1974; Frederici 2012)—they also offer a precedent for the scholar-activist collaborations we will see in the recent investigations of Foxconn.

in management strategies inviting employees to express their feelings in the workplace for the benefit of the company and to ensure smooth collegiality amongst team members (Illouz 2007; Boltanski and Chiappello 2005). Meanwhile women's competence in genres of "talk" whether in the attempt to generate good feeling through "deep acting" (Hochschild 1983) or the more volatile terrain of gossip and rumour offer further resources that we will explore shortly.

The informal circuits also encompass the variety of volunteer, gift, and pirate exchanges online that are enabled by online connectivity. Whether it is the fan labour contributing to the improvement of a cherished media text (Andrejevic 2008) or the "free labour" (Terranova 2000) of app design, testing and development, the iPhone has protracted the start-up company boom beyond the optimistic peak of social media and Web 2.0 to the data-fuelled app-jams and hackathons of today (Gregg and DiSalvo 2013). In other areas, the host of torrent sites distributing locked-down proprietary content in textual, audio, and visual form are the online equivalent of the trade in "fake", "bandit", and "pirate" products filling a similar and substantial market need (Ho 2010).

From China and Vietnam to Turkey and sub-Saharan Africa, fake iPhones, a popular type of "bandit phone" or "shanzhaiji", are an extreme case of network labour subverting the conservative capitalistic logic—a display of bottom-up creativity, which may be channelled back into the formal system, for example, via "licensed" bandit phone manufacturers (Wallis and Qiu 2012). One should not be surprised that these inexpensive bandit phones played an important role in spreading rumours, and even hate speech, that led to ethnic riots in various developing regions of the world, from China to the Middle East, showing how "mere" talk (communication) can lead to material bodies assembling in action (Qiu 2009). A more recent expression of this informal communication circuit is the Yue Yuen shoe factory strike that involved more than 30,000 smartphone-equipped workers in Guangdong and Jiangxi (Kaiman, 2014).

4.3. Short Circuits

The formal and informal circuits as we have depicted them are not insulated from each other. While structural forces of "informalization" in the social, economic, and regulatory realms push labour processes from the formal circuits to the informal ones (Sassen 1998), online and real-world communities as well as civil society networks also build collective identity, even solidarity, using tools made through formal circuits. There are two main "short circuits". One is "survival labour" located in what Sassen terms "survival circuits" (2004), where dispossessed members of the working class become re-connected with each other and with other concerned citizens by joining alternative networks, regionally or transnationally.

On the other hand, there is "playbour", whose original form is found among computer gamers, either individually or networked as hacker/geek groups, which is actively exploited by corporations as free labour (Kücklich 2005). This also includes other networks such as fan culture (Jenkins 2006), or unwitting forms of value extraction, such as iPhone users whose location data was tracked by Apple without their knowledge (Crawford 2012), all providing crucial resources drawn from the informal circuits to allow the formal circuits to continue to expand and evolve (see also Lobato et al. 2011).

This is, however, describing only one type of flow—of capital, body, and creativity—between the formal and the informal. While formal circuits of labour can short-circuit the informal for the benefit of the former, the reverse also happens when informal circuits draw material and immaterial resources from the formal for the building of alternative, even progressive networks, as the following case of Foxconn factory workers demonstrates.

5. iPhone and Foxconn

Just as Ford and the Model T automobile have become emblematic of the Fordist era, we argue Apple can be seen as an emblem of contemporary capitalist world order and the iPhone as a prototype for labour processes in the twenty-first century. The particular labor formations have distinctive globalized and networked characteristics as we have shown in our

illustration of circuits of labour. In this sense, Apple is a typical global network enterprise with the employees in its headquarters in Cupertino, California, being white-collar self-programmable labour, and the Foxconn assembly-line workers in China – and increasingly elsewhere (Andrijasevic et al. 2013)—being grey-collar programmable labour and blue-collar labour.

It is critical to pay close attention to the material aspect of ICT production processes, despite the popular depiction of the "weightless" immaterial ICT industry (Sandoval 2013). Foxconn, the world's largest Apple subcontractor, once had more than 200,000 workers in one facility in Longhua, a factory district of Shenzhen in south China also known as "iPod City" (Webster 2006). In a few years, the Longhua factory grew to about a 400,000 population (Pun et al. 2011) and the total number of Foxconn employees in China exceeded 1 million in 2012 (Markoff 2012). Foxconn has a notorious "military-style" management system, which abused workers and caused at least 17 workers attempting suicide in the first eight months of 2010 (Chan and Pun 2010), an unprecedented tragedy in the history of electronics manufacture.

Terry Guo, Foxconn owner and CEO once publicly stated, "as human beings are also animals, to manage one million animals gives me a headache" (Markoff 2012). Calling workers "animals" is a candid reflection that the factory only values the bodily input of its labour force, not other aspects of its humanity. Yet in the larger industrial system of iPhone production, although Foxconn accounts for the bulk of employees—mostly grey-collar, programmable labour, but also some self-programmable and generic labour—it is, nonetheless a colossal "body" that serves the "brain", ie, Apple's R&D and marketing branches, and transnational capital (Chan and Pun 2010). Foxconn achieves its goals by controlling workers' bodies, at work and off duty, physically and mentally, through formal contractual and managerial measures that brew an "anti-social" culture. This culture atomizes workers through an extreme version of corporate biopolitics (Pun et al. 2011).

Suicide was but one way the formal circuit of labour at Foxconn spins workers off as survival labour, which also happens daily through work injuries and long overtime that hurts workers' health or results in more injuries at work. The most common injury is workers' fingers being cut or crushed by machinery. According to local labour activists, Foxconn was once responsible for about half of all finger-related work injuries in key hospitals of Shenzhen's factory zones in Longhua and Guanlan. To contextualize this datum, in Shenzhen and the surrounding Pearl River Delta of south China, "factory workers lose or break about 40,000 fingers on the job each year" (Barboza 2008). Although only some of these work injuries occurred in IT-industry plants like iPod City, electronic manufacturing is particularly hazardous for hand injuries: workers often have to work very long hours with heavy machinery that moulds and cuts metal parts, factory owners and managers often prioritize productivity over safety, and electronics products like the iPhone have been the fastest growing Chinese exports in recent years.

Foxconn resolved many of the injury or suicide cases through extra-legal means, including several cases that we followed closely (Pun et al. 2011; Qiu 2012). Since 2010, it has also used large number of "student interns", including child labour, to generate more profit by evading China's labour contract law (Mozur 2012a), thus offering yet another illustration for the informalization process: formal circuits cannot be sustained for long without tapping into informal circuits.

This is true for not only Foxconn but also Apple, whose extraordinarily high profit margin cannot be maintained without the fan culture known as "Apple cult" (Beech and Jiang 2012; Belk and Tumblat 2005). That is, in addition to material manufacturing, the sales and technical-support personnel for the world's fast growing IT industry also belong to the rank of programmable labour and grey collars, and those sweeping the floor in shopping malls or moving iPhone boxes belong to blue collars and generic labour.

But Apple certainly did not invent outsourcing and offshoring. The global commodity chain and the unequal international division of labour existed long before the iPhone. What Apple adds significantly to the existing model is iTunes, a further utilization of technical means to lock down content and applications within a given iPhone. There are cycles of boom and bust

in the iTunes app market, despite the oft-told success stories of "playbour" game designers earning fortunes through the App Store (Farrell 2009). But unlike the gold rushes of the past, Apple's iTunes authorization, distribution, and charging system is not only massive in scale and diversity but also much more controlled through technical and legal codes that limit how content flows, and under what revenue sharing schemes. For example, consider those iPhone game testers whose job consists of spending many hours a day concentrating on the operation of apps for the device. Although they don't risk losing or breaking their fingers, they face working lives filled with repetition and low wages along with the assembly-line workers in the iPod City.

Growing awareness of the massive exploitation behind the iPhone, especially at Foxconn, has triggered civil society groups, labour activists, creative designers, and concerned citizens to come together regionally and transnationally to establish alternative networks and their own informal circuits of labour. Following the Foxconn suicides in 2010, more than 60 students and scholars from 20 universities in Hong Kong, Taiwan, and Mainland China formed a volunteer investigation team to study Foxconn's working conditions and provide support for suicide survivors and their families (Pun et al. 2011). This group then connected with other NGOs, citizen reporters, media organizations, and individual workers in and outside Foxconn.

The means of connection include face-to-face and small-group contact, but increasingly they rely on digital social networks of blogs, micro-blogs (Weibo), QQ (Chinese online instant-messenger popular among workers), online forums, mobile phones, Internet video, and most recently their own Chinese-language web portal, www.iLabour.org. There is no formal process for people to join this new anti-sweatshop campaign. Rewards are social, not monetary. Embodied experience is still essential for the fieldwork, including several students who volunteered to work inside Foxconn as "interns" for periods up to one month. Their physical presence was essential to the social and communicative capital that circulates in the volunteer community. In so doing, the informal circuits keep expanding. As Foxconn moves its production facility into China's hinterlands, this informal circuit also starts to include more active members from the inland regions.

This is a transborder movement that goes beyond China's mainland. The 20-university consortium, for example, was first initiated in Taiwan in June 2010, when Pun Ngai, a professor from Hong Kong Polytechnic University was visiting. Several Taiwanese universities and research institutes became the first to join the consortium partly because Foxconn is a Taiwanese company. During the joint investigation that has been carried out since July 2010, Scholars and Students Against Corporate Misbehavior (SACOM, http://sacom.hk), a labour NGO consisting of mostly Hong Kong college students, became a key regional hub of coordination (Sandoval 2013). This was due to Hong Kong's strategic location adjacent to Mainland China and its tolerance of grassroots labour organizing, which is still severely oppressed in the mainland. SACOM also connects the consortium with the global anti-sweatshop movement, working closely with international NGOs such as Good Electronics (http://goodelectronics.org/) and makeITfair (http://makeitfair.org/en).

Particularly notable is the case of Tian Yu, who survived her jump from a Foxconn dormitory in March 2010 and has been receiving care from campaign volunteers since July 2010. Tian Yu's paralyzed body is an illustration of what we term "survival labour": acquiring social and cultural capital from the informal circuit of labour, she became the face of the anti-Foxconn movement, mobilizing further awareness and activism. Figure 3 is the cover image of the Pun et al. book, showing Tian Yu in her wheelchair. She also lent her voice to the short film Deconstructing Foxconn (https://vimeo.com/17558439). Much more than a passive recipient of affective labour, Tian Yu and her family in rural Hubei also provide their own input, materially and immaterially. Since early 2011, they have been making handcrafts that are sold online as well as offline fair-trade stores and promoted through Weibo, China's Twitter-like services (Qiu 2012).

Another transnational development is PhoneStory, a smart phone game produced by Molleindustria, a radical game designer. This is an educational game satirically addressing four issues in the hierarchical circuits: child labour used in extracting Coltan in Congo, Foxconn

suicides in China, consumerism among iPhone users, and hazardous e-waste processing in Bangladesh. Originally the game was designed for gamers using either Apple's App Store or Android Market (ie, Google Play), but within hours it was censored by App Store (Dredge 2011). However, the Android Market sales still went well and Molleindustria was able to donate $6000 to Tian Yu via SACOM. Figure 4 shows the "business model" of this alternative gaming circuit, which has been successful, socially and commercially, by tapping in to Apple/iPhone fandom.

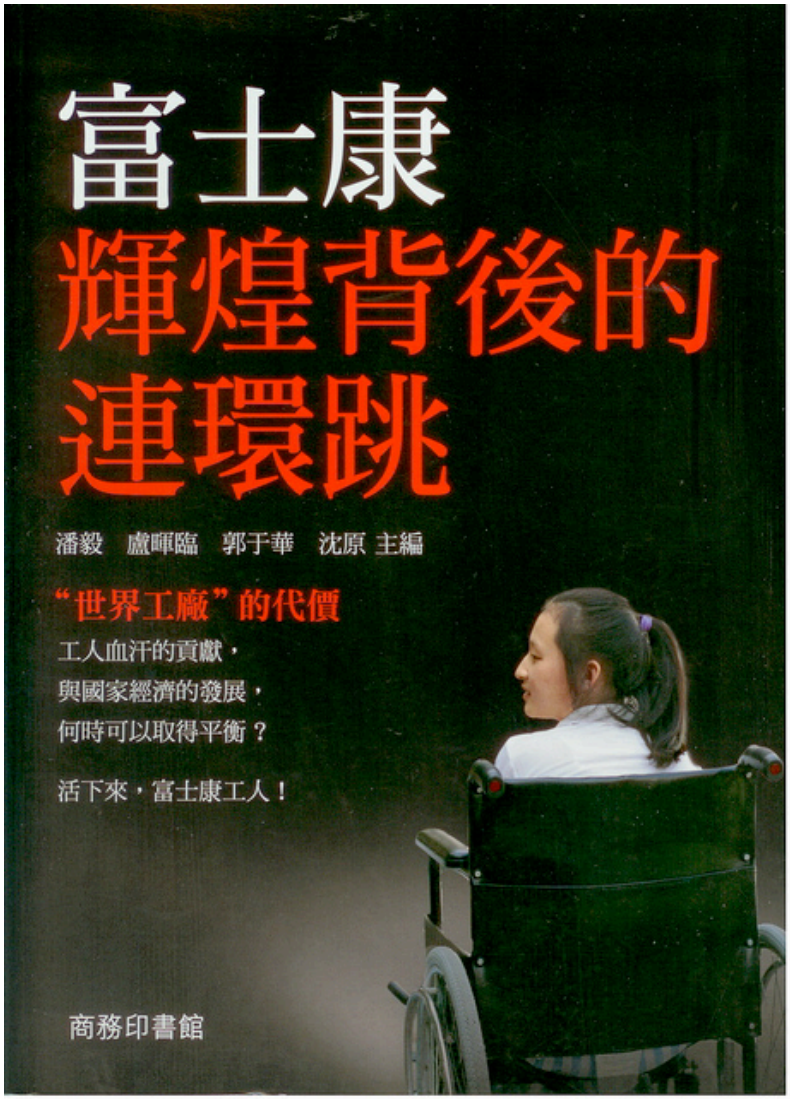
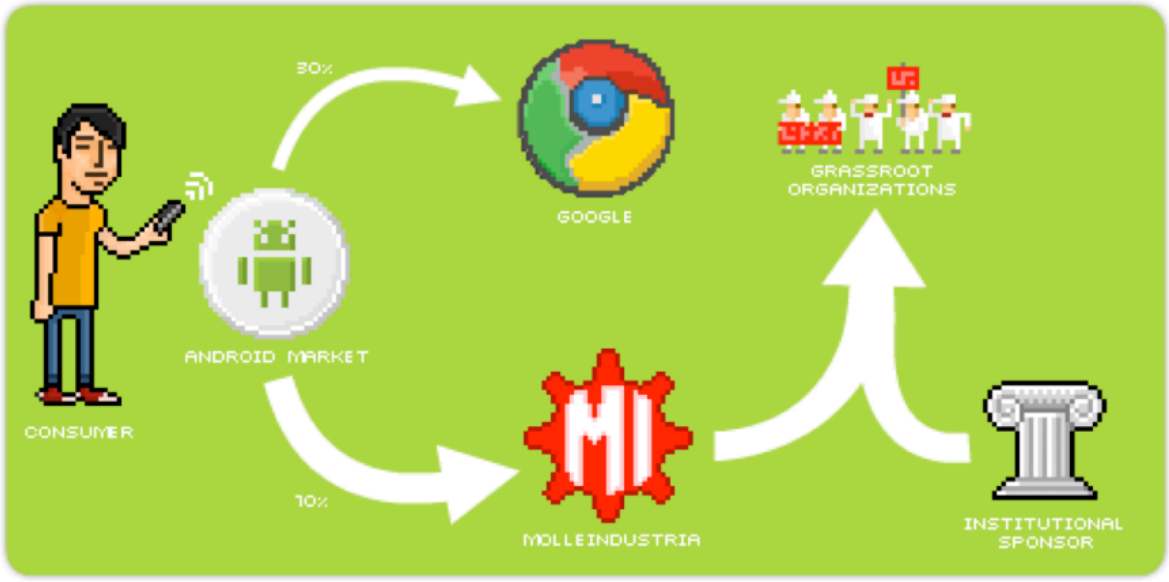


Figure 3: The Pun et al. (2011) book showing Tian Yu, a Foxconn survivor, in her wheel chair



Source: http://www.phonestory.org/

Figure 4: The business model of Molleindustria, a group of radical game designers who created the educational game PhoneStory to address in part the Foxconn tragedies

Source: Authors' collection

Figure 5: Mobile phone video image of security guards beating and threatening workers at one Foxconn gate

Finally, a growing trend since 2011 is the proliferation of user-generated content (UGC), especially in the form of mobile-phone images captured and shared by Foxconn workers themselves. This differs from the conventional pattern of NGOs, activists, or students speaking out for workers, or helping workers to disseminate content (Chan and Pun 2010). As a result, there are many more "raw" images from Foxconn workers. There is a growing genre of Internet videos showing Foxconn security guards beating up or threatening workers who dare to disobey.

Figure 5 shows a screen capture from a 4-minute video, which generated not only anger but also rumour about yet another clash at a Foxconn factory gate in June 2011. This is a moment of playbour short-circuit, where informal, online popular culture can be manipulated to serve the formal circuit of labour, cultivating fear among workers. This is Foxconn's version of the "happy slapper", when violent assaults are recorded on camera phones and shared online. However, not all these attempts to use the informal to serve the formal ended up being successful. For instance, during the worker uprising at Foxconn's Taiyuan plant in September 2012, police and guards reportedly targeted workers who tried to record the event with their mobile phones (Mozur 2012b), showing that the short circuits move in both directions and Foxconn was significantly concerned about the consequences of these circulating video "rumours".

6. Concluding Remarks

"Circuits of labour" is a holistic framework that helps connect various concepts and traditions in the study of labour and ICTs, from communication and cultural studies to political economy and feminist traditions. More than a synthesis of existing conceptual frameworks, the circuits of labour model offers a closer interrogation of the interplay between labor and ICTs in our contemporary era, recognizing the inventive and capacious work of the body under capital. Through a focus on the iPhone and Foxconn, our analysis brings different approaches – material or immaterial labour, affective or mechanized labour, networked or atomized labour, wage labour or "free" "volunteer" labour—into productive relationship. In the process, our decision to write collaboratively across countries, institutions, and companies also intends to model the new conversations that are emerging as much as they are necessary to address the complexity of labour relations and mutual interdependence in the "Asian Century". Media studies needs better measures to reflect the shifts taking place in the geopolitics of production and consumption, which now involves the coordination and surveillance of vast corporate logistics enterprises that escape any one national perspective. The "circuits of labour" model is just one attempt to reflect the significance of these changes, and will hopefully generate many more.

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