

**THIS IS THE ORIGINAL DRAFT SUBMISSION MADE TO THE JOURNAL. IT IS NOT THE DEFINITIVE VERSION OF THE ARTICLE AND IS BEING RELEASED AS BACKGROUND ONLY.**

## **From Free Software to Artisan Science**

### **Table of Contents**

1. Introduction.....	1
2. Striation.....	1
3. Affordances.....	2
4. Critical pedagogy.....	3
5. Critical hacktivism .....	4
6. Artisan science.....	5
7. Occupying and prototyping.....	6
8. Conclusions.....	7

### **1. Introduction**

What critical power remains for Free Software? It has been a powerfully practical critique of Intellectual Property and capitalist incentives, but it is increasingly assimilated by corporations and government as part of a wider strand of open source liberalism.

Perhaps the cutting edge of Free Software doesn't lie in the legal liberalism of its licenses. In this paper I will appeal to a prior source of Free Software criticality in the hacker mentality. Giving an autoethnographic account of my experiences in this area, and in particular my involvement in starting the action-research project 'Social Innovation Camp' (Social Innovation Camp 2012), I will describe how this is unfolding in new practices.

As a way to understand and further these practices is to draw on the notion of technology affordances proposed by Hutchby (2001 cited in Jordan 2009). This will be combined with critical pedagogy to form an approach I will call Critical Hacktivism. I will also ask what critical power remains in the notion of Peer Production. Looking at the proliferation of material practices that parallel Free Software, in particular in hacker spaces, I will argue for an emerging artisan science that materialises critical hacktivism for communities of makers.

The paper will conclude by drawing out the connections between the socially-engaged prototyping of critical hacktivism and the prefigurative politics of social movements like Occupy.

### **2. Striation**

My personal journey with Free Software began when I was working on technology projects in the UK non-profit sector. I had become aware of a collaborative mode of software production that sounded like it shared a lot of the values of organisations I worked with. I was used to non-profit and participatory projects being small and mostly low impact: imagine my surprise when I read that seventy percent of the servers in the City of London ran Apache (a free software web server), and mostly without the knowledge of the senior managers.

Moving to an international human rights NGO, I was keen to enrol Free Software in defence of the freedoms inscribed in the Universal Declaration of Human Rights. But I had reckoned without the neo-corporate dynamics of institutional NGOs and their chilling effect on innovation. This was followed by stints working in, or in partnership with, larger organisations of all stripes (governmental, NGO, academic, private sector). Based on this experience I would suggest that what unites them is more telling than what divides them. Using the language of philosopher-activists

Deleuze & Guattari (1987) they are striated spaces, marked by linear boundaries, restricted to particular planes of activity in the space of all possible potentials. In this context, striation is the overlap in particular experience of all the dynamics that limit change: lack of autonomy in a hierarchical structure, the closed expectations of colleagues, the time it takes to deliver daily targets, the lack of incentive, the lack of peer support, lack of sense of entitlement to change the way things are done - all of which can combine to deliver an experiential straitjacket which is an impersonal affect, a pattern across the system and one that stifles innovation.

For Deleuze & Guattari, like Foucault before them, power does not simply operate as a pyramid but in myriad multifaceted directions and relationships. Foucault said: "One doesn't have a power which is only in the hands of one person who exercises it alone...it is a machine in which everyone is caught, those who exercise power as much as those over whom it is exercised.. it becomes a machinery that no-one owns" (Foucault 1995). The overall effect is an institutional environment that acts to tame energies - a social machine that produces conformity.

The consequent decline in the critical power of Free Software can be traced to a related process that Deleuze & Guattari call reterritorialisation. Reterritorialisation is the process that re-stabilises identity, through physical boundaries like police and border controls or through codes of appropriate conduct like policies and laws. From this point of view, the focus of Free Software projects on the law is as much a weakness as a strength, if what is sought is a system marked by flows, connections and zones of intensity. I believe that the power of Free Software as critique now lies in the practices it enables outside of striated structures (organisational or legal). In the abstract terminology of Deleuze & Guattari, a system capable of disruptive innovation must include smooth as well as striated spaces, where a smooth space is occupied by intensities and events, by the continuous variation of free action. The characteristic experience of smooth space is short term, up close, with no fixed points of reference. Frustrated by institutions, this was the space I was seeking to create when I helped to start Social Innovation Camp.

What would help to create this space was an injection of the hacker ethic. From my digital work in human rights I was aware of early hacktivist projects like the Electronic Disturbance Theatre, and had explored the possibility of partnering with 'white hat' hacker projects like Psiphon. In the UK, MySociety had established the idea of civic hacking. But what is a hacker? The nine definitions of hacker in the original jargon file (The Jargon File 2004), the glossary of geek slang from the era of the mainframe computer, includes two apparently contrasting entries:

- “(1) A person who enjoys exploring the details of programmable systems and how to stretch their capabilities, as opposed to most users who prefer to learn only the minimum necessary.
- (7) One who enjoys the intellectual challenge of creatively overcoming or circumventing limitations.”

Hacking, it seems, has always been a hybrid techno-social activity. By exploring technical details the hacker can surface new possibilities from the matrix of technology, and creatively apply them to circumventing blockages. While the mainstream narrative has relegated this to mischief-making, and activists have seen hacktivism only as a form of online direct action, the paper on 'Abstract Hacktivism' by Von Busch and Palmas (2006) interprets hacking as a new conceptual model through which we can understand and approach the world. I will adopt the idea of hacktivism in this broad sense but without divorcing it from the material technology.

The hack, as a smooth space, would have no 'line of flight' without free software. Without the freedom to run a program for any purpose, to study how the program works, to change it to make it do what you wish, and to redistribute it (Free Software Foundation 2012), civic hacking would be deprived of its raw material. However, now that hacking is becoming valorised as a general mode of innovation, there is a trend for striated institutions to adopt hackdays and app challenges (NYC BigApps 2011, World Bank 2012) as way to deliver new projects and the associated credibility of moving with the times. Other elements are necessary if we are to stay critical. I will develop the

idea that hacking can only become critical hacktivism when it combines a technological imaginary with critical pedagogy. The basis of this technological imaginary is the notion of affordances.

### **3. Affordances**

Through a distillation of my own experiences with programming and open source, and my observation of early hacktivist and civic hacking projects, I was convinced there was untapped potential for social change within Free Software, and that this potential was 'open' in a way that went beyond the openness of the software license. The issue of technological determinism versus openness is an old one, of course. Are the social effects determined by the technology, or is the meaning and impact of a technology constructed by social narratives? While this question has been debated back-and-forth by researchers in Science & Technology Studies (STS) it has recently taken on a more urgent edge through the irruptions of the Arab Spring and the way social technologies were embedded in activist movements (Dan McQuillan 2011). The liminal openness of social technologies can be usefully discussed using the notion of affordances. This was proposed by Hutchby as a non-determinist approach that values the particular materiality of technologies without limiting their interpretations. The idea has its origins in Gibson's work on the psychology of perception, where affordances describe the way a natural environment offers animals particular opportunities and constraints in terms of actions that can be taken. The idea is that technology has intrinsic material properties that shape the ways it can be used, but the actual uses are not limited or defined by the technology itself and are open to unexpected adaptation. One interesting thing about affordances is its challenge to the easy subject-object divide;

“An important fact about the affordances of the environment is that they are in a sense objective, real, and physical, unlike values and meanings, which are often supposed to be subjective, phenomenal, and mental. But, actually, an affordance is neither an objective property or a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective-objective and helps us to understand its inadequacy. It is equally a fact of the environment and a fact of behaviour. It is both physical and psychical, yet neither. An affordance points both ways, to the environment and the observer.” (Gibson 1985)

This exactly describes the social potential I felt was latent in free software and associated technologies. However, there is a challenge to adopting affordances as an approach to participatory technology development; how can non-technical users really participate? For Social Innovation Camp, we started by asking people to identify the issues they were most passionate and frustrated about. But there was still a need for a technological imaginary that enabled people to 'look both ways', at social possibilities and technology affordances. At the start, we relied on analogies; precursor projects like MySociety's FixMyStreet (FixMyStreet 2012), and conceptual mashups of what was already to hand ('it could be like a MySpace for disabled carers'). I now believe that the broad challenge of participatory digital development can be approached through the capability theory of Amartya Sen and Martha Nussbaum, which sees well-being as based on a set of functionings ('beings and doings') that we have reason to value – a view that they trace back to the Aristotelian notion of flourishing (Johnstone 2007). The negative freedom of Free Software licenses (“we won't stop you using it for any purpose, as long as you don't restrict the freedom of anyone else to do likewise”) needs to be superseded by the positive and substantive freedom of actually able to grasp and use these tools to enrich the lives of people and communities. This flourishing depends on the development of capabilities, and on a critical pedagogy fit for that purpose.

### **4. Critical pedagogy**

How can people learn about the real, yet unrealised, potentials in Free Software and other social technologies (which Deleuze & Guattari would call the Virtual)? Social Innovation Camp relied on the radical spirit of shared learning inside the Free Software and wider hacker and geek communities. Barcamps are the heralds of critical hacktivism, and also hacker spaces (Kera 2012),

and with the rise of social media that potential for peer learning has become more fully explored through concepts like peeragogy (Peeragogy Project 2012) which “focuses on the way in which co-learners shape their learning context together” and explicitly incorporates constructionism (focusing on learning via designing and making artefacts) and connectivism (where the connections that make it possible for us to learn in the future are more relevant than the sets of knowledge we know individually, in the present).

Through my previous work in media for development I was exposed to the participatory methodologies espoused by people like Robert Chambers at the Institute of Development Studies (Chambers 2010) The key encounter for me was with the critical pedagogy of Paulo Freire, which positions peer education at the service of the oppressed (Freire 2000). For Freire, learning does not involve one person acting on another, but rather people working with each other. He was focused on praxis – action that is informed. Critical pedagogy is the co-operative activity of making a difference in the world through active knowledge generation (a generative epistemology). The starting point is the lived experience of participants, who come together to understand the ways this experience is constructed and to prepare actions to overcome the challenges they identify.

Adopting critical pedagogy helps immunise hacking against assimilation, because it puts decisions about direction in the hands of those who know the status quo must be challenged. A critical pedagogy is what maintains the critical edge to the use of Free Software and the other technologies:

“The more people unveil this challenging reality which is to be the object of their transforming action,” Freire argues, “the more critically they enter that reality”

An explicit example in open source development can be seen in the Apps for Good project (who's parent organisation originated in the same Brazilian favelas which preoccupied Freire). Through the affordances of the Android operating system, Apps for Good has developed a 5-step framework that links app development to problem-driven learning supported by local action and critical reflection, explicitly based on Paulo Freire's critical pedagogy. Projects that this has given rise to range from a Stop & Search app to empower young people in their interactions with police (Streatham Guardian 2010), to an app that translates key phrases in the school parents evening for parents who's first language is Bengali (Ahmed 2011). Thus we see the emergence of a critical hacktivism that combines technological openness with social engagement.

## **5. Critical hacktivism**

In constructing the idea of critical hacktivism I have also drawn extensively from my Social Innovation Camp experience, which includes piloting camps in Kosovo, Georgia and Kyrgyzstan. Over four years, we developed a methodology for getting teams from recognition of a problem through prototyping and building new ventures to tackle that problem which has been run 26 times in 19 countries. The products are not just prototypes but also networks of activated participants, who have experienced an empowering way to directly tackle social issues.

The camp process starts with an open call for ideas. Anyone can submit a back-of-the-envelope proposal that uses web or mobile technology to tackle a social problem. Workshops spread the word and help people come up with well scoped ideas (problems on their way to becoming solutions). The people who are invited or apply to participate include software developers, service designers, visual designers, and end-users who experience the problem; but also a wide range of others including lawyers, philosophers and activists. The process of building networks and generating innovative ideas culminates in a weekend event (the camp) where the teams hack together a working prototype. Examples of projects created include Enabled by Design (Enabled by Design 2012), MyPolice (MyPolice 2012), and The Good Gym (GoodGym 2012).

The Social Innovation Camp methodology has been characterised as “organising the moment of self-organisation” (Aaltonen 2008). It is a wholly peer-to-peer space based on self-organised teams and a radical interdisciplinarity. The programmers have as much of a say on the social impact as

they do on the technology implementation. The projects often take an approach based on asset-based community development (“a methodology that seeks to uncover and utilize the strengths within communities as a means for sustainable development”) (Asset-Based Community Development Institute 2012) using the affordances of social technology to aggregate and remix them. The aim of the weekend is rapid prototyping, similar to the lean startup idea of minimum viable product: “just those features that allow the product to be deployed, and no more” (The Lean Startup 2012).

It is also productive of publics in the sense defined by John Dewey. In *The Public and Its Problems*, Dewey (1954) presents a public as a confederation of bodies, bodies pulled together not so much by choice as by a shared experience of harm that, over time, coalesces into a 'problem'. Social Innovation Camp starts with an open call for ideas which generates problems in a different form to the way they are framed by institutional stakeholders. In this sense, whether it's about living aids for people with a disability or about the intersection of physical exercise and social isolation, Social Innovation Camp is also productive of publics.

However, our experience with Social Innovation Camp is that projects coming out of the camps are frequently too small and too different for a system to acknowledge (whether that system is a host organisation or the wider political economy around a social issue). Or, if they are recognised, the reaction is just as likely to be hostility as support (Public Strategist 2010). Similarly a project like Apps for Good, channelling Paulo Freire through the affordances of the Android operating system, finds itself pushed away from disaffected youth and in to schools (CDI Europe 2011) by a fear-based benefits system and the myopic and self-interested voluntary sector.

The approach I'm calling critical hacktivism tries to generalise the participatory hacking of Apps for Good and Social Innovation Camp by connecting the affordances of social technology to social innovation in a way that evades capture by existing institutional and knowledge structures. If the current social crisis is a legacy of these striated structures then critical hacktivism asserts that we can create alternatives through the practice of social prototyping. It seeks impact through projects that innovate 'the social' itself. In Social Innovation Camp the best projects come from people's frustrations, and are created without asking permission of whichever institution considers itself to own that particular issue. The temporary smooth space of events like these shows the deterritorialising tendency characteristic of critical hacktivism, and an urgent experimentalism with the emergent capacities of parts and the wholes that they will produce. If this is now the site of Free Software's critical power, then perhaps it can also shed light on the critical power that remains in the notion of peer production. I will suggest that these are combined in the emergence of a form of citizen science that I will call Artisan Science.

## **6. Artisan science**

As a link between the criticality of Free Software and the notion of peer production it is useful to look for sources other than the legalism of Free Software licensing. A clue to other approaches can be found in Gabriella Coleman's authoritative 'Code is Speech', when she reports on testimony from a computer scientist in defence of 16-year-old DeCSS hacker Jon Johansen:

“Thus, there are two rights being argued here. One is that . . . we have the right to look at things we own and figure out how they work. We even have the right to make other things that work in the same way. The other is that code is speech, that there is no way to distinguish between the two” (Coleman 2009).

It's in the first right, the space of making rather than free speech, of prototyping rather than discourse, that I'm interested in here. In particular, the possibility that the former dynamism of the free software movement now resides in the overlap with physical making. From the 'decaying free software communities & emerging hackerspaces' of Macedonia (Stamatovski & Atanasoska 2012) to the DIY bio hacking in Asia (Kera 2012) we can see a shift of the disruptive affect of free

software in to hackerspaces and free-form fablabs. And it's also in terms of material rather than immaterial goods that Dmytri Kleiner couches his challenge to Peer Production:

“So long as commons-based peer-production is applied narrowly to only an information commons while the capitalist mode of production still dominates the production of material wealth, owners of material property will continue to capture the marginal wealth created as a result of the productivity of the information commons” (Kleiner 2012).

He proposes that “rather than placing emphasis on the immaterial distribution of what is produced by current examples of Peer Production, we may note instead that such production is characterized by independent producers employing a common stock of productive assets...if we can implement ways of independently sharing a common-stock of material assets and thereby expand the scope of the commons to include material as well as immaterial goods, then direct producers who employ these assets in their production can retain a greater portion of their product”.

It's striking to read his critique alongside Kera's reports of Asian hackerspaces. Kleiner claims that his formulation of peer production is rooted in history as it describes historical examples of commons-based production such as the pastoral commons, cottage agriculture and cottage industry. In Asia (where a rich knowledge and crafts tradition coexists with rapid industrialization) we find that hackerspaces support vernacular and technological “folk” knowledge creation and sharing, where the models of interaction between community and knowledge are similar to the indigenous and pre-modern forms. Hackerspaces speak to the critique of peer production ideology because production is characterized by independent producers employing a common stock of productive assets. I suggest that it's partly through hackerspaces adopting the framework of critical hacktivism that the flourishing hackerspace movement can become a truly alternative mode of producing knowledge; a productive epistemology. The peer-based exploration of material affordances can encounter the urgent social needs of communities in a way that begins to produce material alternatives.

The starting point for this, across the board, appears to be the activity currently known as citizen science. In Asia the DIY bio consists of combining “traditional knowledge about fermenting with modern, Arduino based, open source gadget technologies” or the jail-breaking of genetically modified and patented flowers using plant tissue culture methods. In Tokyo, citizen science means the production of “open source humanitarian hardware” for participatory sensing of radiation. In the UK, a citizen science project developed a methodology for collecting noise measurements with cheap, hand-held devices that the residents of Pepys Housing Estate in Deptford could use to create an online map of noise pollution in the area, as part of their campaign against an unpopular local scrapyard. In the USA, the balloon mapping of the gulf oil spill has led to the crowdfunded development of DIY spectrometers. “Monitoring, sharing and making sense of various “objective” and “scientific” data and protocols or creating DIY kits, they actively explore and perform the relations between various types of agencies spanning a vast spectrum of scales (molecules, traditions, new hardware tools, social institutions etc.)” (Kera 2012).

The common thread in all these examples is a contestation of establishment knowledge. Hack-based citizen science is the concretization of the nomad (or minor) science the Deleuze & Guattari evoke in *A Thousand Plateaus*. They contrast it with Royal Science – the official, striated science with its apparent emancipation from the State & religion. Royal Science nevertheless maintains an internal state-like discipline and it's own neo-religious beliefs, as Isabelle Stengers highlights in the historical battle between Mach and Planck;

“For Mach, physical references that appeared to refer to a world that existed independently —absolute space and time, atoms, and so on—had to be eliminated and replaced by formulations that tied physical laws to the human practices with which they were indissolubly connected. In contrast to this critical approach, Planck would affirm the necessity of the “physicist's faith” in the possibility of achieving a unified concept of the physical world” (Stengers 2010).

In contrast to Planck, nomadic science is rooted in practices and has no ambition to totalise knowledge. I suggest that when nomadic science is allied to critical hacktivism it becomes Artisan Science; a craft science that produces embedded and contextual understanding, that through its practice empowers the producers, that produces the autonomy of the independent artisan. Thus it's through experimental enquiry and artisan science that the affordances of immaterial and material technologies become a critical force. In the next section I will trace the connection between prototyping and occupy, to suggest that hackerspaces can move beyond communal tinkering to become the Tahrir Squares of participatory technology development.

## **7. Occupying and prototyping**

A vivid first-hand account of one of the Tahrir Square occupations is given by @sandmonkey (aka Mahmoud Salem) in his post 'Tahrir: an Exercise in Nation Building' (Sandmonkey 2011):

“What intrigued me and got me moving around, doing things and staying there, was the fascinating social experiment that the sit-in was creating. In essence, Tahrir was very quickly becoming a miniature-size Egypt, with all of its problems, but without a centralized government”.

He goes on to describe how the tent occupation quickly transformed from a nomadic society to a modern one (they got electricity by jacking in to the street lights) and had to arrange the tents to avoid intrusion (urban planning), search people at the checkpoints (border control), tackle street kids stealing phones & laptops (crime & punishment) and spot infiltration by troublemakers from the Central Security Forces (intelligence services). He concludes “For some people what I just recounted will be heartbreaking, but to me it’s brilliant...the challenges also created a huge number of alliances that were never possible before, since every group, no matter how hard they worked, started realizing that they can’t manage or carry the problems of the country alone, and that in reality, theoretical solutions are not always the most practical or effective ones”.

The assemblages he describes were techno-social; for example, the hashtag #tahrirsupplies which was used to organise the sourcing and distribution food and medical supplies (Movements.org 2011) (and was again in use at the time of writing). As Pete Fein of Telecomix observes, the protesters of the Arab Spring and Occupy function like an offline, rapidly prototyping, open source community (opensource.com 2011). This prototyping is political, but not in the sense of representational politics and orthodox parties. In the context of critical hacktivism, prototyping is a form of prefigurative politics, as developed as an idea by Wini Breines to talk about the new social movements of the 1960s:

“The term prefigurative politics ... may be recognized in counter institutions, demonstrations and the attempt to embody personal and anti-hierarchical values in politics. Participatory democracy was central to prefigurative politics. ... The crux of prefigurative politics imposed substantial tasks, the central one being to create and sustain within the live practice of the movement, relationships and political forms that “prefigured” and embodied the desired society.” (Breines 1989)

It is a form of political action that tries to resolve problems that the relevant authorities are not tackling to the satisfaction of the participants. Tahrir Square solved it's own problems directly, and in doing so prototyped ways of working in the wider struggle. The general assemblies and working groups of Occupy and the Indignados were a form of prefigurative politics that prepared the way for people to tackle problems directly, whether through the resistance to housing evictions in Spain or the grassroots crisis response of #OccupySandy (Occupy Sandy 2012).

Both the critical hacktivism of projects like Social Innovation Camp and the artisan science of hackerspaces try to tackle problems directly without appealing to higher powers or engaging in policy advocacy. As Aaron Peters writes in the context of struggles around higher education and the universities:

“What is missing from much of the commentary regarding the impact of the internet and the network society on political contention is the recognition that online, commons-based forms of production and P2P (peer-to-peer) sharing represent highly effective methods of political contention and practice in their own right. That is to say, not only do they help offline protest with reduced costs of co-ordination and information sharing, but they are also a powerful instrument to advance a radical, prefigurative politics.” (Peters 2011).

Critical hacktivism occupies the Virtual of untapped socio-technical potential and makes it real. But it is not just the practice of prefigurative politics in the area of technics; it overflows in to the street. Describing the first occupation of a square by the Spanish Indignados, anthropologist John Postill writes:

“In the early hours of 16 May something unexpected happened. A group of some forty protesters decided to set camp at Madrid’s main square, Puerta del Sol, instead of returning to their homes. One of them, a member of the hacker group Isaac Hacksimov, explained later: ‘All we did was a gesture that broke the collective mental block’. Fearing that the authorities may evict them, they sent out calls for support via the internet. The first person to join them learned about their action on Twitter.” (Postill 2011)

These tactics of protest merge with technology in the experimental approach that I am calling artisan science, occupying temporary autonomous laboratories in which to prototype possible futures.

## **8. Conclusions**

At the beginning of this article I asked, what critical power remains for Free Software? Tracing a path through the ideas of technology affordances and critical pedagogy, and through my own experiences with striated institutions and hack-based social innovation, I have asserted that that critical potential is to be found in the practice of critical hacktivism. Following free software to its origin in the will to hack, and finding the new momentum in physical hacking, I looked at hackerspaces in the light of a critique of immaterial peer production. I suggested that hackerspaces are starting to engage in critical hacktivism through the beginnings of artisan science, which is productive both of prototypes and social solidarity. Finally I made the connection between prototyping and prefigurative politics to show that the practice of free coding has become part of an assemblage with the politics of the street; part of prototyping of the new world in the shell of the old.

## **References**

- Apps for Development CDI, 2012. Apps for Development. Available at: <http://appsfordevelopment.challengepost.com/> [Accessed December 5, 2012].
- Chambers, R., 2010. Paradigms, Poverty and Adaptive Pluralism - Institute of Development Studies. Available at: <http://www.ids.ac.uk/index.cfm?objectid=15260F08-D62B-B6CA-D12D9370BC15A74F> [Accessed December 5, 2012].
- Collaborative Futures collective, 2010. The Freedom To Merge, The Freedom To Fork. [www.booki.cc](http://www.booki.cc). Available at: <http://www.booki.cc/collaborativefutures/the-freedom-to-merge-the-freedom-to-fork/> [Accessed December 8, 2012].
- Deleuze, G. & Guattari, F., 1987. A Thousand Plateaus: Capitalism and Schizophrenia 1st ed., University of Minnesota Press.
- Dewey, J., 1954. Public & Its Problems, Swallow Press.
- Enabled by Design, 2012. Enabled by Design | People passionate about Design for All. Available at:



<http://enabledbydesign.org/> [Accessed December 9, 2012].

Foucault, M., 1995. *Discipline & Punish: The Birth of the Prison* 2nd Edition., Vintage.

Freire, P., 2000. *Pedagogy of the oppressed*, Continuum International Publishing Group.

Gibson, J.J., 1986. *The Ecological Approach To Visual Perception* New Ed., Psychology Press.

Johnstone, J., 2007. Technology as empowerment a capability approach to computer ethics. *Ethics and Information Technology*. Available at:

<http://eccleethics.wikispaces.com/Technology+as+empowerment+a+capability+approach+to+computer+ethics+by+Justine+Johnstone> [Accessed December 5, 2012].

Kera, D., Hackerspaces and DIYbio in Asia: connecting science and community with open data, kits and protocols. *Journal of Peer Production*. Available at:

<http://peerproduction.net/issues/issue-2/peer-reviewed-papers/diybio-in-asia/> [Accessed December 5, 2012].

Kleiner, D., Critique of Peer Production Ideology. P2P Foundation. Available at:

[http://p2pfoundation.net/Dmytri\\_Kleiner%27s\\_Critique\\_of\\_Peer\\_Production\\_Ideology](http://p2pfoundation.net/Dmytri_Kleiner%27s_Critique_of_Peer_Production_Ideology) [Accessed December 7, 2012].

McQuillan, D., 2012. Critical Hacktivism. internet.artizans. Available at:

[http://www.internetartizans.co.uk/critical\\_hacktivism](http://www.internetartizans.co.uk/critical_hacktivism) [Accessed December 5, 2012].

McQuillan, D., Hack Day London - a missed opportunity | internet.artizans. Available at:

[http://www.internetartizans.co.uk/hack\\_day\\_london\\_a\\_missed\\_opportunity](http://www.internetartizans.co.uk/hack_day_london_a_missed_opportunity) [Accessed December 5, 2012a].

McQuillan, D., New Social Networks With Old Technology - What The Egyptian Shutdown Tells Us About Social Media | internet.artizans. Available at:

[http://www.internetartizans.co.uk/socnets\\_with\\_old\\_tech\\_egypt](http://www.internetartizans.co.uk/socnets_with_old_tech_egypt) [Accessed December 5, 2012b].

Movements.org, A Marketplace for Needs and Haves Emerges Organically in Tahrir Square.

Available at:

<http://www.movements.org/blog/entry/a-marketplace-for-needs-and-haves-emerges-organically-in-tahrir-square> [Accessed December 11, 2012].

MyPolice, An online feedback tool for the police. Available at: <http://www.mypolice.org/> [Accessed December 9, 2012].

mySociety, FixMyStreet. Available at: <http://www.fixmystreet.com/> [Accessed December 11, 2012].

New York City Economic Development Corporation, NYC BigApps 3.0. Available at:

<http://2011.nycbigapps.com/> [Accessed December 5, 2012].

Peeragogy Project, Peer-to-Peer Learning Handbook. Available at: <http://peeragogy.org/> [Accessed December 5, 2012].

Peters, A., A New World in the Shell of the Old: prefigurative politics, direct action, education. openDemocracy. Available at:

<http://www.opendemocracy.net/ourkingdom/aaron-peters/new-world-in-shell-of-old-prefigurative-politics-direct-action-education> [Accessed December 8, 2012].

Postill, J., Democracy in the age of viral reality. *media/anthropology*. Available at:

<http://johnpostill.com/2011/11/02/democracy-in-the-age-of-viral-reality-2/> [Accessed December 20, 2012].

Public Strategist, 2010. Government is an elephant. Available at:

<http://publicstrategist.com/2010/03/government-is-an-elephant/> [Accessed December 11, 2012].

Raymond, E. & Steele, G., 1975. *Hacker - The Jargon File* (version 4.4.7). Available at:

<http://www.catb.org/jargon/html/H/hacker.html> [Accessed July 18, 2011].

Ries, E., 2012. The Lean Startup | The Movement That Is Transforming How New Products Are Built And Launched. Available at: <http://theleanstartup.com/> [Accessed December 20, 2012].

Sandmonkey, Tahrir: an Exercise in Nation Building. Available at: <http://www.sandmonkey.org/2011/07/16/tahrir-an-exercise-in-nation-building/> [Accessed December 8, 2012].

Social Innovation Camp, 2012. Social Innovation Camp. Available at: <http://sicamp.org/> [Accessed December 18, 2012].

Suehle, R., Telecomix, Anonymous, anarchy, and getting things done through the do-ocracy. opensource.com. Available at: <http://opensource.com/life/11/6/telecomix-anonymous-anarchy-and-getting-things-done-through-do-ocracy> [Accessed December 8, 2012].

Tech City, 2011. Mahima Ahmed, Student and App Developer, at STEM skills event, 15th September 2011, Available at: <http://vimeo.com/29314692> [Accessed December 11, 2012].

The Asset-Based Community Development Institute, 2012. Asset-Based Community Development. Available at: <http://www.abcdinstitute.org/> [Accessed December 20, 2012].

The GoodGym, GoodGym - Do good, get fit. Available at: <http://www.goodgym.org/> [Accessed December 9, 2012].

Watts, M., Mobile phone app to diffuse stop and search tension. Streatham Guardian. Available at: [http://www.streathamguardian.co.uk/news/8185732.Mobile\\_phone\\_app\\_to\\_diffuse\\_stop\\_and\\_search\\_tension/](http://www.streathamguardian.co.uk/news/8185732.Mobile_phone_app_to_diffuse_stop_and_search_tension/) [Accessed December 11, 2012].

THIS IS THE ORIGINAL DRAFT SUBMISSION MADE TO THE JOURNAL. IT IS NOT THE DEFINITIVE VERSION OF THE ARTICLE AND IS BEING RELEASED AS BACKGROUND ONLY.