

Towards a taxonomy of virtual work

Kaire Holts

Kaire Holts is a PhD Candidate at Hertfordshire Business School in the University of Hertfordshire, United Kingdom

ABSTRACT

Whether they are used for real-money trading in massive multiplayer online role-playing games, on-line content production, working through crowdsourcing Internet marketplaces, modding, online gambling, playing human-based computation games, or just browsing, sharing files, and connecting with friends, online spaces have produced a wide range of new forms of activity. A growing number of scholars now refer to these as 'new labour activities', 'virtual work' or 'digital labour' or describe them as new sources of value creation for capital. Alongside these developments, new terms are emerging to describe the virtual workforce of which 'gold farmer', 'prosumer', 'Turker' or 'microworker' are only a few examples. Despite these new terms and categories, a coherent conceptual framework and understanding of what constitutes virtual work in more general terms is still lacking. No clear classification of this type of work yet exists, nor is there a clear distinction between it and the work that takes place in the 'real world'. This paper explores the obstacles that prevent the construction of such a classification and creating a clear definition and taxonomy of virtual work.

Introduction

Discussions around new value creation or business models on the Internet are currently filling the pages of academic journals. Although the landscape of online value creation models is rich in variety, it is also increasingly difficult to navigate. This is partly because the research has not been able to keep up with the rapid development of virtual work. In particular, understanding of the sources of value remains nebulous. The existing analyses show, however, that although virtual in their nature, online spaces and online business models continue to draw on work carried out in the real world, whether paid or unpaid. The objective of this paper is to create a better understanding of the forms of work that have emerged alongside the development of the Internet and the commercialisation of online spaces and that a growing number of scholars describe as 'virtual work', 'digital labour' or new sources of value creation for capital. The topic matters because the number of people involved in virtual value creating activities is growing and new terms, such as 'gold farmer', 'prosumer', 'Turker', 'click-worker' and 'microworker' are emerging. However, other than these labels, some empirical data, media interest and insular academic discussions, there is no understanding of what constitutes virtual work in more general terms – a definition and classification are missing.

The first section of this paper will, therefore, discuss the emerging debates around activities that could be classified as virtual work by looking at their underlying value creation logics and, in particular, at the ones that draw on human labour as a source of value. It will examine the line between real and virtual work, look for the origin of the latter and try to identify commonalities and differences between different forms of virtual work.

This paper seeks to shed some light on the complex landscape of virtual work by highlighting the obstacles and opacities that complicate the classification of its different forms. According to Bailey (1994), the classification of objects in the form of a taxonomy should reduce complexity and advance the understanding of different domains. A solid taxonomy would, therefore, provide a starting point for understanding virtual work and pave the way for a possible definition that could be applied across the disciplines. However, a good taxonomy must be built on key characteristics or dimensions that need to 'be both exhaustive and mutually exclusive' (Bailey, 1994:3). The second and last section will, therefore, discuss the challenges and barriers confronting the researcher who tries to identify such characteristics for the study of virtual work.

Value creation: a continuation of old patterns or new forms?

This section reflects on those online activities that draw on human labour. It is outside the scope of this paper to address all the possible forms of virtual work separately but some examples will be explained in more detail. The focus will be on value-extracting methods based on virtual communities, work-like activities in or around computer games and crowdsourcing. These examples have been selected because of an emerging body of research and debates around them. The following analysis will look at the origin of these value creation forms and at emerging patterns and commonalities between them but will, by no means, provide a full account. First, the terms 'work' and 'value' will be addressed and explained for the purpose of this paper.

From the question of work to the question of value

Any discussion of virtual work begs the question how 'work' itself should be defined. This is a major challenge. It is not so much the lack of a definition but the bewildering variety of existing concepts that makes it so hard to address. The analysis of work can be traced back to the time of Aristotle and there are many different disciplines that study the nature of work or as Thompson put it: 'there is a bewildering variety of disciplines which claim work as their province' (Thompson, 1989:11). These disciplines have produced a wide range of definitions and concepts that examine work in relation to one or more dimensions, such as organisation, occupational identity, skills, control, wages, and the mode of production, depending on the focus and the level of abstraction the analyst wishes to apply.

The debate about virtual work has generated a number of articles that address topics like the fuzziness of the boundaries between work and play, the extension of work beyond the formal workplace or unpaid labour, or puzzle over the source of value creation (see e.g. Hardt & Negri, 2000; Arvidsson & Colleoni, 2012; De Peuter and Dyer-

Witthorff, 2005; Goggin, 2011). At this stage of the analysis it is, therefore, useful to draw on a definition of work that captures a large range of activities. This suggests that a higher abstraction level is needed to embrace all these activities and include them into the analyses. One, widely used, definition looks at work in relation to value and discusses work as an activity that creates value for capital. Defining work as a value-creating activity has the advantage that it does not restrict itself to a single particular location of value creation, for instance a workplace. It allows for a higher abstraction level and also captures activities that are unpaid or take place outside employment relationships. This paper will, therefore, draw on a definition of labour that understands it as a value-creating activity and will use the terms 'labour' and 'work' interchangeably.

Although labour and value are often discussed together (and increasingly so in debates about virtual work), this linkage is charged with problems. The concept of value and its determinants have been discussed for over 200 years, with particularly prominent contributions from Smith, Ricardo and Marx (Meek, 1973). However, connecting these theoretical debates with debates about value-creating online activities involves bridging a large gap. The literature about value creation mechanisms on the Internet is mainly spread between management studies that reflect on new business models (see e.g. Evans & Wurster, 1999; Hagel & Armstrong, 1997; Amit & Zott, 2001; Zott, et al., 2011), computer science where it is discussed as new technological solutions (see e.g. von Ahn, 2009; von Ahn, 2008; Lechner & Hummel, 2002), and critical voices predominantly from social sciences or critical communication and media studies (see e.g. Fuch 2011a; Terranova, 2013; Scholz, 2010). It is paradoxical that these discussions make use of the concept of value by explaining how value is created or appropriated without really addressing the term 'value' itself or the underlying concepts. It is inevitable that this can lead to different uses and understanding of the term. It is often not clear, for instance, whether 'value' refers to economic or monetary value in a broader sense, to market price or to use value. The term is often taken for granted with little or no explanation. While the management literature tends to put the focus on value production and profit generation without (or rarely) mentioning the role of labour in the determination of value, studies of work and employment are more likely to focus on value appropriation and the role of labour in generating value or being part of the value production. There is thus an inconsistent use and application of the term. I have drawn attention to it here as an important problem for future research to address; however, doing so is beyond the scope of this paper. While recognising that the conceptualisation of value is an important issue for understanding virtual work, this paper will not make a distinction between different applications of the term. Its purpose is to identify and analyse debates about new value-creating activities (regardless of the inconsistent use of the term 'value') that could be classified as virtual work.

Value extraction methods based on virtual communities

Value creation based on virtual communities reached critical mass with the rise of Facebook. In the first decade of the Internet's lifetime, when the gift economy still played a significant role, the first attempts to generate value online, associated with the commercialisation of the Web, were based on e-commerce or on selling packaged

software, with web browsers and web servers constituting the commodities that were being sold (O'Reilly, 2007). Only a few corporate players saw the Internet as their sole source of wealth. Most were sceptical about its profitability. This is also reflected in the questions that business people asked around the turn of the Millennium: 'Why are profits scarce or nonexistent? Why is there so much uncertainty about Internet business models? When will some modicum of order emerge from the chaos of doing business on the Web?' (Rayport, 1999). However, since the bursting of the dot-com bubble in the autumn of 2001, the dynamics of the market have changed (O'Reilly, 2007:17). Web applications that are delivered as a service have grown in popularity, 'with customers paying, directly or indirectly, for the use of that service' (O'Reilly, 2007:20). According to O'Reilly (2007) value has moved to services delivered over the platform and commodity-development has become 'more of a process than a finished product' (Terranova, 2013:47). Amazon.com was one of the first and Google and Facebook are the most prominent examples of this type of service providers, players that have simultaneously been shaping the Web 2.0 movement.

Many scholars argue that the creation of economic value on a platform that supports social networking, community building, file sharing, information production or blogging is generated based on social bonds, the content the participants bring into the community and users' interactions, such as sharing files, linking, posting and commenting (Fuchs, 2011; Scholz, 2010). In 1997, Hagel and Armstrong (1997:45) predicted that advertising and transaction commission revenues would become viable sources of revenue for virtual community companies. More than ten years later, the majority of such platforms are, indeed, accumulating capital by advertising (both broad and targeted) and by selling special services to their users (Fuchs, 2011:211). The principle of these business models is that the more users participate, the more wealth is created. Without user interaction no profit could be made, because the platforms interact as service providers between a very large number of actors.

However, if value is created based on users, can they, then, be regarded as unpaid workers? What role does labour play in these discussions? And how can this be theorised? There is a growing body of academic literature that understands online virtual communities that are gathered on a corporate platform as a form of value-creating labour (see e.g. Fuchs, 2011; Terranova, 2013; Scholz, 2010). This debate is predominantly situated in critical media and communication studies and draws on the concept of the 'audience commodity' developed by Dallas Smythe and on Marx's analysis of capitalism (in particular on the creation of surplus value by capital). The underlying assumption is that user activities create surplus value and profit and that these users should, therefore, be regarded as workers. For instance, Scholz explains how user activities on Facebook create surplus value and therefore constitute labour: 'all of our actions produce value for Facebook and other companies (third parties)'. Scholz (2010:242) summarises this view by saying that 'labour markets have shifted to places where labour does not look like labour at all'. Targeted advertising on online platforms is often explained using the 'audience commodity' concept developed by Smythe, who suggested that the mass media audience is a commodity and should be understood as a form of labour (Smythe 2006:230) because advertisers are interested in buying

the attention given to programmes that feature advertising breaks (Fuchs, 2012:704). Similarly, according to this view, users who interact with each other or create content, constitute an audience commodity that is sold to advertisers and are, therefore, doing unpaid work. However, Fuchs (2012:710) considers that value creation online differs significantly from value created by traditional media, firstly because targeted online advertising is more efficient (with more surplus value being generated in the same time period) and secondly because users are also producers of content that is sold to advertisers: ‘the users’ data – information about their uploaded data, social networks, their interests, demographic data, their browsing and interaction behaviour – is sold to the advertisers as a commodity’ (Fuchs, 2012:704).

Contrary to this view, Huws (2014) argues that online social networking and search engine companies generate value in the form of rent and that their value does not derive from the labour of the people who use the sites but from the people who produce the commodities that are advertised on these platforms. The users, when acting in this capacity, cannot therefore be regarded as workers – at least not in the form suggested by Fuchs (2011), Terranova (2013) and Scholz (2010) – and value creation based on virtual communities does not belong to the debate about virtual work. Arvidsson & Colleoni (2012) challenge the debate from a different perspective, positing the financial rent through investments as an additional source of value for social media platforms. They suggest that the realisation of value ‘needs to be understood as part of an extended, society-wide process of finance-centered accumulation’ (Arvidsson & Colleoni, 2012). Table 1 summarises possible revenue forms for social networking platforms mapped against the corresponding user activities.

Table 1: Type of revenues and user activities under discussion as possible sources of value from virtual communities

Type of revenue	User activities
Advertising, targeted advertising	Donating unpaid services and volunteer work, sharing files, uploading photos and images, linking, posting and commenting, accumulating friends, clicking on ‘like’ buttons (user affect), browsing, searching.
Fees e.g. subscription fees, transaction fees, user fees, fees for special services or for content delivery	
Sale of user data to third parties	
Volunteer work e.g. translating Facebook in other languages	
Financial rent through investments	

Source: author’s analysis

When it comes to finding parallels between online activities and those in pre-digital periods then Huws (2014) compares rent as a source of value with billboards and street markets where the rent for a stall-space was dependent on the location and the number (and quality) of people passing by: the richer the clientele, the higher the rents. Labour

that produces the commodities sold on those markets is the primary source of value creation and not the number or activities of people passing by (Huws, 2014). Ross finds parallels between free online blogging and print media in the eighteenth century (Ross, 2013:15) and concludes that new forms of digital labour are based on old patterns that go back to early stages of industrialisation (Ross, 2013:30). He states that forms of free labour have always existed but with digital technology there are better ways to harvest them (Ross, 2013). Hagel and Armstrong (1997:46) also mention the sale or 'rental' of member usage or transaction profiles to third parties and link this revenue stream to traditional businesses such as the sale of magazine subscriber lists or direct mail customer lists.

The conclusion that can be drawn is that the form of value creation on a platform that supports social networking, community building, file sharing, information production or blogging is not unique. There are parallels to be found between these activities and other older ones including television, radio, newspapers, magazines, billboards, and street markets. It can, therefore, be seen as continuation of old patterns. However, whether the users of these platforms can be regarded as virtual workers, or whether the users' labour involved in this form of value creation constitutes virtual work, remains a moot point.

Work-like activities in or around computer games

Work-like activities that are carried out in or around computer games or on online gambling websites (that are digital in their nature) illustrate well the contradictions and dynamics of the digital labour market highlighted in the introduction. They are developing fast, have a changing character and provide income for millions of people but also exist in unpaid forms and challenge the current understanding of what is work and what is play. There is no established body of literature that addresses all the different forms of game-related work together. Game labour comes in a variety of forms. For instance it includes people who work in the gaming industry such as game developers (De Peuter & Dyer-Witthof, 2005), players who are involved in (mostly unpaid) game modification ('modding') or game testing (Kücklich, 2005), the production of virtual goods and services, real-money trading or 'gold farming'¹ in massive multiplayer online role-playing games (MMORPG) (Heeks, 2008), players of human-based computation games ('games with a purpose') that harvest their unpaid efforts for financial gain (Von Ahn, 2005) or people involved in online poker or other types of online gambling (Fiedler & Wilcke, 2011). Understanding the underlying value creation forms of these activities is not straightforward due to their diverse character. Another question that arises is whether the aspect of 'game' or 'play' that they have in common is enough to constitute them as a single category.

Academics who have analysed the playful character of work carried out in or around computer games, have suggested terms like 'playbour' (Kücklich, 2005), 'ludocapitalism' (Dibbell 2006) or 'productive play' (Sotamaa, 2007) to describe the

¹ 'Gold farming' refers to the (often illicit) reselling for 'real' cash of 'virtual currencies' earned in online games to enable their holders to progress to new levels in the game or obtain other 'virtual' advantages.

emerging forms of labour. Kücklich (2005) studied user-produced game modification ('modding') and suggested that 'the relationship between work and play is changing, leading [...] to a hybrid form of "playbour"' (Kücklich, 2005). He compares modding with freelance work, voluntary work and with productive forms of waged labour and concludes that it has similarities with each of them. Julian Dibbell applied a similar concept to third-party gaming services in MMORPGs, calling the underlying phenomenon 'ludocapitalism' (Dibbell, 1999:297; Dibbell, 2006:299). Finally, Sotamaa (2007) shows how the computer game industry is dependent on the playful-productive activities of their gamers. Although these analyses can serve as a good basis for categorising all the game-related activities, it is not clear whether they can also help explain the underlying value creation mechanisms.

Furthermore, the question about the origin of the labour in and around computer games is difficult to answer. In their book about the computer game industry, Kline, Dyer-Witheford and De Peuter explain that video and online gaming did not fall from the sky but 'emerged on the basis of (very) mass-mediated markets and culture' (Kline, Dyer-Witheford & de Peuter, 2003:18). They consider that online gaming has its origin in television and is the outcome of commodified entertainment culture, being thus an ideal type of commodity for post-Fordism (Kline, Dyer-Witheford & de Peuter, 2003:75). Other authors agree that the commodification of play is the origin of most forms of online gaming (Sotamaa, 2007; Kücklich, 2005). However, whilst this may explain the demand for game developers it does not explain the emergence of gold farming or the reasons why online poker provides an income for a growing number of people. Perhaps there is no simple answer to the question regarding the underlying value creation logic of game labour. Perhaps online gaming is, indeed, an ideal type of commodity for post-Fordism and has created a number of very different value-creating models. It is possible that neither the aspect of play nor the commodification of play is sufficient to capture this diversity and that each form of labour that has its origin in online games needs to be analysed separately.

One of the most controversial game-related labour activities is the real-world sale of virtual goods and services, also called 'gold farming', that has emerged from virtual gaming worlds. The most prominent example includes the real-money trading that takes place in the World of Warcraft. It describes the real-world sale of virtual goods and services produced in the game. According to Heeks (2008), real-money trading in virtual worlds was first mentioned in 1987 but only took off at the beginning of the Millennium when the term 'gold farming' began to be used. The gross revenue of gold farming services industry was estimated at around US \$1-3 billion in 2009, providing primary income to more than 100,000 workers (Heeks, 2008; Lehdonvirta & Ernkqvist, 2011). More up-to-date statistics are missing. In gold farming, value is mostly generated by the simple act of trading virtual goods and services. In addition to generating income for the gamers (gold farmers) themselves, it may also do so for various agents along the value chain such as intermediaries and the gaming company. Table 3 summarises the value-generating activities of gold farming. When drawing parallels with activities in the real world, World of Warcraft has similarities with live-action role-playing games in real life (such as those organised by war re-enactment societies

like the Sealed Knot). However, the latter are not known for creating economic value on a similar scale.

Table 2: Value creating activities of gold farming

Type of revenue	User activities
Producing and selling in-game (virtual) items or services to other gamers through an intermediary or directly (players and their intermediaries)	Playing, farming gold, collecting in-game items (e.g. epic, legendary items in the World of Warcraft), power-leveling avatars, looking for profitable coding bugs in the game.
Subscription fees, fees for special services (gaming company)	
Buying and selling existing virtual items (intermediaries)	
Broadcasting live gaming (e.g. on the platform Twitch.tv)	

Source: author's analysis

Articles about the production of virtual goods and services often point out the novelty of this form of labour. Wang (2006) and Heeks (2008) show that there are some elements that are new or different, such as anonymity in game playing and trading, and the impacts of information failures and value-chain intermediaries, but otherwise the ‘whole activity of gold farming replicates real-world patterns of capitalist development: the commoditisation and division of labour seen for thousands of years, and the globalisation and offshoring seen for tens if not hundreds of years’ (Heeks, 2008:62). According to Wang, ‘Virtual gaming economies embody and reproduce real patterns of capitalist structures of labor, including alienated labor, commodity fetishism and a modern concept of labor theory of value’ (Wang, 2006:1). Wang (2006) goes even further and argues that the economy of virtual gaming does not produce new relations of labour, as Hardt and Negri (2000) claim, but reproduces the inequitable exploitive relations of a material capitalistic economy. ‘This is the key factor that is ignored in scholars who claim virtual economies have new relations in production’ (Wang, 2006:5). However Wang and Heeks (2008) do not elaborate their analyses. In general, there is an absence of research about gold farmers and a lack of reliable data on their activities.

Online gambling is another form of value creation that has grown rapidly in recent years. Fiedler and Wilcke estimate that there are more than 6 million online poker players in the world and more than 1.4 million people play the game for real money (Fiedler & Wilcke, 2011). Fiedler and Wilcke also study the literature about poker and conclude that most of the studies are concerned with understanding playing strategy and with the question whether poker is a game of a skill or a game of chance (Fiedler & Wilcke, 2011). However, there is lack of research about the value creation mechanisms of online poker and about its global value chains. According Fielder and Wilcke, by

2010 the online poker operators already received US \$3.60 billion from their subscribed player community. This indicates that there is a large value creation market that has not been sufficiently studied. Existing studies focus on traditional poker playing but exclude the online version of it. For instance, Bjerg studied traditional poker and came to the conclusion that poker ‘simulates characteristic features of capitalism and reproduces these in an accelerated and sublimated form’ (Bjerg, 2011:463). He applies Marx’s framework of value creation to a game of poker and argues that poker does not create use-value since no labour goes into the game of poker. But what about addiction to the game that is widespread?² Could this be regarded as providing gratification that constitutes use value in a Marxist sense? According to Bjerg, ‘Winning in poker is a matter of the player mastering the “market mechanisms” of the game and negotiating the “exchange-value” of the hands in a way that redistributes the value at stake in the game to his benefit’ (Bjerg, 2011:455). This and other questions need a more detailed analysis, in particular an examination of online poker as a possible form of work.

In addition to game activities that generate income for players, there are also forms of unpaid game activities that create value for the game industry or other businesses. ‘Modding’ or computer game modification and human-based computation games (‘games with a purpose’) are two frequently cited examples of this. Küklich (2005) studied modding as a value generating activity and concluded that this and ‘other similar forms of “free labour” do not fit the categories of wage labour, freelance or voluntary work, and neither do they fit the categories of leisure, play or art. While free labour, or “playbour”, shares traits with all of these occupational types, it can only be understood on its own terms’ (Küklich, 2005). Value generation based on human-based computation games will be explained in the following section.

It can be concluded that work-like activities that are carried out in or around computer games or on online gambling websites are based on different types of value generating mechanisms. However, they do partly overlap with value creation logics based on virtual communities and crowdsourcing. As with other forms of virtual work, there is a big gap in the research and a lack of empirical data.

Crowdsourcing

Another value creation model that has emerged on the Internet and that draws heavily on human labour as a source of value is web-based crowdsourcing. This term refers to the outsourcing of tasks that were traditionally performed by employees or sub-contractors. Generally this is done in the form of an open call addressing an undefined but large group of people (Howe, 2009). Crowdsourcing differs from outsourcing in that it relies on individuals while outsourcing draws on labour provided by other companies. It has also been described as a ‘distributed problem-solving production model’ (Brabham, 2008:76) or ‘a sourcing model in which organisations use predominantly advanced Internet technologies to harness the efforts of a virtual crowd to perform specific organisational tasks’ (Saxtona et al., 2013:6). Corney describes crowdsourcing as ‘a tool to enable open innovation in firms that look to advance their

² Unpublished results from semi-structured interviews with online poker players carried out by the author in Estonia, December, 2012 and January, 2013.

technology or improve their products using external contributors' (Corney et al., 2009). Although these definitions have emerged recently, several authors show that the idea of crowdsourcing is not new and that it goes back to non-profit collaborative online communities in the digital age and to open call contests in the pre-digital age (see e.g. Geiger et al., 2011:1; Corney et al., 2009; Thomas, 2011). Napoleon used the power of the crowd as early as the 19th century when looking for innovative ideas for preserving large amounts of food and for a substitute for butter. As a result canned food and margarine were invented (Thomas, 2011). The Oxford English Dictionary used the power of hundreds of volunteers to improve its consistency (Thomas, 2011). These and many more examples show that the idea of using the power of the crowd to perform large-scale tasks or to find innovative solutions to certain problems is extremely old. However, none of these examples reached the scale and efficiency of web-based crowdsourcing projects. What has changed is the rise of for-profit crowdsourcing and, with it, the emergence of crowd workers who rely on it as their only source of income (see e.g. studies by Caraway, 2010:120; Ross et al., 2010; Ipeirotis, 2010a). Digital technologies have made it easier to recruit workers and to channel and sell the results of the crowd's labour (Corney et al., 2009). The community's creation has become business and the activities of the crowd a source of profit. As Ross said about free labour (Ross, 2013), crowdsourcing can be said to have always existed but with digital technology it is easier to harvest it.

But what are the characteristics of this type of work and how does it compare with other forms of virtual work? One of the characteristics of crowdsourcing is the dissolution of conventional employer-employee relationships that is replaced by more casual and short-lived forms of collaboration focusing on tasks or collaborative processes or unpaid game activities. In terms of activities, it typically includes working through crowdsourcing Internet marketplaces, playing human-based computation games or participating in other computational processes, whether consciously or not.

The existing literature points to several movements and technological advances that have paved the way for value creation based on collaborative processes and on the knowledge of the crowd. These include open source production (Malone & Laubacher, 1998:146), human computation (Geiger et al., 2011) and the Web 2.0 movement (O'Reilly, 2007). From a technical point of view, web-based crowdsourcing platforms and computer algorithms have been the main engines (Saxtona et al., 2013:9) behind the transformation of ordinary web users into virtual crowd workers or as Quinn and Bederson (2011) put it: 'organising web users to do great things'. As noted in the introduction, crowdsourcing perfectly reflects the diversity and characteristics that are typical of virtual work, including the fusion of work and play, the intertwining of work and leisure time and the dissolution of formal employment relationships. Crowdworkers may be either paid or unpaid, conscious about their contribution to value creation or not, embedded in a game-like environment or not, or paid with real or virtual money (see e.g. Saxtona et al., 2013). What is common to all these different forms of crowdsourcing is that they are channelled through the web and mostly through online service platforms that give companies access to a global pool of workers, serve as intermediaries in the value chain and play a key role in the further

rapid growth of crowdsourcing. The undefined crowd (the large network of workers), the crowdsourcing service platforms and the corporate sector are, therefore, the main agents in value creation. As stated above, not all the participating individuals receive a monetary compensation, although the whole value creation process relies on human labour (Brabham, 2008:83). In contrast, the clients for crowdsourcing services profit in the form of commodity sales or through the improvement of their internal production processes (see Table 3). The crowdsourcing service platforms use a variety of value creation models ranging from subscription fees to third-party advertisements. To make them even more complicated to understand, it is not only the distribution of wealth that varies between platforms but also the types of tasks that are outsourced.

Table 3: Type of revenues of clients of crowdsourcing services, crowdsourcing platforms, and corresponding crowd activities

Type of revenue	User activities
Sale of goods and services produced by the crowd (e.g. through micro-tasks, public design and innovation contests, use of innovative ideas that improve the quality of products, services and internal processes)	Donating unpaid services and volunteer work, performing Human Intelligence Tasks (HITs), participating in design contests, producing goods and services, playing human-based computation games, solving CAPTCHAs
Sale of user-generated content (e.g. photographs and design)	
Volunteer work of the crowd e.g. writing reviews on the Internet (e.g. on TripAdvisor or Amazon)	

Source: author's analysis

At one end of the spectrum are complex problems that are broken down into extremely small tasks, which require very little time and few skills to be completed, in some cases only the ability to click. After the completion of small tasks by a network of workers, usually for low compensation, the project is recomposed with the help of digital tools. In such projects the workers often remain anonymous and are sometimes called ‘Turkers’, ‘clickworkers’ or ‘microworkers’ (Lehdonvirta & Ernkvist, 2011:24; Ipeirotis, 2010a).

However, crowdsourcing can also involve the outsourcing of tasks that require higher skills and creative thinking. In this case the number of people working on any given problem will be small, but a company can choose between a large distributed pool of individuals. These tasks typically include writing, translation, graphic design, website and software development or day-to-day office tasks. The easy access to a large group of remote workers who are willing to invest their time, energy and skills often eliminates the need to hire a local expert or an employee. As the workers can be located anywhere in the world, many national laws with their minimum wage requirements cease to have effect. The unregulated area of crowdsourcing, together with the brisk competition

between individual workers from all over the world, has had the effect of decreasing the level of compensation companies are willing to pay (see e.g. Quinn & Bederson, 2011; Ipeirotis, 2010b, Ross et al., 2010).

The development of crowdsourcing has not only lowered wages and created a new workforce but has also transformed some formerly paid jobs into unpaid activities. Examples of this include design contests whereby a company looks for new design ideas for its products or for innovative solutions to its business problems through an open call. Typically a call might address a large number of people, promising the winners a reward in the form of mass production of their ideas instead of monetary compensation (Brabham, 2008:76). This business model is often praised using phrases like 'the wisdom of the crowd', 'crowd intelligence', 'collective intelligence', 'the innovative power of the crowd' or 'distributed', 'plural' or 'collaborative' problem solving (see e.g. Howe, 2009; Brabham, 2008; Malone & Laubacher, 1998; Quinn & Bederson, 2011). However, the existing literature about crowdsourcing is reticent on the topic of the elimination of formerly paid work by the designers and other experts who might otherwise be carrying out this product design and similar tasks. The question to ask here is whether an outsourced task in the form of a competition still constitutes work and, if so, how it should be theorised and categorised. Should it still be designated virtual work?

This question becomes even more challenging when the crowd creates value in exchange for entertainment or when people playing computer games, without consciously doing so, simultaneously solve large-scale problems (von Ahn, 2006:96). This business model is sometimes called 'game with a purpose' or simply 'human computation'. Although Quinn and Bederson (2011) argue that human computation is not synonymous with crowdsourcing, its value creation logic looks similar, drawing on the same type of labour. For instance the ESP Game³ was designed for the purpose of labeling web images and creating a database that aimed at improving the quality of web-based image search (von Ahn, 2006:96). Another innovative example is the reCAPTCHA system that asks users to enter words seen in distorted text images, used to protect websites from computer-generated spam. By doing so, these users contribute (often not consciously) to the digitisation of old books and newspapers (von Ahn et al., 2008:1465). For instance, through the reCAPTCHA system, the entire New York Times Archive from 1851 to 1980 was digitised in less than 12 months, using the (unpaid) labour power of the crowd (von Ahn, 2009). The computer scientist Luis von Ahn is a pioneer of crowdsourcing models that link entertainment with computational tasks. Interestingly, on his blog he addresses the question of categorisation by referring to unpaid activities as work. He also concludes that making the crowd work for free in exchange for entertainment is legitimate:

Assume we decide as a country that labor markets like Mechanical Turk should be legislated and a minimum wage is imposed. Some of the work on human computation involves transforming tasks into enjoyable games so that people

3 The ESP Game was developed by computer scientists to address the problem of creating difficult metadata. The idea behind the game is to use the computational power of humans to perform a task that computers cannot do (originally, image recognition) by packaging the task as a game. (Wikipedia - http://en.wikipedia.org/wiki/ESP_game, accessed July 1, 2013)

perform them in exchange for entertainment. Is it ok to pay people less (or nothing) if the task is fun? What about writing a review for a book online or rating a video? These are concrete pieces of work that benefit the Web sites, but that nobody seems to object to doing for free. (von Ahn, 2010)

However, this type of conclusion requires more analysis than the current research is able to provide. There is also lack of studies focusing on workers' perspectives on crowdsourcing. For instance, according to Howe, crowdsourcing uses the network to harness peoples' spare cycles – the time and energy left over after their obligations to employers and family are fulfilled (Howe, 2009:13). Yet, the few empirical studies (see e.g. Caraway, 2010:120; Ross et al., 2010; Ipeirotis, 2010a; Ipeirotis, 2010b) show that, contrary to Howe's view, for a substantial number of crowd workers it is their primary source of income. This shows that more critical and comparative analyses of crowdsourcing are needed. There is an obvious mismatch between theory and reality. This is partly because a substantial part of the crowdsourcing literature has been written by researchers from management and computer studies, often cross referencing each other. However, the lack of workers' perspective in their studies makes it difficult to find what common basis there might be with other forms of virtual work and to move towards a taxonomy and a possible definition. This literature also fails to provide any clear analysis of the underlying value creation processes or any means to distinguish between different forms of crowdsourcing (Geiger et al., 2011:1). It is only clear that crowdsourcing exists in paid and unpaid forms, and relies on both skilled and unskilled workers. It has transformed paid work into unpaid activities but also changed unpaid into paid work. As for motivation, a wide range of possible factors is listed in the literature. What is also clear is that crowdsourcing blurs the boundaries between work and play and work and leisure time. It contributes to the dissolution of conventional employer-employee relationships, and to the degradation of wages and its success relies on digital technologies and the Web. However, it is an open question whether this is a sufficient basis for asserting commonalities between different forms of crowdsourcing and distinguishing them from other forms of work.

Towards a taxonomy and definition of virtual work: obstacles

The previous section gave an overview of debates about activities that can be classified as virtual work. This uncovered three main obstacles to developing a clear definition of virtual work: the first is concerned with the shifting boundaries between work and play, and between consumption and production; the second with the conceptualisation of value; and the third with gaps in the existing knowledge about different forms of virtual work.

How should the pool of different forms of virtual work be defined?

Before addressing the question of how different kinds of virtual work can be characterised, it is necessary to ask more broadly how the broader pool of different forms of virtual work should be defined. What type of work qualifies as 'virtual work'? Here, perhaps the biggest challenges derive from the widely discussed fusion between work and play, the intertwining of work and leisure time and the merging of

consumption and production. Should an activity that is unpaid but creates monetary value for capital be considered as work? Or can paid labour that has elements of fun be seen as work? These are fashionable topics to discuss, in particular among scholars from media and communication studies (see e.g. Andrejevic, 2013; Goggin, 2011; Terranova, 2013; Kücklich, 2005; Fuchs, 2011). There is no straightforward answer to these questions but it is clear that the blurring of boundaries between different spheres complicates the understanding and the demarcation of what should be included in the category of virtual work. It should be noted, however, that this problem is not limited to the Internet and to digital industries.

A study by Gershuny (2000) provides empirical evidence for a broad shift towards leisure societies and a blurring of the boundary between work and leisure. This provides an interesting starting point for mapping the landscape of digital work. Gershuny's study brought together time-diary data from twenty industrial countries and produced a historical account of how time-allocation changed over the last third of the twentieth century (Gershuny, 2000:4). According to Gershuny, there has been a general decline in working time and a growing preference for leisure: 'the balance of waking time has shifted in general away from work, towards leisure.' (Gershuny, 2000:133). However, for society as a whole, he found that the expansion of leisure time has been associated with an expansion of work. This apparent paradox can be explained by the increasing number of service jobs in the 'leisure' industry (Gershuny, 2000:134). This raises interesting questions with respect to work in online spaces: if the shift from work towards more leisure creates new jobs then what exactly are these digital jobs that the 'leisurely' world wide web and digital technologies have created? Are we able to recognise them? To what extent are these jobs based on alternative or new value creation models? This leads to the question whether we can distinguish between leisure activities and unpaid work. How many of the activities that are considered as fun or free time activities, such as browsing on the Web or using Facebook, fall in reality into the category of unpaid work and are hidden from statistics? Although Gershuny did not look separately at computer-related activities, he pointed out that an adequate distinction between unpaid work and leisure is increasingly difficult (Gershuny, 2000:108-109).

One could also ask what triggers the shift towards a leisure society and the convergences mentioned above? There are different opinions. While Terranova suggests that the merging of consumption and production is symptomatic of post-Fordism (Terranova, 2013:37), Kücklich argues that the fusion of play and work is a result 'of a "deregulation" of work in which the primary source of coercion is no longer the institution an individual works for, but the individual herself' (Kücklich, 2005). Meanwhile Goggin (2011) analyses the convergent culture we live in and concludes that history does not provide enough evidence that would allow us to see play and work as two different spheres. In fact, this author argues, the boundary has always been blurred. Spencer (2009) concludes with a similar statement: 'the distinction between work and leisure is, in reality, an artificial one' (Spencer, 2009:140). However, in order to understand all the possible reasons for the convergence it is necessary to draw a clearer distinction between play and work, consumption and production, but this is outside the scope of this paper.

Based on the discussion about the shifting boundaries, it can be concluded that different forms of virtual work are not necessarily to be found in the category of paid work and that we should look beyond it to find them. Alternatively, as long as these questions are not clear, we should not distinguish between paid, unpaid and leisure activities in virtual spaces but should focus on underlying value creation mechanisms. It is not accidental that human activities create economic value (although strategies designed to do so may fail). Whether a person is paid or not, formally employed or not, or whether there is a creation of monetary value out of his or her activity usually follows certain logics and is based on a business model. On the Internet, businesses have been particularly successful in developing value creation mechanisms that draw on human labour without engaging in formal employment relationships.

Confusion around the concept of value

A second area of confusion concerns the concept of value. This has some similarities with the problem related to the shifting boundaries between work and play but has a slightly different angle. According to Gorz (1994:54), work only becomes work if it generates value that can be exchanged on the market. This goes back to the value creation debate that was first theorised by classical economists including Adam Smith, David Ricardo and Karl Marx. These classical political economists were the first to recognise the importance of labour as the source of value, necessary for capital accumulation (Spencer, 2009). For this reason, understanding the logic of value creation that involves labour is important for understanding the nature of work. There are two aspects that need to be explored in this context. One is the way value is generated; the other includes understanding the source of value, which traditionally refers to human labour. As showed in the previous section, there is a great deal of confusion in the literature about the sources of value and value creation mechanisms on the Internet. However, so long as there is no agreed understanding about these value creation mechanisms, it cannot be clear what qualifies as virtual work. Although (sometimes for slightly different reasons) there are many authors who call for reconfiguration of the concept of value and its measurement, explaining that the traditional tools and concepts do not capture all forms of value creation (see e.g. Morini & Fumagalli, 2010; Böhm & Land, 2012). Böhm and Land criticise the labour process theory (LPT): 'as long as LPT assumes that the employment relationship is the only location of capitalist labour process, the theory might blind itself to fundamental changes that have moved labour outside of the workplace and contract-based employment' (Böhm & Land, 2012:223). Morini and Fumagalli focus on affective labour but come to a similar conclusion with regard to the labour theory of value as a tool for measuring value generation, stating that: 'the labour theory of value must dynamically adjust to the capitalist system and the succession of different modes of accumulation' and conclude that the labour theory of value must be rethought (Morini & Fumagalli, 2010). There are other authors who are less concretely critical of the theory but conclude in a similar way by calling for new theoretical frameworks (see e.g. Banks & Humphreys, 2008; Cubitt, 1998; Petersen, 2008). Nevertheless, concrete suggestions for new tools and theories are rare.

Lack of knowledge

A third obstacle to the development of clear definitions is created by the incompleteness of the existing knowledge about the emerging value creating activities on the Internet. On the one hand, there is shortage of empirical studies. The existing studies either have a narrow focus on a single type of activity, investigating, for instance, gold farming (Heeks, 2008), crowdsourcing (Howe, 2006), prosumption (Ritzer & Jurgenson, 2010; Beer & Burrows, 2010) or they address it on a very abstract level describing it, for instance, as 'free labour' (Terranova, 2013) or 'immaterial labour' (Lazzarato 1996; Coté & Pybus, 2010; Pybus, 2011). On the other hand, digital labour is studied from a variety of disciplinary perspectives. Each discipline, however, has a different focus and tends to ask slightly different questions. While researchers from media and communications studies are concerned with the exploitation of free labour (see e.g. Ross, 2013; Terranova, 2013), computer scientists are exploring new ways of how to use people's 'free' labour time to create value for capital (see e.g. von Ahn & Dabbish, 2008). And while mainstream economists are primarily interested in understanding the market size and the contribution of the activities in virtual environments to real world economies (Castronova, 2002), more critical voices from heterodox economics look at wealth distribution and decomposition of classes. Although there are studies that draw parallels between labour in the digital and pre-digital ages (Ross, 2013; Terranova, 2013), a cross-disciplinary analysis is missing. This makes an inventory, development of a definition and comparison of different forms of work emerging on the Internet difficult. It also makes it difficult to identify dimensions across the different forms of digital work.

Furthermore, dimensions only become valid if they are matched with possible values, ideally based on empirical data. However, as shown, the amount and quality of empirical data about virtual work is incomplete or uneven. According to Bailey (1994), a successful classification is characterised by the ability to identify the key characteristics on which the classification is to be based: 'the only basic rule is that the classes formed must be both exhaustive and mutually exclusive' (Bailey, 1994:3). What could be the possible key dimensions that would form exhaustive and mutually exclusive classes of virtual work? Traditionally, the study of work has focused on the full-time employment model and on dimensions like control over the work process, the contractual nature and the number of parties involved in the work relationship (Cappelli & Keller, 2012). However, this model has already shown its weaknesses for addressing the complexities of the growth of alternative work arrangements like independent contracting and temporary work (Cappelli & Keller, 2012), and is even more difficult to apply to virtual work. As shown in the previous section, on the Internet, businesses have been particularly successful in putting forward value creation mechanisms that draw on human labour without engaging in formal employment relationships; thus a classification system is needed that captures this diversity.

Conclusion

The objective of this paper was to create a better understanding of the value creating activities that are emerging on the Internet. It has focused on those business models that draw on human labour and activities that are referred to as 'virtual work' and on value extracting methods based on virtual communities, work-like activities in or

around computer games and crowdsourcing. It has tried to search for their origin, to draw parallels with work outside of virtual spaces, identify emerging patterns and communalities between different forms of virtual work.

Based on this analysis, the paper identified the factors that complicate the classification of different forms of virtual work. It identified three main problem areas. First, virtual work is accompanied by trends of shifting boundaries between work and play, intertwining of work and leisure time, and merging of consumption and production. It found that different forms of virtual work are not necessarily to be found in the category of paid work but often lie outside formal employment relationships or even among activities that look like leisure and are unpaid. However, whether all these forms of value creation constitute virtual work is debatable. As a result, it is difficult to define what qualifies as virtual work. Second, it is evident that there is a great deal of confusion around the concept of value and that the traditional concepts and tools do not capture all the emerging forms of value creation. However, the nature of work cannot be understood without also understanding the value creation logic that human labour is involved with. As long as it is not clear how value is created and what the exact sources of value are, it is, again, difficult to define the pool of virtual work. Third, it was shown that the amount and quality of empirical data about virtual work is incomplete or uneven. The topic is studied by a variety of disciplines that look at it from different perspectives. There is lack of cross-disciplinary analyses and empirical data. This in turn hinders the identification of the key dimensions necessary for a taxonomy.

Until these obstacles are addressed and resolved it will be challenging to move towards a better understanding of virtual work. More empirical data, investigation, inter-disciplinary research, new tools and theories or adaptations of old ones are needed before a taxonomy and a definition of virtual work can be developed. Parts of the research agenda presented in this paper will be taken forward in a doctoral thesis that is focusing on gold farming and other forms of game labour – income-generating forms of virtual work. It aims at applying existing theoretical frameworks such as the labour theory of value and labour process theory in order to make sense of virtual work in a wider sense.

© Kaire Holts, 2013

REFERENCES

- Amit, R. & C. Zott (2001) 'Value creation in e-business', *Strategic Management Journal*, 22:493-520.
- Andrejevic, M. (2013) 'Estranged Free Labour', T. Scholz (ed) *Digital Labor: The Internet as Playground and Factory*, London: Routledge.
- Arvidsson, A. & E. Colleoni (2012) 'Value in Informational Capitalism and on the Internet', *The Information Society: An International Journal*, 28 (3):135-150.
- Bailey, K. D. B. (1994) *Typologies and Taxonomies: An introduction to classification techniques*, Sage University Paper Series on Quantitative Applications in the Social Sciences, series no. 07-102. Thousand Oaks, CA: Sage.
- Banks, J. & S. Humphreys (2008) 'The Labour of User Co-Creators: Emergent Social Network Markets?', *Convergence: The International Journal of Research into New Media Technologies*, November, 14:401-418.
- Beer, D. & R. Burrows (2010) 'Consumption, Prosumption and Participatory Web Cultures', *Journal of Consumer Culture*, 10 (1):3-12.

- Bjerg, O. (2011) 'Poker phases: Draw, Stud and Hold'Em as play-forms of capitalism', *ephemera: theory & politics in organization*, 11 (4):450-465.
- Böhm, S. & C. Land (2012) 'The new 'hidden abode': reflections on value and labour in the new economy', *The Sociological Review*, 60 (2):217-240.
- Brabham, D. C. (2008) 'Crowdsourcing as a Model for Problem Solving. An Introduction and Cases', *Convergence: The International Journal of Research into New Media Technologies*, 14 (1):75-90.
- Cappelli, P. & J. R. Keller (2012) 'Classifying Work in the New Economy', *ACAD MANAGE REV.* July 24, 2012, Published ahead of print July 24, 2012. Accessed on January 30, 2013 from <http://amr.aom.org/content/early/2012/07/20/amr.2011.0302.abstract>.
- Caraway, B. (2010) 'Online labour markets: an inquiry into oDesk providers', *Work Organisation, Labour and Globalisation*, 4 (2):111-125.
- Castronova, E. (2002) 'On Virtual Economies', *CESifo Working Paper Series No. 752*, category 9: Industrial Organisation. Accessed on January 30, 2013 from: <http://ssrn.com/abstract=338500>.
- Corney, J. R., C. Torres-Sánchez, P. Jagadeesan, A. Lynn & W. Regli (2009) 'Outsourcing labour to the cloud', *International Journal of Innovation and Sustainable Development*, 4 (4):294 - 313.
- Coté, M. & J. Pybus (2010) 'Learning to immaterial labour 2.0: MySpace and Social Networks', *ephemera: theory & politics in organization*, 7 (1):88-106.
- Cubitt, S. (1998) *Digital Aesthetics*, London: Sage.
- De Peuter, G. & N. Dyer-Witheford (2005) 'A playful multitude? Mobilising and counter-mobilising immaterial game labour', *The Fibreculture Journal*, 5. Accessed on January 30, 2013 from: <http://five.fibreculturejournal.org/fcj-024-a-playful-multitude-mobilising-and-counter-mobilising-immaterial-game-labour/>.
- Dibbell, J. (2006) *Play Money: Or, How I Quit My Day Job and Made Millions Trading Virtual Loot*, New York: Basic Books.
- Dibbell, J. (1999) *My Tiny Life: Crime and Passion in a Virtual World*, New York: Henry Holt.
- Evans, P. & S. T. Wurster (1999) 'Getting Real About Virtual Commerce', *Harvard Business Review*, November- December:84-94.
- Fiedler, I. & A.-C. Wilcke (2011) 'The Market for Online Poker'. Accessed on January 30, 2013 from: <http://ssrn.com/abstract=1747646>.
- Fuchs, C. (2012) 'Dallas Smythe today – the audience commodity, the digital labour debate, Marxist Political Economy and Critical Theory. Prolegomena to a digital labour theory of value', *tripleC – Journal for a Global Sustainable Information Society* 10 (2):692-740.
- Fuchs, C. (2011) 'The contemporary world wide web: social medium or new space of accumulation?' ; D. Winseck & D. Yong Jin (eds) *The Political economies of the media: the transformation of the global media industries*, London: Bloomsbury.
- Geiger, D., S. Seedorf & M. Schader (2011) 'Managing the Crowd: Towards a Taxonomy of Crowdsourcing Processes', *Proceedings of the Seventeenth Americas Conference on Information Systems*, Detroit, Michigan August 4th-7th 2011, Paper 430. Accessed on January 30, 2013 from: http://aisel.aisnet.org/amcis2011_submissions/430.
- Gershuny, J. (2000) *Changing Times: Work and Leisure in Postindustrial Society*. New York: Oxford University Press.
- Goggin, J. (2011) 'Playbour, farming and leisure'. *ephemera: theory & politics in organization*, 11 (4):357-368.
- Gorz, A. (1994). *Capitalism, Socialism, Ecology*. Translated by Turner, C. London, New York: Verso.
- Hagel, J. & Armstrong, A. (1997) *Net Gain: Expanding Markets Through Virtual Communities*. Harvard Business School Press.
- Hardt, M. & Negri, A. (2000) *Empire*. London: Harvard University Press.
- Heeks, R. (2008) 'Current Analysis and Future Research Agenda on 'Gold Farming': Real- World Production in Developing Countries for the Virtual Economies of Online Games'. Development Informatics Group, Institute for Development Policy and Management, University of Manchester.
- Howe, J. (2009) *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business*. London: Random House Business Books

- Howe, J. (2006) 'The Rise of Crowdsourcing'. Wired Magazine, Issue 14.06.
- Huws (2014) 'The underpinnings of class in the digital age: living, labour and value'. Socialist Register 2014: The Remaking of Class.
- Ipeirotis, P. (2010a) 'Demographics of Mechanical Turk'. Working Paper CeDER-10-01, New York University, Stern School of Business.
- Ipeirotis, P. G. (2010b). 'Analyzing the amazon mechanical turk marketplace'. XRDS: Crossroads, The ACM Magazine for Students, 17(2), 16-21.
- Kline, S., Dyer-Witthof, N. & De Peuter, G. (2003) Digital Play: The Interaction of Technology, Culture, and Marketing. McGill-Queen's University Press.
- Kücklich, J. (2005) 'Precarious playbour: Modders in the digital games industry', Fibreculture, 5. Accessed on January 30, 2013 from: <http://journal.fibreculture.org/issue5/index.html>.
- Lazzarato, M. (1996) 'Immaterial Labour'. In Virno, P. & Hardt, M. (eds.) Radical Thought in Italy: A Potential Politics. Minneapolis: University of Minnesota Press:132-146.
- Lechner, U. & Hummel, J. (2002) 'Business Models and System Architectures of Virtual Communities: From a Sociological Phenomenon to Peer-to-Peer Architectures'. International Journal of Electronic Commerce. Spring 2002, 6 (3):41-53.
- Lehdonvirta, V. & Ernkqvist, M. (2011) Knowledge Map of the Virtual Economy. Washington DC: World Bank.
- Malone, W. T. & Laubacher, J.R. (1998) 'Are big companies becoming obsolete? The Dawn of the E-Lance Economy'. Harvard Business Review, Reprint 98508, September-October 1998:145-152.
- Meek, R. L. (1973) 'Studies in the Labour Theory of Value', London: Lawrence & Wishart.
- Morini, C. & Fumagalli, A. (2010) 'Life put to work: Towards a life theory of value'. ephemera: theory & politics in organization, 10(3/4):234-252.
- O'Reilly, T. (2007) 'What is Web 2.0: Design Patterns and Business Models for the Next Generation of Software'. Communications & Strategies, No. 1, p. 17, First Quarter 2007:17-37.
- Petersen, S. M. (2008) 'Loser Generated Content: From Participation to exploitation'. First Monday, 13 (3) March 2008. Accessed on January 30, 2013 from: <http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/rt/prINTERfriendly/2141/1948>.
- Pybus, J. (2011) 'The Subjective Architects: When Tweens Learn to Immaterial Labor'. *Journal of Communication Inquiry*, 35 (4):403-409.
- Quinn, A. J. & Bederson, B. B. (2011) 'Human Computation: A Survey and Taxonomy of a Growing Field'. In Proceeding, CHI '11 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 1403-1412.
- Rayport, J. (1999) 'The truth about Internet Business Models'. *Strategy and Business* (1999):5-7.
- Ritzer, G. & N. Jurgenson (2010) 'Production, consumption, prosumption', *Journal of Consumer Culture*, 10 (1):13-36.
- Ross, A. (2013) 'In Search of the Lost Paycheck', T. Scholz (ed) *Digital Labor: The Internet as Playground and Factory*, London: Routledge.
- Ross, J., L. Irani, M. Silberman, A. Zaldivar & B. Tomlinson (2010) 'Who are the crowd workers? Shifting demographics in mechanical turk', *Proceedings of the 28th of the international conference extended abstracts on Human factors in computing systems*, ACM:2863-2872.
- Saxton, G.D., O. Ohb & R. Kishore (2013) 'Rules of Crowdsourcing: Models, Issues, and Systems of Control', *Information Systems Management*, 30 (1).
- Scholz, T. (2010) 'Facebook as Playground and Factory', D. E. Wittkower (ed) *Facebook and Philosophy: What's on Your Mind?*, Chicago: Open Court Publishing.
- Smythe, W. D. (2006) 'On the Audience Commodity and its Work', G. Durham & D. M. Kellner (eds) *Media and cultural studies: keywords*, Oxford: Blackwell.
- Sotamaa, O. (2007) 'Let Me Take You to The Movies: Productive Players, Commodification and Transformative Play', *Convergence: The International Journal of Research into New Media Technologies*, 13 (4):383-401.
- Spencer, D. A. (2009) *The Political Economy of Work*, Oxon: Routledge.
- Terranova, T. (2013) 'Free Labor', T. Scholz (ed) *Digital Labor: The Internet as Playground and Factory*, London: Routledge.

- Thomas, S. (2011) *9 examples of crowdsourcing, before 'crowdsourcing' existed*, Memeburn: Tech-Savvy Insight and Analysis. Accessed on January 30, 2013 from: <http://memeburn.com/2011/09/9-examples-of-crowdsourcing-before-%E2%80%98crowdsourcing%E2%80%99-existed/>.
- Thompson, P. (1989) 'The Nature of Work: An Introduction to Debates on the Labour Process', London: Macmillan Education Ltd.
- von Ahn, L. (2010) *Work and the Internet*. Accessed on January 30, 2013 from: <http://vonahn.blogspot.co.uk/>.
- von Ahn, L. (2009) 'Human Computation', *Computing Research that Changed the World: Reflections and Perspectives*, Presentations from the March 25 Symposium. Accessed on January 30, 2013 from: http://www.cra.org/ccc/locsymposium_spfeat_vahn.php.
- von Ahn, L., B. Maurer, C. McMillen, D. Abraham & M. Blum (2008) 'reCAPTCHA: Human-Based Character Recognition via Web Security Measures', *Science*, 321 (5895):1465–1468.
- von Ahn, L. & L. Dabbish (2008) 'General Techniques for Designing Games with a Purpose', *Communications of the ACM*:58-67.
- von Ahn, L. (2006) 'Games with a Purpose', *Computer*, 39 (6):92-94.
- Wang, P. (2006) A Marxian Analysis of World of Warcraft: Virtual Gaming Economies Reproducing Capitalistic Structures. Accessed on January 30, 2013 from: <http://triciawang.pbwiki.com/f/marxvirtual.pdf>.
- Zott, C., R. Amit & L. Massa (2011) 'The Business Model: Recent Developments and Future Research', *Journal of Management*, 37 (4):1019-1042.