

## **Work and wellbeing in digital public space**

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Work has been influenced as workers, products, tools and employers have been transformed by a move to a digital space. When struggling to overcome an endless stream of email, or when looking at a data centre that employs only a handful of staff compared with the hundreds that worked in the factory that had been on the land before, it can feel like the change has been an entirely negative one. An increasingly digital economy has also brought about new forms of work such as the supply of software services from distant workers, often on a different continent and lacking the basic rights and representations their western counterparts take for granted. At the same time e-tail behemoths such as Amazon employ hundreds of 'pickers' in vast hangars to fulfil orders from their carefully constructed online catalogue. These physical spaces reflect the dominant software engineering paradigm of throughput, into which human workers are integrated as the 'wetware' part of the system. Amazon is now actively trying to make these centres people-free with robots 'employed' to track down orders and combine them into delivery-optimised consignments. There has been increasing awareness of the lack of humanity, not only in the spatial organisation of the workplace, but also in the zero contract hours model of employment on offer.

Email has allowed employers and managers to shift the risk of time management and accountability to their employees, and smear tasks into unpaid time. Systems of automation have allowed companies to remove human compassion from interactions with workers to increase efficiency. Rapid automation has left cohesive working

communities suddenly without skills or systems of support to adapt. Cheap communication networking allows outsourcing of the service industry to areas of the world with this month's cheapest wages or lowest worker rights in a race to the bottom. There has been a corresponding attempt to imbue digital systems with human-like characteristics, often related to tone of voice, speed of response and the tropes of physical world affordances such as transparency, lighting effects, and angles of view. While it is true that new communities have emerged in response to distributed working practices (the open-source movement is a good example) around a shared set of principles, they are often missing some of the essential signifiers of human scale communities such as limited numbers, face to face meetings, and informal communications. Shared values are often codified in FAQs or T&C documents rather than negotiated in shifting social contexts.

We can define work using several overlapping definitions. These are all affected by the implications of digital resources.

- A process. (Is all work a collaboration or building on prior knowledge?)
- Overcoming a significant challenge. Effort exerted. Solving a problem that is important.
- A system of control.

These definitions imply a technocratic viewpoint. There is a well-established social definition of work that emphasises how different specialisations contribute to a social body adjusted to its local ecosystem of available social and physical materials. A system of education designed to produce socially useful workers, and a managerial

class skilled in the organisation of social effort have also traditionally been seen as important to a socially valuable definition of work. 'The specialisation of work involves the social production of expert artisans' in the words of Octavi Rofes.

The examples above mostly describe advances in digital technology as forms of control within a traditional top-down models of what work is for. It has been argued that our current working practices need to change if we are to sustainably and fairly manage our planet's increasing population. Providing access to work as we have defined it in 'the West' for all the people on our planet would require unimaginable levels of continued growth and the associated catastrophic increases in carbon emissions. The provision of work in the modern era has been left to the vagaries of market dynamics in uncomfortable partnership with ideological imperatives from national and international governments. The European Union for example continues to operate on this basis. As the ideological and economic power of nation states has declined so computational and algorithmic systems have replaced human capital endeavour. John Lanchester identified one major cause of the recent economic downturn as attributable to a lack of human understanding of how computers work out mathematical lending probabilities.

We can also see the influence of digital technology on work as an act of overcoming significant challenges – what has been referred to as the 'core economy'. In some cases, these challenges are entirely superfluous to society's needs; how do we get live weather condition information from every corner of the globe? How do we wage war unseen from 35,000 feet? How do we enable the instant upload and worldwide distribution of holiday snaps? Solving these kinds of problems requires new

organisational structures but only at the level of infrastructure. In many instances the corporations and government departments driving digital developments are organisationally indistinguishable from their 19 century counterparts. They depend on management hierarchies, careful deployment of resources, attraction of outside investment and shepherding of a globally listed share price. Digital space has however dismantled many traditional structures of organisation, starting with those encountered by early pioneers of these tools, the hackers who have built them. We can look to the adapting working practices in these established areas of work in the digital space to highlight examples of where work might be headed more generally. We propose the digital workplace has a current tendency towards lower resolution, slower processes, and less centrally organised power.

In this text we explore some of the positive and negative effects of digital space opening up for workers and working practices and consider work within the wider context of a digital public space that recognises an older and wider definition of ‘worker’ that encompasses traditionally unpaid and under-recognised forms of work including caring and volunteering.

### **Technology changes work**

Farming marked a shift from food gathering for survival, to documented patterns of cultivation to provide stability and free time (memory). Livestock and mechanisation both marked shifts away from human strength and manual exertion to system design (mechanics). Factories marked a shift to automation, and a move from an emphasis on

labour and skilled muscle memory, to the intelligence of the machine operators and engineers (computation). The telegraph and global trading marked a shift to rapid communication over any global distance (connectedness).

As you say I think the above could be a little off topic

Digitisation has taken the key aspect in each of these advances and rapidly grown the scale of availability.

Digital technology is characterised by the storage, transformation and transfer of information in the form of bits, usually computed as 1s and 0s. Claude Shannon outlined the theory that describes how signals, words and data can be held in this binary format and probabilistically communicated, while taking account of loss and noise on the channel. This calculation of loss or deterioration set out the principles of 'general computation'. A computer that can handle digital information simply as a series of 'on' or 'off' bits, does not need to be built with a specific task in mind and does not need to be reprogrammed for each individual task. This disconnection between infrastructure and use has meant that the science of computation can be advanced extremely rapidly, and unexpected uses for this technology can evolve. Here we refer to the potential scope that digital memory, computation and connectedness have to affect processes as 'digital space'.

We might think of 'digital space' as an additional dimension to our physical world, a parallel universe of the kind David Deutsch has proposed, one governed by all the physical laws of the non-digital but capable of delivering quite completely artificial

human experiences. The vast but defined digital space of memory, computation and connectedness in a phone app for example, and the advances of general-purpose mechanics in robotics.

Work can be thought of as the solution of process design tasks. Collaboration and storytelling served to greatly advance process design in terms of tactics and tools by providing a vehicle for the expression of human experience and a means of information transfer between workers in different specialities. Narratives have been analysed in the context of educational textbooks, technical instruction manuals, and non-verbal communication. The digital workplace has seen a blending or hybridisation of personal and professional narrative structure so that the sometimes-fictional nature of digital experience is hard to distinguish from real life. For example, Facebook friends occupy a radically alternative definition to what might have been understood as fulfilling the role 'friend' just ten years ago. A Skype 'meeting' is similarly very different to a face-to-face meeting. The way digital work interactions are described often conceals their fundamental difference and essentially metaphorical relationship to real world interactions.

### **Fragmentation and resolution**

Opensource projects are often characterised by a process of fragmentation. Roles that would have traditionally been completed by one or two people are broken down into much smaller parts and carried out by a distributed network of thousands. The resources of searchable storage, annotation interface design and computational

connectedness are used to compensate for the disorder of the fragments, allowing a much larger number of people to contribute, but many at a much lower level of engagement. Some contributors have low specific skills for the task but draw from an extremely large pool of potential 'workers', while others are highly skilled in solving the problems faced, but can contribute only a small amount of effort or time to a task. This process also makes system rules (algorithms) more important since many separate people carry out similar tasks in widely varying contexts. The process of solving a significant challenge then shifts from the act of a single worker completing a task, to a swarm of activity gradually pushing forward on a problem following a centrally determined set of cascading rules. The challenge for fragmented work is determining when something is good enough, and where to focus attention. This could be understood as a question of resolution. What is the optimum number of contributors to a problem? What problem unit size are they working to? How do unit sizes vary over the lifetime of the task? How do we tell when the task is finished?

An impression is sometimes given, in describing the successes of projects like wikipedia or apache that working in digital spaces guarantees an emergent utopia of collaboration. Most project ideas gather no momentum, and are soon left behind. It is important to acknowledge that many open source projects are still characterised by centralised models of authorship and management, either with a few key 'maintainers' active over any one period, or with a more traditional company environment creating or maintaining a project over longer periods.

However, even here the fragmentation of working roles manifests itself in a blurring of the boundaries of participation. A 'long tail' of contributions is made from relative

experts and non-experts. This tension between distinct directorial vision and authorship, and the extended reach that open participation and contribution allows seems to be a key factor dictating the success or failure of an open-source project. The nature of this balance between centralised and distributed decision-making scales beyond open-source project management and development. An example could be military command structures and the relative autonomy of field officers making on-the-ground decisions that are communicated through the chain of command in both directions. Another example could be seen in how electricity grids are designed to deliver appropriate voltage for domestic and commercial use and point of use. Healthcare is another one...

Amazon's Mechanical Turk allows people to sign up to a listing interface and select small tasks to complete for micro-remuneration. A job on Mechanical Turk might involve looking at an image and clicking to indicate if it is pornographic or not. Each task requires only moments of attention and effort and pays only a few cents or tens of cents. The start-up Task Rabbit goes a step further and requires potential workers or 'rabbits' to bid on proposed tasks listed on the site for their local neighbourhood. Task Rabbit creates opportunity for employment where before a inertia of bureaucracy limited employees for such work to organisations large enough to have enough tasks to sustain an employee's workload. By combining tasks from more than one employer, or by fitting Task Rabbit employment along-side other forms of work, employees can draw on a new source of financial reward. Mechanical Turk similarly exposes a range of micro tasks to a wider pool of potential workers, which, it could be argued has an enabling effect for those locked out of traditional employment by location, time-zone, poor

interview performance, employer prejudice, etc. However, services like Task Rabbit introduce a greater separation between worker and employer. This separation includes a reduction of direct legal obligation in comparison with the rights of full time, permanent employees. The separation is also social, with the workers represented as abstracted units of completed work, with little need for interaction. In the case of Mechanical Turk, it is even possible to code employee interactions into your software directly so that no human connection is needed at all.

### **Human computational ability and infrastructure.**

Much of this kind of work can be seen through two distinct lenses. The first is defined as human computational ability. This refers to the kind of work that humans are better at than computers. As given above, determining whether an image is pornographic or not is a good example. Since the label 'pornographic' is a social category and simultaneously a semiological category, its rules will vary between cultures. What is pornographic in an Islamic theocracy like Iran (seen recently in the official outrage there that greeted images of singer Shakira's bare arms) can be very different in a permissive social democracy such as France. To code all these differing interpretations into computer intelligence would result in so much signal noise on the channel (as Shannon would say) that Titian portraits would be forbidden. Something seen recently with the use of automatic content filtering.

Human computational ability, while slower to carry out, can result in much more efficient probabilistic matching than computers could achieve. Since the number of opinions needed to classify a category convincingly varies between tasks, often fewer

responses (or computations) are needed to reach full resolution. whale.fm allows people to listen to short snippets of whale song online and assign them to three categories. When a statistically significant number of snippets has been assigned to any one category the task can be said to be fulfilled. Any further computation is finer and finer resolution. Human computational ability involves interpretation in a flexible context. i.e. there are similarities between whale song snippets and the person responding must decide which category they are closer to. There is no inherent metadata to draw on.

re-captcha is a similar system designed to identify tiny strands of text from poorly scanned text documents, often single words. The system uses pattern recognition - a typical task where human computational ability outstrips artificial intelligence. In this way re-captcha uses human computational ability to tell human and computer apart (important for system security and targeted advertising) and at the same to digitise books and other text documents that would not otherwise attract resources.

Responses are considered accurate if they receive five consistent answers, beyond this level they are taken as 'control words' and are used to judge against the validity of new words and their associated responses. Recaptcha had digitised 30 years of the New York Times by 2012 at zero cost beyond system maintenance. The same mechanisms have been used to draw maps and translate languages often exploiting game-like designs to elicit work from people. While whale.fm is a non-profit organisation and the work can be considered voluntary in a traditional sense, re-captcha was purchased by Google, in 2009 for an undisclosed sum and contributes to corporate profits.

The second lens through which we view digital work is exemplified by oDesk, e-lance, and Guru, just three among many sites (like TaskRabbit) that offer opportunities for freelance workers to earn professional income. oDesk alone claims to have brokered \$1 billion in online work and plans to reach \$5 billion in five years. The revolution these companies represent is infrastructural and dematerialising. There is no need for actual desks, lighting, insurance, health care, heating, stationary or legal advice. They are either virtualised or irrelevant to the oDesk work environment. Employers post job specifications with a budget and freelancers all over the world undercut each other to win the work. oDesk provides a measure of security in the form of a legally binding contract but little in the way of redress should things go wrong. Union representation, income protection, a stake in company decision making or pension provision are entirely sidestepped. The hard-won rights of people in the workplace at every level have been rendered obsolete. Digital public space in this context is largely denatured of the rights that people have treasured about work for five generations. The online freelance environment does still demand the responsibilities of timely supply of work, within budget, to a high standard of finish.

Task rabbit slices existing roles like 'intern', 'runner' or 'apprentice' it to fragments that a wider pool of 'rabbits' can compete to complete. Both Mechanical Turk and Task Rabbit use digital resources of connectivity and computation to fragment and re-allocate aspects of work. This partitioning of work into tasks, rather than traditional employee roles allows for an ecosystem of activity. While these systems have already successfully fragmented task distribution, fragmentation of management and quality control are still works in progress. Task Rabbit pre-vets workers using a series of

hurdles including producing a video and completing a survey. Assessment of completed tasks is left to each employer, which is an inefficient aspect of the system. Mechanical Turk users have adopted error checking approaches to test whether tasks are 'good enough'. For example, a task may be given to more than one 'turker' and the results compared, or several outputs may be passed back as a new task for review. These inefficiencies are possible because of the low cost of each task completion. The scale of participants on the listing sites means that there likely to be enough workers 'on-call' whenever a task is offered. Task creators see a redundancy in the number of potential workers, which allows for the machine-like responsiveness elicited from the individual human participants.

This is not outsourcing to office space and employment regulation in another country, but beyond that, outsourcing of office space and employment risk to each individual worker. They sit at home or internet cafe, paying their heating, cooling, computer and internet costs.

In summary, access to and supply of work in the digital public space is dependent on a series of infrastructural disruptions and features a complex arrangement of technical and social elements whose effects we are only beginning to observe. There is every indication these effects will continue to multiply, putting commonly understood definitions of employment, remuneration and skills into question.

## **Digital Public Space**

Rapid iterative design of interfaces for use, supporting computational processing and instant connectedness mean that the 'cost' of contributing to a task in digital space in terms of time and effort can be low enough that people are happy to contribute for free.

Opensource projects can combine contributions from paid and unpaid workers by building on a context of equal, 'public' ownership. Other industries that are traditionally based on private, corporate ownership of creations and products are currently faced with a difficult transition when trying to draw on fragmented worker contributions that include their 'users' or 'consumers'.

Online news is one place where this tension is apparent. The immediacy and ubiquity of social media content, particularly images and video, has presented traditional news gathering organisations with serious challenges of speed of response and credibility. There are numerous examples where an image or video has spread around the world faster than any single news organ has time to analyse, comment, or verify. The execution of Osama Bin Laden in Pakistan in May 2011 by US special forces was initially released on the internet in the form of a shaky bystander's video. The Arab Spring has been notable for the volume of social media material generated directly by protesters rather than filtered through official news desks. The Boston Marathon bombing story was widespread on Twitter hours before being picked up by mainstream news.

The response of news desks around the world has been twofold. Most major news organisation now have their own active channels using the tools of social media to tell news stories in different formats. This has led to the phenomenon of 'hamsterisation'

where journalists are so busy with an ever widening set of digital tasks - repurposing their stories for Facebook, Twitter, YouTube, and personal blogs - that they have little time left for actual reporting. Investigative journalism is widely seen as under threat from abbreviation services such as Summly (bought by Yahoo for \$30 million) which automatically reduces news stories to 400 words. Social media in other words can be recuperated by official news organisations but at the cost of in depth journalistic enquiry and long form analysis. The work of journalism is being shaped more by digital distribution channels than by editorial decisions. Where short form is appropriate, for example in election coverage, news has been successful. CNN ran a widely praised social media platform during the 2012 US elections, partnering with Facebook for analysis of user traffic and providing a successful app designed to get people out to vote.

The second strategy adopted by news desks has been to open their editorial doors to user content. The principle of web 2.0 - user generated content - has finally made it to mainstream news desks in the form of citizen journalism. In the wake of the July 2005 London bombings The BBC featured content filmed in the train carriage by a victim of the bombings. Journalist Richard Sambrook wrote in the week after the event 'from now on news coverage is a partnership' indicating the pivotal moment when footage created and submitted by a citizen rather than a journalist became the defining visual expression of the event. The tension between professional and amateur is often expressed in terms of credibility, a quality long-treasured in the news industry, and the BBC now has a ten-strong team scouring social media content worldwide and verifying its authorship and reliability. Journalistic work has thus become a process of checking

how reliable freely submitted social media content is in the context of the nightly broadcast. The Guardian has created a platform explicitly designed to elicit citizen journalistic content. Guardian Witness invites people to 'Share your view of the world' a carefully worded phrase perhaps intended to side-step questions of credibility. The Guardian is asking quite clearly for 'views' rather than 'news' associated with the stories of the day. Interestingly, the emphasis of Guardian Witness is on visual content in the form of photos and videos, easily generated and uploaded using smartphones. Digital public space in this context has seen the blurring of boundaries between work and not-work, professional and amateur, reliable and immediate. Although much of the result is due to the challenge to news gathering methods, we propose that the digital affordances of; network effects, speed over reliability, and people power over central power, have played a significant part.

Digitally enabled processes and tools for work show a trend towards a breaking-down of tasks into manageable component parts. Roles traditionally completed by a single person can be shared in this way across a team.

Splitting a task into several parts requires planning but can deliver efficiency (mass production). Dividing the tasks up further becomes unmanageable as tracking, inter-communication and documentation loads increase with the number of nodes (mythical man-month). Digital space allows these management roles to also fragment, so that tasks can be split into smaller and smaller units of activity. The dependability of a fragmented system of work relies on a redundancy of participants in the process.

Fragmentation needs to move far enough that the parts seem to represent a new whole.

A traditional job can be substituted by a swarm of activity which, at a distance, looks acts like a coherent form if the resolution is high enough.

We can see examples of this fragmentation in classic open systems. The tone-of-voice within the articles of Wikipedia for example is relatively consistent. The encyclopaedia is sustained by a deep digital space of social interaction, participation tools and historical edits stretching out 'behind' each current page of the website. Wikipedia also features a complex set of instruments to bring this quality into being. From how screen interactions are organised to the consistent information architecture across articles, to editing procedures, and participation guidelines. The key aspect of this texture (or resolution) of digital activity is that it was not imposed or pre-determined but has evolved over the lifetime of the project (and continues to do so) in response to participants views, actions, and contributions. It is a consensual system.

A discussion of fragmentation within the context of libre and opensource projects hides a set of constraints that currently limit the resolution it is possible to reach. The challenge to dividing work into smaller parts is that all aspects of the role and task must be fragmented successfully.

Not sure how true this is. What about the work being chunked into parts that are then fragmented according to who is going to be doing the work or how well developed the reconstructive algorithms are? There can be different resolutions of fragmentation for the same task.

However, systems of support for wellbeing, safety and social security have, it seems, adjusted to fragmented working practices less than aspects of production and allocation. Libre and open projects have not had to consider much of the traditional architecture social security because there is no payment for work. While mechanisms have developed in some digital spaces to manage abuse and marginal voice, other concepts such as minimum wage, maximum working hours or sickness support are largely side-stepped because these are traditionally regulated through pay, and most contributors to such projects are giving their time for free. I would also argue that there is a digital bias at work in the sense that the engineering production paradigm favours efficiency, production, throughput, and clearly definable outcomes.

Money is only one of a number of interdependent motivations for work. Barter and exchange for non-financial reward plays a central part in many contexts of work. Status, reputation and other altruistic factors are also key motivations for work. Early versions of the Safari interface focused on the experience of the individual, emphasising the altruistic 'scientific good', along with the personal gain of 'exploration' and 'learning'. Newer developments in the system have greatly extended social discussion and reputation building aspects, it seems in recognition of the social motivations and successes of users. The people in the science research community using these tools of mass-participation have also been careful to acknowledge the participants in their publications.

In fact there is plenty of evidence (of a Stanley Milgram type) demonstrating how financial reward is a poor motivator for work

How might industries traditionally dominated by paid work draw on wider audiences of participation that open communities regularly benefit from and that appear a necessary component to achieve high resolution fragmentation?

Great question

This is the challenge that companies face when viewing their customers as more than just consumers. One model is to obfuscate the nature of the worker. The financial value of the user labour of creativity, filtering and documentation in environments like Facebook is downplayed to its workers ('users'). They are rewarded instead in-kind with some free storage, usability design and software stability. Luis Von Ahn is best known for demonstrating other forms of reward for 'human computation'. These include 'fun' as a reward in the image tagging ESP Game [now licensed as Google Image Labeler], 'fulfilment' in the language learning transcription site Duolingo and 'function' in the case of ReCaptcha log-in tests that verify a user as human while also digitising scanned documents. Examples like the map editing interface on Google Maps borrow directly from the successes of the Open Street Map project. But again, the value of the work done in updating a map is downplayed, with the contributions to Google's map becoming locked into their license agreement which prevents contributors from adapting their maps for anything but personal use. The repercussions of lost ownership of contributions in all of these systems has yet to be fully examined. Indeed, much user participation currently seems to succeed by hiding traditional transfers of ownership heavily weighted on the side of the corporations involved deep within the click-through small-print of the online terms and conditions.

Companies may find they can go further without asking their customers to be workers.

Google's location services for its Android phones are faster to pinpoint you on a map than standard GPS because they draw on a database of known wifi hotspots. However, this database is updated unknowingly by the users of the system when they agree to Google's terms of service.