

Social Technologies and the Digital Commons

Humanity's capacity to generate new ideas and knowledge is its greatest asset. It is the source of art, science, innovation and economic development. Without it, individuals and societies stagnate. This creative imagination requires access to the ideas, learning and culture of others, past and present.

Adelphi Charter on creativity, innovation and intellectual property

INTRODUCTION

Software — sets of programmed instructions which calculate, control, manipulate, model and display data on computing machines and over digital networks — is culturally loaded. Whenever we load programs, we also load messy clusters of cultural norms and economic imperatives, social biases and aesthetic choices, into machines and networks whose own histories are linked to larger socio-political forces. Increasingly instrumental in facilitating new forms of cultural expression and social activism, software is used to connect and mobilise diverse communities, interest groups and audiences, spanning local, regional and global levels.

New social assemblages, and new social relations, are thus arising out of software-assisted communication, collaborative production and exchange of creative, intellectual artefacts.¹ This model of autonomously-managed generative activity is termed 'peer production'. The knowledge-based outcomes of peer production are framed as contributing to a global 'digital commons'.² Just as the concept of the earthly commons centres around communally shared and managed material resources — land, trees, water, air, and so on — the digital commons can be imagined as shared immaterial resources. These are wildly proliferating nodes of electronic spaces, social technologies, intellectual goods and cooperative labour processes enabled by, and manifested through, the internet. The voluntary labour driving this phenomenon is occurring on an unprecedented scale, generating demonstrable effects on both knowledge generation and social organisation.

Chronicles of software-as-corporate-culture abound, revealing the light and shadow of the giants, from IBM to Amazon to Google. Similarly, the rise and rise of the free software movement, the open source software participatory programming model, and the evolution of the internet and then the World Wide Web, are well documented.³ Less visible are the histories of the pixies, those nimble social technologies arising from the nexus of the free software movement, cultural activism, and new hybrid forms of peer production. Where documentation does exist, it is more likely to be within the fields of new media art, tactical media and the emerging academic interdisciplinary field of software studies, or in project WIKIs and blogs.⁴

This chapter places collaborative software development within the context of software as culture. Specifically, I examine some instances of software-assisted peer production in the cultural expression of social activism. The first part of the chapter draws attention to some socio-political factors that shaped the development of computing, giving an historical context to my proposition that software and culture are intrinsically interconnected. This is followed

by a brief sketch of current theoretical propositions about some relationships between capitalism, computing technologies, knowledge-based labour and network society.

In the second part of this chapter I will identify distinguishing features of the digital commons, outlining the cooperative processes which enliven it. Moving from theory to practice, I will highlight three exemplary projects to illustrate the kinds of content, processes and social relations contributing to the digital commons. I will introduce the *Dyne:bolic* distribution of the GNU/Linux operating system, and the *Streamtime* network for producing content in crisis areas. The *Container Project*, an open access digital media hub in Jamaica, will be then foregrounded. Speculation on future trends will signpost efforts to contain the circulation of knowledge and cultural material via systems of 'digital enclosures'. I will conclude by speculating on possible directions for social technologies, as network nodes proliferate globally, thereby increasing public spaces for creative co-operation. Increased peer participation and cultural diversification give rise to a concept of a multitude of interlinked digital commons. Such networked imaginative productive spaces not only could meet the challenges thrown down by the socially elite proponents of the new digital enclosures, but also prefigure possibilities for new global democratic socio-political forms.

BACKGROUND

The evolution of computing is woven through with histories of power, capital and social control. Each major innovation benefited from a rich accretion of ideas and inventions, sometimes spanning centuries, cultures and continents. Specific political imperatives (serving national or imperial interests) and wider societal forces shaped the development pathways of computing. From cog to code, information technologies have never been neutral.

The Politics of Invention

Joseph-Marie Jacquard's construction of the automated punch card loom, a proto-information technology, illustrates both strategic government patronage, and the collective, cumulative processes of invention.⁵ The loom benefited from government intervention and financial support, as Napoleon recognised that the new loom could play a crucial role in achieving post-revolutionary France's economic goal to rival the industrial giant Britain. This same Jacquard loom directly inspired the English inventor Charles Babbage (himself assisted by the visionary mathematician Ada Lovelace), who made a series of conceptual and engineering breakthroughs in two mechanical systems for automated arithmetic calculation, the Difference Engine and the Analytical Engine.⁶ Babbage was influenced by the ideas of the eighteenth century moral philosopher Adam Smith, the Scottish anti-mercantile proponent of laissez-faire economic liberalism, who proposed the idea of the systematic division of labour. Babbage envisaged his mechanical cog-and-card machines as furthering Britain's national economic interests, as trade and taxation would benefit from mathematical precision and reduced labour costs.

Punch cards reappeared in the electro-mechanical binary punch card calculating machines developed by engineer Herman Hollerith in the late nineteenth century in the United States. The role of IBM in the programming of punch cards for customised demographic data

collection by the Nazi regime throughout the 1930s-40s, demonstrates what Christian Parenti (2003) terms the 'informatics of genocide'.⁷ In the twentieth century, information technology played a dominant role in determining material and ideological power, within and between nations.

On the eve of World War 2 both Axis and Allies were thirsting for new mathematical engines. The English and French needed information to decrypt the codes of Germany's Enigma machine;⁸ the Americans needed information in the form of ballistic firing tables in order to accurately instruct their gunners which way to point their guns in their new generation of fast war planes;⁹ and the Germans needed a machine which could rapidly process stacks of simultaneous equations to ensure that the frameworks of *their* new planes could withstand the stress of increased speed.¹⁰ Each of these national objectives was answered by the injection of substantial government and corporate support for the boffins in the engine rooms; technological innovation in computing was sculpted by powerful external influences.

Network Society and Immaterial Labour

How did humanity reach what historian Paul Ceruzzi (2003) describes as 'an age transformed by computing'?¹¹ Attempts to commercialise computers were made in the late 1940s; later the creation of small systems in the 1960s was followed by personal computing in the 1970s, and the rise of networked systems in the mid-1980s. The 'deep recession' of the 1970s consolidated socio-industrial changes in the West so profound that they constituted a new regime of accumulation, termed late capitalism.¹² The markers were privatisation, deregulation, the growing power of transnational corporations, and globalisation — of markets, labour, finance and communications. Globalisation itself required specific technological developments, including automation and computerisation of production processes, and the growth of networked communications (Castells, 2000; Webster, 2000).

In his three-volume opus *The Information Age: Economy, Society and Culture*, Manuel Castells (2000) describes the emergence of a network society around the end of the twentieth century, characterised by the centrality of information and knowledge to the economy, and the rise of communication networks.¹³ *The Rise of the Network Society* proposes that a 'new social order' arises from a global system of 'informational capitalism' (Castells, 2000). The 'revolutionary' era's distinguishing feature is the 'action of knowledge upon knowledge itself as the main source of productivity' (p. 17), creating a 'cumulative feedback loop between innovation and the uses of innovation', with 'the human mind [as] a direct productive force' (p. 31). 'Critical cultural battles for the new society' are played out in this 'new historical environment' (p. 405).

The central role played by 'immaterial labour' within this network society was first articulated by Italian theorists.¹⁴ In the essay *Immaterial Labour*, sociologist Maurizio Lazzarato (1996) describes a 'great transformation' starting in the 1970s, which blurred the manual/mental binary framing of labour. He defines immaterial labour as 'the labour that produces the informational and cultural content of the commodity'. The commodity's informational content indicates 'the changes taking place in workers' labour processes..., where the skills

[increasingly] involve...cybernetics and computer control (and horizontal and vertical communication)'. For 'the activity that produces the "cultural content" of the commodity, immaterial labour involves activities ..not normally recognized as "work" [...] activities involved in defining and fixing cultural and artistic standards, fashions, tastes, consumer norms, and, more strategically, public opinion'. No longer the privilege of a social elite, these activities have 'become the domain of what we have come to define as "mass intellectuality"'. Immaterial labour is constituted 'in forms *that are immediately* collective', existing 'only in the form of networks and flows' (italics in original).

In *Network Culture: Politics for the Information Age*, Tiziana Terranova (2004) takes the idea of flows to examine the productive relations flowing between the 'thriving and hyperactive' internet, an 'outernet' of social, cultural and economic networks, the 'digital economy', and 'free' labour. Terranova focuses on the critical role of the internet, arguing that it 'functions as a channel through which "human intelligence" renews its capacity to produce' (pp. 73-79). The internet 'highlights the existence of networks of immaterial labour and speeds up their accretion into a collective entity'. Commodities become 'increasingly ephemeral' and turn into 'translucent objects', a transparency which reveals their 'reliance on the labour which produces and sustains them'; it is this 'spectacle of labour' — 'creative, continuous, innovative' — that attracts users/consumers of these commodities (p. 90).

KNOWLEDGE, CREATIVITY AND SOCIAL CHANGE ON THE DIGITAL COMMONS

The fields of sociology and cultural theory are not alone in advancing theories about the social relations of information technology. Perspectives from the free software movement, media arts, the sciences and the law are also contributing to new notions of the commons.¹⁵ In his essay *Three Proposals for a Real Democracy: Information-Sharing to a Different Tune*, Brian Holmes (2005) proposes:

the constitution of a cultural and informational commons, whose contents are freely usable and protected from privatization, using forms such as the General Public License for software (copyleft), the Creative Commons license for artistic and literary works, and the open-access journals for scientific and scholarly publications. This cultural and informational commons would run directly counter to WIPO/WTO treaties on intellectual property and would represent a clear alternative to the paradigm of cognitive capitalism, by conceiving human knowledge and expression as something essentially common, to be shared and made available as a virtual resource for future creation, both semiotic and embodied, material and immaterial.

In *piratology: the deep seas of open code and free culture*, theorist Armin Medosch (2003) unpicks the labour processes creating the commons. He explains that the point-to-point communications principle on which the internet is based 'aids the creation of new transversal structures - communities, movements, interest groups, campaigns, discussion boards, file-sharing communities...' These autonomous groupings produce a 'social dynamism, based on new types of technologically-supported collectivisations' (p. 13). Medosch describes

'commons-based peer production', which he defines as 'the production of goods and services based on resources that are held in a commons and organised by peers', as now having reached a 'critical mass'.

Crucially, this has occurred 'right in the centre of Western societies, within the most advanced areas of production' (p. 15). As evidenced by pan-continental gatherings; the activity on free software lists in Latin America, India, Asia and Africa; the blogging movements in Iran and Iraq; and the adoption of free software by various governments, I would argue that concurrent swells of participatory media are also forming in non-Western societies spanning various stages of industrialisation.¹⁶ Medosch proposes that 'without explicitly formulating itself as oppositional, this nondescript movement of movements slowly but inevitably changes society from within' (p. 15).

The historical importance of this trend is echoed by other commentators. James Boyle (2002) describes the internet as 'one big experiment in distributed cultural production'. For Free Software Foundation legal counsel Eben Moglen (2003), 'the movement for free information announces the arrival of a new social structure, born of the transformation of bourgeois industrial society by the digital technology of its own invention'. Castells (2000) views the technological transformation of media participation as being of 'historic dimensions', likening it to the 'new alphabetic order' of the ancient Greeks, which 'provided the mental infrastructure for cumulative, knowledge-based communication'. Hypertext and a 'meta-language' integrate oral, textual, aural and visual modalities into one system of communication, which reunites the human spirit in 'a new interaction between the two sides of the brain, machines, and social contexts' (Castells, 2000, pp. 355-56).

Knowledge work 'is inherently collective, it is always the result of a collective and social production of knowledge', according to Terranova (2004, p. 80). The General Public Licence (GPL) conceived by Richard Stallman¹⁷ and taken up widely by Free/Libre Open Source Software (FLOSS) developers, is a legal mechanism ensuring that information about software source codes remains open and unprivatised. The Free Software Foundation explains that 'the GPL builds upon the ethical and scientific principle of free, open and collaborative improvement of human knowledge, which was central to the rapid evolution of areas like mathematics, physics, or biology, and adapts it to the area of information technology'.¹⁸ The GPL was later applied to other kinds of cultural goods, providing a framework for discussions around the role of knowledge in information society. It also inspired the open content licensing system, Creative Commons (CC).¹⁹ Creative Commons offers a spectrum of copyright or copyleft protections which can be assigned to a wide range of content types such as film, music and texts before they enter the public realm.²⁰

Internet-assisted systems of knowledge exchange recall the ideas of educator Ivan Illich (1971) in his prescient book *Deschooling Society*. Decades before the internet became a popular medium, Illich proposed that the 'unhampered participation' of individual active subjects informing and empowering themselves 'in a meaningful setting' via mechanisms such as autonomously organised learning webs, skill exchanges and networks of peers was fundamental to societal transformation (Illich, 1996, p. 39, pp. 76-97). Twenty years later, by conceiving and then crafting the ingenious marriage of hypertext and computer networks, Tim

Berners-Lee created the World Wide Web, thereby gifting the internet with a user-friendly means of creating self-managed electronic learning webs.²¹

Scalability — the virtually infinite capacity of the internet to add interconnected nodes of communicable content to itself — means that the digital commons is potentially boundless. It is constrained mainly by technical issues, such as bandwidth availability, and economic factors such as access costs. Limits to the constitution of the commons are more likely to be social in nature. Common land is bounded by hedges, fences or historical memory, and its resources cooperatively accessed and managed by agreed upon rules. Similarly, the digital commons is a self-managed web of systems that follows protocols 'defined by the shared values of the community sharing these resources' (Kluitenberg, 2003).²²

Kluitenberg (2003) stresses the hybrid and fluid qualities of the democratic media systems created by 'artistic and subversive media producers'. According to him, the 'successful mediator needs to be platform independent,...able to switch between media forms, cross-connect and rewire all platforms to find new communication spaces [...] they become tools to break out of the marginalised ghetto of seldomly visited websites and unnoticeable live streams'. An example of this approach is the Media Shed project by the acclaimed art group Mongrel.²³ Operating from a light industrial shed in the economically impoverished city of Southend, England, Mongrel collaborated with the local Linux Users Group to run software training sessions, assist community-generated digital art projects, and establish an internet radio station. All projects used recycled electronic hardware, and free and artist-made multimedia softwares. The Media Shed charter reflects Mongrel's long history of making 'socially engaged culture', and resonates with the ideals expressed by similar hybridised collaborations on the digital commons. It aims:

To research, create and promote communication through free-media technologies outside the monetary and licensing control of proprietary systems, to assist the free flow of information, self education and opinions, to encourage creative expression and to contribute to and explore the issues that are important to the everyday lives of individuals, communities and diverse cultures in a pluralist society (Mongrel 2006).

Some discourses foreground the radical cultural potential of the digital commons, and the social agency of its 'immaterial labourers'. *The Delhi Declaration of a New Context for New Media* (World Information Cities, 2005) speaks of a 'vigorous cluster of practices of ongoing cultural transaction within and outside formal commodity relations' which guarantees cultural diversity. Medosch (2003a) depicts artist/coders as being 'at the heart of a cultural struggle' because they 'carry forward the cultural politics of code by supporting the foundations for the preservation and renewal of culture' (p. 16). With the digital tools they make, 'the artist/coders liberate culture from the grips of the culture industries....creat[ing] platforms for social experimentation' (p. 16). A related set of practices can be grouped under the umbrella of electronic civil disobedience. Jordan and Taylor (2004) describe practitioners of 'hacktivism' as seeking to 're-engineer systems in order to...confront the overarching institutions of twenty-first-century societies' (p. 29).²⁴

Brian Holmes (2003) identifies the progressive re-engineering of public knowledge and the

social imaginary in his text *Cartography of Excess*, referencing internet-based mapping projects such as *TheyRule*, a detailed investigation into American corporate boardroom power relations.²⁵ Holmes opines that 'far beyond the computer logic of Open Source, the great alternative project of the last decade has been mapping the transnational space invested primarily by corporations, and distributing that knowledge for free. This is the real power of "spontaneous cooperation" in a global information project like Indymedia' (p. 65). Such projects are valuable because they make the rules of the neoliberal economy visible to a point where 'we can start imagining — or exploring — a radically different map of the planet again' (Holmes, p. 65).

Social Softwares as Social Technologies: Dyne:bolic, Streamtime, and, the Container Project

Creating the material circumstances to enable the democratic exchange of imagination and information is a driving factor in numerous projects on the digital commons. Dyne:bolic, Streamtime and the Container Project are three such examples, employing free and social softwares as tools for creative expression, social activism and cultural transformation. If we consider the digital commons to be the macro-structure, then social software can be thought of a set of micro-systems within this framework.²⁶ Matthew Fuller (2003, p. 24) describes social software as:

Primarily...built by and for those of us locked out of the narrowly engineered subjectivity of mainstream software. It is software which asks itself what kind of currents, what kinds of machine, numerical, social, and other dynamics, it feeds in and out of, and what others can be brought into being. [...] It is...directly born, changed, and developed as the result of an ongoing sociability between users and programmers in which demands are made on the practices of coding that exceed their easy fit into standardised social relations.

Dyne:bolic, a live bootable distribution of the GNU/Linux operating system, is a good example of Fuller's model of social software. Released under the GPL, it has the bonus of 'a vast range of software for multimedia production [...] ready for being employed at home, in classrooms and in media centers' which have been made by 'hundreds of programmers all around the world' (Jaromil 2006).²⁷ In order to ensure the widest spectrum of people and machines can access Dyne:bolic, it has been optimised to run on older machines. Compare this with the OS releases from the proprietary vendors — could an Apple SE circa 1995 run OS10 for example? Completely rewritten in 2005 as the 'DHORUBA' release, lead developer Jaromil (2006) announces that the project is already planning its next stage, which will be 'a cross-platform build environment to cover all kinds of hardware around'.

In an undated text entitled *This is Rasta software*, Jaromil links Dyne:bolic with revolutionary social movements, proclaiming:

This software is for all those who cannot afford to have the latest expensive hardware to speak out their words of consciousness and good will. This software has a full range of applications for the production and not only the fruition of information, it's a full multimedia studio...because freedom and shar[ing] of knowledge are solid principles for

evolution and that's where this software comes from....This software is free as of speech and is one step in the struggle for Redemption and Freedom....

Dyne:bolic and many other free softwares have arisen out of the Italian autonomous hackmeeting and hack labs scene.²⁸ Whilst 'trying to recover the essence of the first hackers from MIT', these are outcomes of a significantly different cultural context to that of the liberal and libertarian interpretations of freedom characterised by American discourse (Nmada & Boix 2003). The *social and communal* end uses and empowering possibilities of the software are valorised, more than the *individual's* right to examine and share source code. This is cooperatively-made software to 'let people be Free to Create' (Jaromil 2006).²⁹

The Streamtime project, a collaboration between Radio Reedflute and Rastasoft, applies this principle, gathering up free softwares such as Dyne:bolic from the digital commons, to assist the building of 'autonomous networks in extreme conditions'.³⁰ Streamtime describes itself as 'a handshake in cyberspace, a hanging garden for dialogue and cooperation, generated by a sense of solidarity, hospitality and a desire to communicate and relate'. An initiative of Dutch media activist Jo van der Spek, the communication platform enables self-production of media, such as low-tech wireless radio networks to stream local content. It hosts a meta-blog linking to multi-lingual chronicles of life in wartime situations in Iraq and Lebanon, audio archives (poetry and interviews), and links to other DIY media resources. Streamtime's Mission Statement explains:

Streamtime uses old and new media for the production of content and networks in the fields of media, arts, culture and activism in crisis areas, like Iraq. Streamtime offers a diffuse environment for developing do-it-yourself media. We focus on a cultural sense of finding your own way in the quagmire that is Iraq, and its representation in the global media. We should not try to change politics in order to foster cultural change; we should support cultural manifestation in order to force political change.

The Container Project, initiated by Jamaican artist Mervin Jarman, is a more localised example of cultural intervention using social technologies.³¹ Mervin wanted to take 'creative computer technology to ghetto people and deep rural communities in the Caribbean', so that 'kids growing up in the ghettos of Jamaica [could] realize they can “fulfill their wildest dreams”' (de Silva). The project of 'technological repatriation' was inspired by Mervin's own youthful experiences of poverty, his later journeys into video making, and his participation in a digital media training program for the socially disadvantaged at ARTEC in London. He sees the Container as a 'revolutionary project' that challenges the existing social order of endemic poverty, by using under-recognised rich local cultural traditions and talent to generate new entrepreneurial systems of reciprocal exchange and opportunity (Fuller, 1999).

In 2003 a volunteer team came to the Jamaican village of Palmers Cross to help realise Mervin's vision. The group converted the shipping container into a media lab housing sixteen networked computers running three operating systems (GNU/Linux, Mac and Windows), all connected to a Linux server. The lab included a purpose-designed dedicated multimedia suite, and machines hosting a mix of proprietary and free software programs, including artist-made social softwares. Mervin used his intimate knowledge of his community's dynamics when

designing the Container's architecture. The bright yellow structure was opened up with large kiosk-style windows, inviting people to get to know what was happening at their own pace.

The Container fulfilled a community need for a social hub. Originally envisaged as a mobile lab, the local people have been reluctant to let it leave their village. Its educational and cultural exchange programs addressed a range of needs, from general computer skilling to the sharing of creative talents with a world audience. Mervin views this community empowerment as a global issue, explaining:

That's why I think the Container is such an incredible and revolutionary project because it allows street-level emergence into what would be an otherwise unchallenged consortium of global culturalisation and then where would we be? What would happen to our dynamics as it relates to production, be that in the Music, Art and Craft, in the way we conduct businesses, and develop our own customized software to satisfy our specifics?....No system should impose its will and/or cultural identity on another, the only way for software and technology to be truly dynamic is to decentralize the decision making process, open up the formats to customization on a more trans-culture and gender context (Fuller, 1999).

In 2004 a broadband connection linked the Container to the wider world, and its electronic Post Office Box (e-POB) was an immediate success, tapping into fundamental communication needs. In June 2005 the young musicians and singers of the village participated in the SkintStream project, a network connecting 'audiences and cultural spaces previously separated by economic, geographical and political factors'. A temporary 'Poor-to-Poor' streaming radio channel was established, linking creative communities in Palmers Cross, a shanty town in Johannesburg, a diaspora Congolese community in London, a public housing community in Toronto, and young musicians in Southend.³² It was the first time that most of the participants had performed their creative works to outside audiences, and the level of excitement with the experience of exchanging original content was reportedly very high. SkintStream embodies one of the goals around cultural empowerment stated on the Container website — to demonstrate to people in remote and isolated communities that they too 'can contribute to the future, that they will have a place in the millennium'.

In March 2006 the Container Project hosted a Community Multimedia Centre Management Workshop.³³ The three week event included a Digital Storytelling Workshop, and the creation of a temporary recording studio. Based on a knowledge-sharing model, guest artist/teachers passed on technical, creative, leadership and training skills to ten workshop participants, giving the students the ability to replicate the program themselves in other communities. The Container team are now working closely with local organisation ICT4D Jamaica to deliver workshops under the 'community without borders' concept.³⁴ As Mervin explained, this 'fulfills the Container mobility needs, only we move people into Palmers Cross so they get the whole ambient of what it feels like to be part of the Container family'.³⁵ Two projects in the planning stage are the creation of a community internet radio portal for the region, and mongrelStreet lab, a portable lab made out of wheelie bins.

Like Dyne:bolic and Streamtime, the Container harnesses social technologies with creative

expertise to create a platform for cultural expression and exchange for disenfranchised communities. These are just three of a multitude of similar projects occurring around the world. Visible social change is happening on grassroots local levels, and ideas and project-generated content are feeding back into a multiplicity of interconnected digital commons. This emergent phenomenon could herald widespread social change based on the new shared social imaginaries which are being generated.

FUTURE TRENDS

Mongrel (2004) propose that when 'new common cultural spaces open up in the public domain as they did with the internet in the 1990's, those with the proprietary right or economic might, usually attempt enclosure.' Commodification and privatisation of natural and public resources and spaces present a significant challenge to the commons, earthly and electronic.³⁶ The various processes through which attempts are made to privatise the digital commons are termed the 'digital enclosures'. In response, new alliances of free software developers, legal and cultural activists are gathering to protect, and extend, the freedom of the commons. Two recent examples of the digital enclosures include the failed legislative bid by the European Parliament to impose software patents,³⁷ and the impositions of the United States' Digital Millennium Copyright Act (DMCA).³⁸ Battles on the contested ground of intellectual property are intensifying as the United States pressures its trading partners to 'adopt laws modelled on the DMCA as part of bilateral and multilateral trade agreements' (von Lohmann, 2004).

James Boyle (2002) warns that intellectual property rights (IPR) threaten the 'commons of mind', stating that 'things...formerly thought to be uncommodifiable, essentially common, or outside the market altogether are being turned into private possessions under a new kind of property regime. But this time the property...is intangible, existing in databases, business methods, and gene sequences'. He notes that, unlike a common tract of land which can be overexploited,³⁹ the 'digitized and networked *commons of the mind*' is not depleted or destroyed by being mutually shared. Due to the fragmentary nature of information products, all fragments 'can function as raw material for future innovation' (Boyle, 2002).

Despite the threat of the enclosures the digital commons is expanding, as peer production of democratic media projects, cultural activism and art proliferate. The internet is the key enabling technology underpinning the commons, and all figures point to the exponential growth of the net, especially in the global South.⁴⁰ This creates a more culturally-diverse, socially inclusive, and globalised network society, and it is unlikely that the new swarms of activity will recede or wither. These non-linear clusters of social technologies and projects resonate with fundamental human desires to communicate, to create, to work cooperatively and collectively, and to exchange elements of ourselves and our cultures.

Empirical research is needed to analyse these new phenomena. Comprehensive documentation of a spectrum of projects energising the digital commons will contribute to an understanding of what is common (and different) about these projects' co-operative labour processes, their technological innovation, the new systems of cultural and social exchange developing, and the challenges faced by participants. Multiple-language translations of project documentation and case studies would offer important cross-cultural perspectives. Qualitative research would

ground more speculative work, such as considerations about the shifts in social imaginaries resulting from these experiments in production and social relations. Indeed, learning how such imaginative shifts are being played out in material projects and networks could reveal unfolding global patterns and flows.

CONCLUSION

The idea that all humanity is living in a global age of advanced neoliberal capitalism, with its interconnected communicative flows of data, finances and labour is no longer new; Marshall McLuhan and others were channelling the information revolution spirits some forty years ago.⁴¹ In contrast, discourses around network society, knowledge work, immaterial labour, and software as culture, are still in their infancy, and the language is sometimes esoteric, or opaque. Fortunately practice outstrips theory on the digital commons, as new hybrid collaborations of peer production and social activism are creating democratic public spaces for communication and creativity, and generating new systems of exchange. In these contexts, far away from the Google campus, co-operation displaces competition, and the creation of shared frameworks of knowledge and action provides traction for local, regional and transnational social change.

There is no unitary or abstract digital commons, but rather a multiplicity of digital commons across the North-South power axis. In this new millennium voices from the 'Fourth World' or 'Global South' are entering the network flows, forming new autonomous networks and creative laboratories, further transforming the praxis. Their discourses emphasise software freedom as being intrinsically related to free culture,⁴² community empowerment, traditional Indigenous knowledge⁴³ and social rights. The decision by the Brazilian government to use only open source software, and to establish one thousand free software and free culture centres in the poorest parts of the country, is directly linked to a radical social vision which is challenging knowledge ownership laws from pharmaceutical patents to file sharing. In the words of Brazilian Minister of Culture and acclaimed musician Gilberto Gil, 'if law doesn't fit reality anymore, law has to be changed....That's civilisation as usual' (Burkeman 2005).

And just beneath civilisation lies the unknown, the realm of spectres and magic and transformation. What is a spell if not a set of programmed instructions to create change? Open code is transforming society subtly, as social technologies are being cooperatively built, shared and used in a deeply networked, informatised, immaterial, cultural space — the 'collective subjectivity' of the digital commons (Dafermos 2005).⁴⁴ The free software movement has provided the impetus for the evolution of numerous thriving ecosystems, rich hybridised sites of cultural production. The enthusiastic embrace by the 'Fourth World' of free software is one sign, amongst many others, that social change on an unprecedented scale is afoot. The immaterial spaces created by networked imaginations could offer us all vital keys to comprehending such change.

GLOSSARY

Digital Commons

A conceptual framework for considering the common wealth of intellectual goods, knowledge products, creative works, free software tools, shared ideas, information, and so on which are freely and democratically shared, and possibly further developed, via the internet.

FLOSS

A convenient acronym for 'Free Libré Open Source Software'. It neatly bundles the revolutionary associations of 'free (libré) as in freedom' together with the more technical and neutral connotations of 'open source'. The term implicitly acknowledges that differences between the two camps exist, but they are operational in the same field.

Free Software

Software in which the underlying code is available to be inspected, modified, shared, with the proviso that it remains open, even following modification. To ensure it remains open, free software is distributed under the General Public License (GPL) or similar legal agreements.

Free Software Movement

The philosophical and political context underpinning the creation of free software, and the subjective sense of community shared by developers and users.

Immaterial Labour

A theoretical framing of knowledge work, labour processes and social relations in information society, initially articulated by Italian theorists including Maurizio Lazzarato and Christian Marazzi.

Open Source Software

A strategic business-friendly 'rebranding' of free software emphasising the practical benefits of the model of participatory software development and open code, and downplaying the original ideological and philosophical positions.

Peer Production

A horizontal, distributed method of cooperative, creative labour, generally facilitated by high levels of communication, information and file sharing via the internet.

Social Software

The term came out of the nexus between cultural and social activism, art and tactical media, and was originally used to designate software that came into being through an extended dialogue between programmers and communities of users, ensuring that the software was responsive to user needs. The phrase no longer carries the same import, as it is now applied to software-assisted social networking platforms such as MySpace.

Social Technologies

An umbrella term which could include free software, social software, recycled electronic equipment in free media labs, and so on. Technology put to use by the people, for the people.

BIBLIOGRAPHY

- Agar, J. (2001). *Turing and the Universal Machine: The Making of the Modern Computer*. Cambridge: Icon Books UK.
- Berners-Lee, T., & Fischetti, M. (1999). *Weaving the Web*. London: Orion Business Books.
- Black, E. (2001). *IBM and the Holocaust: The Strategic Alliance Between Nazi Germany and America's Most Powerful Corporation*. New York, NY: Crown Publishers.
- Bollier, D. (2002). *Silent Theft: The Private Plunder of Our Common Wealth*. New York, NY: Routledge.
- Bosma, J., Van Mourik Broekman, P., Byfield, T., Fuller, M., Lovink, G., McCarty, D., et al. (Eds.). (1999). *Readme! filtered by Nettime: ASCII Culture and the Revenge of Knowledge*. New York, NY: Autonomedia.
- Boyle, J. (2002). *Fencing Off Ideas: Enclosure and the disappearance of the public domain*. Retrieved 18 August, 2005, from <http://centomag.org/essays/boyle>
- Boyle, J., Brindley, L., Cornish, W., Correa, C., Cuplinskas, D., Deere, C., et al. (2005). *Adelphi Charter on creativity, innovation and intellectual property*. Retrieved 8 November, 2005, from <http://www.adelphicharter.org>
- Burkeman, O. (2005, 14 October 2005). Minister of counterculture. *The Guardian*.
- Castells, M. (1998). *End of Millenium* (2nd ed. Vol. 3). Oxford: Blackwell.
- Castells, M. (2000). *The Rise of the Network Society* (2nd ed. Vol. 1). Oxford: Blackwell.
- Ceruzzi, P. E. (2003). *A History of Modern Computing* (second ed.). Cambridge, MA: The MIT Press.
- Critical Art Ensemble. (1994). *The Electronic Disturbance*. New York, NY: Autonomedia.
- da Rimini, F. (2005). *Grazing the Digital Commons: artist-made social softwares, politicised technologies and the creation of new generative realms*. Unpublished Masters thesis, University of Technology, Sydney.
- Dafermos, G. N. (2005). *Five Theses on Informational - Cognitive Capitalism*. Retrieved 28 November, 2005, from <http://www.nettime.org/Lists-Archives/nettime-l-0511/msg00103.html>
- Davis, M. (2000). *The Universal Computer: The road from Leibniz to Turing*. New York, NY: W. W. Norton.
- de Silva, S. (undated). *Desperately seeking Mervin*. Retrieved 14 March, 2005, from <http://www.thepaper.org.au/024/024desperatelyseekingmervin.html>
- Essinger, J. (2004). *Jacquard's Web: How a hand loom led to the birth of the information age*. Oxford: Oxford University Press.
- Fitzpatrick, A. (1998). Teller's Technical Nemeses: The American Hydrogen Bomb and Its Development within a Technological Infrastructure. *Society for Philosophy and Technology*, 3(3).
- Fuller, M. (1999). *Mervin Jarman - The Container*. Retrieved January, 2005, from <http://www.nettime.org/Lists-Archives/nettime-l-9906/msg00138.html>
- Fuller, M. (2003). *Behind the Blip: Essays on the Culture of Software*. New York, NY: Autonomedia.
- Grattan-Guinness, I. (1990). Work for the Hairdressers: The Production of de Prony's Logarithmic and Trigonometric Tables. *Annals of the History of Computing*, 12(3), 177-185.
- Hauben, R. *History of UNIX: On the Evolution of Unix and the Automation of Telephone*

- Support Operations (i.e. of Computer Automation)*. Retrieved 7 November, 2005, from <http://www.dei.isep.ipp.pt/docs/unix.html>
- Hauben, M., & Hauben, R. (1995). *Netizens: On the History and Impact of the Net*. Retrieved 7 November, 2005, from <http://www.columbia.edu/~hauben/netbook/>
- Holmes, B. (2003). Cartography of Excess. In T. Comiotto, E. Kluitenberg, D. Garcia & M. Grootveld (Eds.), *Reader of the 4th edition of Next 5 Minutes* (pp. 63-68). Amsterdam: Next 5 Minutes.
- Holmes, B. (2005). Three Proposals for a Real Democracy: Information-Sharing to a Different Tune. In M. Narula, S. Sengupta, J. Bagchi & G. Lovink (Eds.), *Sarai Reader 2005: Bare Acts*. Delhi: Sarai.
- Illich, I. (1971, 1996). *Deschooling Society*. London: Marion Boyars.
- Jaromil. *This is Rasta software*. Retrieved 13 November, 2005, from <http://dynebolic.org/manual-in-development/dynebolic-x44.en.html>
- Jaromil. (2006). *dyne:bolic 2.1 codename DHORUBA*. Retrieved 13 July, 2006, from <http://nettime.org>
- Jordan, T., & Taylor, P. A. (2004). *Hackivism and Cyberwars: Rebels with a cause?* London: Routledge.
- Kluitenberg, E. (2003). Constructing the Digital Commons. In T. Comiotto, E. Kluitenberg, D. Garcia & M. Grootveld (Eds.), *Reader of the 4th edition of Next 5 Minutes* (pp. 46-53). Amsterdam: Next 5 Minutes.
- Lazzarato, M. (1996). *Immaterial Labor*. Retrieved 11 August, 2005, from <http://www.generation-online.org/c/fcimmateriallabour3.htm>
- Lessig, L. (2004). *Free Culture: How Big Media Uses Technology and the Law to Lock Down Culture and Control Creativity*. London: Penguin.
- Liang, L. (2004). *Guide to Open Content Licenses*. Rotterdam: Piet Zwart Institute.
- Linebaugh, P., & Rediker, M. (2001). *The Many-Headed Hydra: Sailors, Slaves, Commoners, and the Hidden History of the Revolutionary Atlantic*. Boston, MA: Beacon Press.
- Lovink, G. (2002). *Dark Fiber*. Cambridge, MA: The MIT Press.
- Mantoux, P. (1905: 1983). *The Industrial Revolution in the Eighteenth Century: An Outline of the Beginning of the Modern Factory System in England* (Revised ed.). Chicago, IL, and London: University of Chicago Press.
- Medosch, A. (2003). piratology: the deep seas of open code and free culture. In A. Medosch (Ed.), *Dive*. London: Fact
- Medosch, A. (2005). Roots Culture: Free Software Vibrations "inna Babylon". In M. Narula, S. Sengupta, J. Bagchi & G. Lovink (Eds.), *Sarai Reader 2005: Bare Acts*. Delhi: Sarai.
- Meikle, G. (2002). *Future Active: Media Activism and the Internet*. Sydney: Pluto Press.
- Midnight Notes Collective. (1990). The New Enclosures. *Midnight Notes*, 10.
- Moglen, E. (1999). Anarchism Triumphant: Free Software and the Death of Copyright. *First Monday*, 4(8).
- Moglen, E. (2003). *The dotCommunist Manifesto*. Retrieved June, 2005, from <http://moglen.law.columbia.edu/>
- Mongrel. (2004a). *BIT_COMMON <=> CODE_OF_WAR*. Retrieved 30 November, 2005, from <http://www.scotoma.org/notes/index.cgi?MonsterUpdate3>
- Mongrel. (2004 b). *About Mongrel*. Retrieved 15 August, 2005, from <http://www.mongrelx.org/home/index.cgi?About>
- Mongrel. (2006). *Free-media*. Retrieved 22 July, 2006, from

- <http://dev.mediashed.org/?q=freemedia>
- Moody, G. (2001). *Rebel Code: Linux and the Open Source Revolution*. London: Allen Lane, The Penguin Press.
- Nmada, & Montserrat Boix. (2003). *Hacklabs, from digital to analog*. Retrieved 2 February, 2006, from http://wiki.hacklab.org.uk/index.php/Hacklabs_from_digital_to_analog
- Parenti, C. (2003). *The Soft Cage: Surveillance in America from Slave Passes to the War on Terror*. New York, NY: Basic Books.
- Plant, S. (1997). *Zeroes + Ones: Digital Women + The New Technoculture*. London: Fourth Estate.
- Rheingold, H. (2000). *Tools for Thought: The History and Future of Mind-Expanding Technology* (2nd ed.). Cambridge, MA: The MIT Press.
- Stallman, R. (2005, 20 June 2005). Patent absurdity. *The Guardian*.
- Swade, D. (2000). *The Cogwheel Brain: Charles Babbage and the Quest to Build the First Computer*. London: Little, Brown and Company.
- Terranova, T. (2004). *Network Culture: Politics for the Information Age*. London: Pluto Press.
- Toner, A. (2003). *The Problem with WSIS*. Retrieved 8 November, 2005, from <http://world-information.org/wio/readme/992006691/1078414568/print>
- Toole, B. A. (Ed.). (1992). *Ada, the Enchantress of Numbers: A Selection from the Letters of Lord Byron's Daughter and Her Description of the First Computer*. Mill Valley, CA: Strawberry Press.
- von Lohmann, F. (2004). Measuring the Digital Millennium Copyright Act against the Darknet: Implications for the Regulation of Technological Protection Measures. *Loyola of Los Angeles Entertainment Law Review*, 24, 635-650.
- Weber, S. (2004). *The Success of Open Source*. Cambridge, MA Harvard University Press.
- Webster, F. (2002). *Theories of the Information Society* (2nd ed.). London: Routledge.
- Williams, S. (2002). *Free as in Freedom: Richard Stallman's Crusade for Free Software*. Sebastopol, CA: O'Reilly & Associates.
- World Information Cities. (2005). The Delhi Declaration of a New Context for New Media. In *IP and the City: Restricted Lifescapes and the Wealth of the Commons* (pp. 15). Vienna: World-Information City.

- ¹ In his seminal book *Behind the Blip: Essays on the Culture of Software*, Matthew Fuller (2003) proposed that computers are 'assemblages', combining technical, mathematical, conceptual and social layers. Through a process of critical examination we can better understand 'the wider assemblages which they form and are formed by' (p. 21). According to Fuller, software creates sensoriums, 'ways of seeing, knowing and doing in the world that at once contain a model of that part of the world it ostensibly pertains to, and that also shape it every time it is used' (p. 19).
- ² The digital commons is often discussed with reference to the changing of common land usage since Medieval times. For example, eighteenth century England was 'marked by the co-existence and close association between small agricultural production and small industrial production', and 'the commons' referred to bounded parcels of land which were available to be used by the local yeomanry and tenants (gleaned and gathered, cultivated, hunted, and traversed for reaching other destinations) under agreed upon protocols (Mantoux, 1983, pp. 137-39; Linebaugh & Rediker, 2000, pp. 22-26). Collective ownership and usage rights of land underlies 'the clachan, the sept, the rundale, the West African village, and the indigenous tradition of long-fallow agriculture of Native Americans — in other words, it encompassed all those parts of the Earth that remained unprivatised, unenclosed, a noncommodity, a support for the manifold human values of mutuality' (Linebaugh & Rediker, 2000, p. 26).
- ³ The emergence of unwelcome proprietorial directives at MIT in the early 1980s inspired hacker Richard Stallman to begin work on a system enabling the free circulation of technical knowledge in the field of software. Thus began the GNU (a recursive shortening of 'Gnu's Not Unix') project, which eventually resulted in the GNU/Linux operating system. The subjective sense of belonging to a global programming community which grew up around the various free software projects was fostered by an early social software — the newsgroup medium, a free, bandwidth-light, subject-based communication environment. The participatory programming method that benefited the GNU/Linux development model was enabled by the internet, a medium in which everyone could communicate, and exchange software modules, with no geographical or timezone barriers. A comprehensive history of FLOSS (Free, Libré Open Source Software) has been documented by Glyn Moody (2001) in *Rebel Code: Linux and the Open Source Revolution*. Sam Williams (2002) provides a detailed account the birth of the free software movement in *Free as in Freedom: Richard Stallman's Crusade for Free Software*. Steven Weber's (2005) *The Success of Open Source* posits open source as a 'political economy', and provides perspectives on how the phenomenon functions on micro and macro levels. The website and community around slashdot.org is a central Anglophone forum for technically-focused discussion. *FirstMonday* is a refereed online journal focusing on FLOSS and associated cultural issues www.firstmonday.org.
- ⁴ Documentation and critique of more culturally focused software projects can be found in anthologies such as *Readme!* (1999), *Dark Fiber* (2002), *Anarchitexts: Voices from the Global Digital Resistance* (2003) and the annual *Sarai Reader* (2001-2005); and in mailing lists such as nettime.org. See also Fuller, 2003; Medosch 2005; da Rimini, 2005.
- ⁵ The punch card was the 'software', a self-feeding set of pattern instructions, which was fed into, and controlled, the fixed loom 'hardware'. Different sets of punch cards could be fed into the same loom, resulting in different 'outputs', patterned lengths of material. The automation of weaving processes caused the disappearance of certain jobs; specifically, the punch card completely replaced the work of the draw boy. See Essinger's (2004) fascinating account.
- ⁶ For various reasons Babbage's machines were never built beyond prototype stage in his lifetime. Illuminating

histories of Babbage, Lovelace and the Engines are to be found in Toole, 1992; Plant, 1997; Swade, 2000; and Essinger, 2004. Swade also documents the recent building of a Babbage engine from original plans.

⁷ See the authoritative account by Edwin Black (2004).

⁸ In 1937, the young English mathematics student, Alan Turing, 'imagined a machine that could be used to generate complex numbers.... a *symbol-manipulating machine*' (Agar, 2001, pp. 88-89, italics in original). These thought experiments generated the concept of a Universal Turing Machine, that is, 'any stored-program computer [which] can be programmed to act as if it were another' (Ceruzzi, 2003, p. 149). See *Computing Machinery and Intelligence* (Turing, 1950) at <www.cse.msu.edu/~cse841/papers/Turing.html>. During WW2 Turing worked as a code-breaker at the Code and Cypher School at Bletchley Park, the centre of the Allies' efforts to decrypt Germany's Enigma machines. Later Turing worked with the first general purpose electronic computer, the 'experimental monster' nicknamed the 'Blue Pig', built in 1948 at Manchester University. The Atlas, a later version built in 1962, used a 'hierarchy of memories, each slower but larger than the one below it', that 'gave the user the illusion of a single-level fast memory of large capacity'. This beast was 'one of the most influential on successive generations' of computers (Davis, 2000, pp. 177-97; Agar, 2001, pp. 120-22; Ceruzzi 2003, p. 245).

⁹ In the build up to the United States' entry to WW2, American mathematician Howard Aitken was funded by the US Navy, and supported by IBM's machines and expertise, to construct a modern version of Babbage's Difference Engine. The Automatic Sequence Controlled Calculator, renamed Harvard Mark 1, 'churn[ed] out numbers for naval weapon design'. Simultaneously, 'a second monster was under construction....the Electronic Numerical Integrator and Computer — the ENIAC...also born of speed and conflict'. ENIAC's creators, physicist John W. Mauchly and J. Presper Eckert, were funded by the US Army to build a 'monster calculator'. The army 'was desperate' for a machine which would be able to rapidly process the complex simultaneous equations needed to produce ballistic tables for the new anti-aircraft guns. Finished in 1945 the ENIAC missed the war, but was soon employed for other military tasks, including thermonuclear bomb calculations for the nascent science of nuclear physics (Fitzpatrick 1998; Agar 2001, pp. 53-61).

¹⁰ Engineer Konrad Zuse was employed by the Henschel aircraft company during the rearmament of Germany in the mid-1930s. Pressured to hasten production of its new, fast military planes, Henschel was hampered by the time needed for vital mathematical calculations to ensure fuselage and wing stability. Because there were up to thirty unknowns in these calculations, they were best solved by simultaneous equations, taking a team of mathematicians weeks of labour. Zuse realised that these complex processes could be mechanised, if there was a calculator which could read a 'plan' or script giving the order of the equations to be sequentially calculated. Zuse's great intellectual contribution was to conceive of using binary numbers for the plan, machinic memory and calculations. In 1938 Zuse built a prototype, the Z3, at home with the help of friends, including Helmut Schreyer, a Nazi and hobbyist projectionist. The binary plan was punched into celluloid film reels. (Rheingold, 2000; Agar, 2001, pp. 41-52; Ceruzzi, 2003, pp. 83-84). See also *The Life and Work of Konrad Zuse*, by Prof. Horst Zuse, online at <www.epemag.com/zuse>.

¹¹ This phrase is borrowed from Paul Ceruzzi's meticulous account of computing in the United States between 1945-2001 in *A History of Modern Computing* (2003, p. 2).

¹² This phase of capitalism is also framed as 'post-Fordism', 'late capitalism' and most commonly, 'neoliberalism'. The

policies of the triumvirate of the World Bank, the International Monetary Fund, and the World Trade Organisation, are acknowledged as determining the way this stage of capitalism is manifested in the Global North and Global South.

- ¹³ Manuel Castells is a leading theorist on the relationships between information and society (Webster, 2001, p. 97). In *The Information Age: Economy, Society and Culture*, Castells (1998, 2000) combines empirical evidence with personal cross-cultural research to analyse the material features of informational societies, social movements arising out of network society, macro-political affairs, and processes of social transformation.
- ¹⁴ Notable theorists include sociologist Maurizio Lazzarato, the economist Christian Marazzi, Paolo Virno and philosopher Antonio Negri. With many texts now translated into English, the concept permeates debates from free software to 'precarious labour'. Quotations in this paragraph are drawn from Lazzarato's 1996 essay, *Immaterial Labour*, using the English translation by Paul Colilli and Ed Emory at <www.generation-online.org/c/fcimmateriallabour3.htm>. A version of the essay is in Hardt, M. & Virno, P. (eds.), *Radical Thought in Italy: A Potential Politics*, University of Minnesota Press, Minneapolis (pp. 133-47).
- ¹⁵ Interrelated concepts of a knowledge commons, science commons, genetic commons and creative commons are emerging from these dialogues. The Digital Library of the Commons (DLC) is a portal into an extensive collection of literature at <dlc.dlib.indiana.edu>. Other resources include: <onthecommons.org>; <science.creativecommons.org>; <creativecommons.org>; <www.ukabc.org/genetic_commons_treaty.htm>.
- ¹⁶ Some representative examples follow. The Free Software Foundation Latin America (FSFLA) was founded in 2005. See <<https://mail.fsfeurope.org/mailman/listinfo/fsfla-anuncio>>. Africa Linux Chix is a lively Pan-African mailing list launched in 2004, active in promoting the benefits FLOSS via conferences, networking and workshops. Blogging has driven the democratic media movement in the Middle East. Bloggers with the nicks of Salaam Pax, Raed and Riverbend provided unique perspectives from Baghdad on the 2003 invasion of Iraq, with two collections of these chronicles later published in book form. See Pax, S. (2003), *Baghdad Blogger*, Penguin, London, and, Riverbend (2005), *Baghdad Burning: Girl Blog From Iraq*, Marion Boyars, London. See also Alavi N. (2005), *We Are Iran: The Persian Blogs*, Soft Skull Press, New York. Complementing bloggers' personal accounts are two independently-produced major websites, <electroniciraq.net> and <www.iraqbodycount.org>, providing information to English-speaking audiences. In East Asia the Interlocals project formed in 2006 as 'a platform for facilitating cross-border dialogue on critical issues related to culture, gender, environment, social justice, peace, global/local politics, media movement, social movement and transformation, etc'. Currently hosted by In-Media Hong Kong, content is created by a community of media activists around East Asia. See <www.interlocals.net>. In South Asia the Bytes for All initiative of Frederick Norhona and Parha Pratim Sarker is a platform showcasing innovative 'IT for social changes practices'. The website, e-zine and mailing lists cover projects ranging from knowledge pipelines to rural areas to net portals for 'slum-kids' to GNU/Linux rewritten in local languages. See <bytesforall.org>.
- ¹⁷ Computing histories generally agree that the free software movement — as a social movement — was initiated and steered by one individual, Richard M. Stallman (Moody, 2001; Williams, 2002; Ceruzzi, 2003). His achievements include the seminal GNU Project (Gnu's Not Unix, the heart of what became the GNU/Linux free operating system), the GPL (General Public License), and the establishment of the Free Software Foundation (FSF).

- ¹⁸ Source: <[mail.fsfeurope.org/pipermail/press-release/2005q3/000116.html](mailto:fsfeurope.org/pipermail/press-release/2005q3/000116.html)>
The General Public License (GPL) is online at <www.gnu.org/copyleft/gpl.html>.
- ¹⁹ The organisation was founded in 2001, with the first set of CC licenses released in December 2002. See <creativecommons.org>.
- ²⁰ In *Guide to Open Content Licenses*, researcher Lawrence Liang (2004) argues that the open content paradigm is a serious alternative to traditional copyright regimes that typically favour the interests of giant media conglomerates over both independent creators and the public.
- ²¹ The World Wide Web, or WWW, is a cluster of communication protocols (HTTP), a programming language (HTML) and a universal addressing system (URL), that facilitates the exchange and display of documents on the internet (via browser softwares), regardless of hardware platforms and operating systems. Developed by Tim Berners-Lee, the WWW was launched in March 1991 at the CERN facility in Switzerland (Berners-Lee & Fischetti, 1999). Berners-Lee had envisaged a 'single, global information space' in 1980, unaware of key earlier projects. Vannevar Bush in the 1940s, and Ted Nelson, and Doug Engelbart, in the 1960s, are visionaries who made conceptual leaps in software, hardware interface and connectivity.
- ²² Such self-management is explicit in the 'softwiring' of collaborative authoring systems like WIKI. An example of 'trust-based' software, WIKI is an open source database software for the shared authoring and 'open editing' of web pages. In the mid 1990s Ward Cunningham coded 'the simplest online database that could possibly work.' The WIKI developers state that 'allowing everyday users to create and edit any page in a Web site is exciting in that it encourages democratic use of the Web and promotes content composition by non-technical users. Source: <wiki.org>. Content Management Systems (CMS) like WIKI, Dada and Drupal offer features such as reversion to earlier instances of a document (useful when social boundaries have been transgressed by troublemaking 'trolls'). These social softwares are designed with an awareness of human use (and abuse) of public space.
- ²³ Mongrel is an art group and a network, which formed in London in 1995-96. The original group comprised Graham Harwood, Matsuko Yokokoji, Mervin Jarman and Richard Pierre-Davis. Documentation of Mongrel's many acclaimed software art projects can be found at <mongrelx.org>. Mongrel (2004b) describe themselves as:
- ...a mixed bunch of people, machines and intelligences working to celebrate the methods of a motley culture. We make socially engaged culture, which sometimes means making art, sometimes software, sometimes setting up workshops, or helping other mongrels to set things up. We do this by employing any and all technological advantage that we can lay our hands on. Some of us have dedicated ourselves to learning technological methods of engagement, which means we pride ourselves on our ability to programme, engineer and build our own software, while others of us have dedicated ourselves to learning how to work with people .
- ²⁴ The neologism 'hacktivism' (reportedly coined by a journalist) denotes 'electronic civil disobedience' or 'ECD', a concept first enunciated by Critical Art Ensemble (CAE) in 1994. ECD employs tools developed by programmers and cultural activists. In their book *Hacktivism and Cyberwars: Rebels with a cause?* Jordan & Taylor (2004) describe hacktivism as 'the emergence of popular political action...in cyberspace [...] a combination of grassroots political protest with computer hacking' (p. 1). An example is the Floodnet program which enables non-destructive virtual sit-ins on government or corporate websites to draw attention to social issues (see analyses in Meikle, 2002;

Jordan & Taylor, 2004).

- ²⁵ *TheyRule*, an award-winning research project in the form of a dynamic website mapping the tangled web of US corporate power relations, was created by Josh On and Futurefarmers at <www.theyrule.net>. Other projects mentioned by Holmes include the influential diagrammatic work by the late Mark Lombardi piecing together various banking and other scandals; and Bureau d'etudes *Planet of the Apes*, 'a synoptic view of the world money game'. See related texts at <ut.yt.t0.or.at/site>.
- ²⁶ Due to the enormous take-up of web-based social networking platforms such as Friendster, MySpace and online dating sites the term 'social software' has lost its original political edge. However, it remains a useful way of framing the social relations of software created by programmers and cultural activists.
- ²⁷ First released in 2001, according to its makers Dyne:bolic was the first CD distribution of GNU/Linux operating system which did not require the user to install it permanently on their computer. Instead, the user would load the CD and it would open up into a user-friendly temporary GNU/Linux system, with additional media-making tools. See: <dyne.org> and <dynebolic.org/manual-in-development/dynebolic-x44.en.html>
- ²⁸ As Dyne:bolic grew out of the Italian 'Hackmeeting' movement, it is linked closely to the praxis of auto-gestation, or radical Do-It-Yourself (DIY). Many socially-driven cultural projects have arisen from the large Italian network of *centri sociali* or squatted social centres. See a history of Hackmeetings at <wiki.hacklab.org.uk/index.php/Hacklabs_from_digital_to_analog>.
- ²⁹ Dyne:bolic belongs to a vision of integrated software and communication systems. For example, videos made with the free software tools on Dyne:bolic can then be distributed via online archives like New Global Vision, entering the digital commons. International video archives maintained by cultural activists include <ngvision.org> originating in Italy, and the video syndication network <v2v.cc> from Germany. The Indymedia video portal at <www.indymedia.org/projects.php3> focuses on documentary material. A mammoth cultural archiving project is <archive.org>.
- ³⁰ Quote from the Streamtime portal at <streamtime.org>. Interviews with key project facilitators online at <wiki.whatthehack.org/index.php/Streamtime_and_Iraqi_Linux>.
- ³¹ The Container Project website is a repository of material documenting the history of the project and links to its current activities. <www.container-project.net/>. Photo documentation of the process of converting the Container is online at <www.container-project.net/C-Document/Album/page1.html>.
- ³² Skint Stream was an initiative of ICA Cape Town, Mongrel and radioqualia. Find details of Skint Stream, and the participating communities, at <www.jelliedeel.org/skinstream>.
- ³³ See workshop reports at <www.cnh.on.ca/container.html>, <www.cyear01.com/containerproject/archives/blog.html> and <www.ict4djamaica.org/content/home/detail.asp?iData=504&iCat=292&iChannel=2&nChannel=Articles>.
- ³⁴ See <www.ict4djamaica.org/content/home/index.htm>.

- ³⁵ Mervin Jarman, pers. comm., 12 Sept 2006.
- ³⁶ The 'Old Enclosures' in England were carried out by thousands of Acts of Parliament between 1702 and 1810. Hunger and terror for the dispossessed multitudes accompanied the old enclosures, as capital wealth piled up for a minority. Expropriated peasants, day-labourers and artisans throughout Europe did not capitulate meekly to the new rule of waged work, with fierce resistance during feudal times and throughout the Middle Ages (Federici 2004, pp. 133-38). Silvia Federici argues that a new set of 'enclosures' — from thefts of agricultural land through government expropriation, to the creation of vast masses of criminalised poor from the newly or generationally dispossessed — are accompanying 'the new global expansion of capitalist relations'. (Federici, 2004, p. 11). David Bollier (2002) documents the enclosures of various contemporary commons, including the internet, in *Silent Theft: The Private Plunder of Our Common Wealth*.
- ³⁷ See <www.nosoftwarepatents.com/en/m/intro/index.html> and <www.ffii.org/> for summaries of this battle, and <lpf.ai.mit.edu/Patents/patents.html> for historical background on earlier bids to impose patents on software.
- ³⁸ The controversial and 'questionably constitutional' *Digital Millennium Copyright Act (DMCA)* was signed into United States law on 28 October 1998. The main objections to this law are that it is unreasonably weighted in favour of the top end of town in terms of copyright holders (the record, film and publishing industries), criminalises very widespread social applications of communications technologies, and stifles innovation by small players. It also holds Internet Service Providers liable for the actions of their clients, which is similar to holding the postal service liable for the contents of a private letter. The law focuses on technological aspects of copy protection instead of the actual works themselves. For example, the law 'creates two new prohibitions in Title 17 of the U.S. Code—one on circumvention of technological measures used by copyright owners to protect their works and one on tampering with copyright management information—and adds civil remedies and criminal penalties for violating the prohibitions' <www.copyright.gov/legislation/dmca.pdf>. A number of prosecutions have ensued, often targeting young users of peer-to-peer file sharing programs. Also prosecuted was the developer of a program that can 'crack' video compression software (making it easier for people to potentially watch downloaded movies). Under this law even makers of DVD copying software have been prosecuted. The Electronic Frontier Foundation's *Digital Millennium Copyright Act (DMCA) Archive* contains a listing of many of the cases brought to trial or underway, and counter suits by lobby groups challenging the validity of the law. See <www.eff.org/IP/DMCA/> and <www.eff.org/IP/DMCA/DMCA_against_the_darknet.pdf>.
- ³⁹ Over-exploitation supposedly leads to what ecologist Garrett Hardin depicted as the 'tragedy of the commons' in his classic text of the same name published in *Science* in 1968. One of the arguments supporting privatisation proposes that the 'commons-ers' will always ruin the land through over use. See essay and responses online at <www.sciencemag.org/sciext/sotp/commons.shtml>. Paul Ceruzzi asserts that by 'strict technical measures, the Internet has not come close to approaching this point of overpopulation...[passing through] 'challenges like the 1988 worm, viruses, the Y2K crisis, the dot.com collapse, and the terrorists' attacks of September 11, 2001, with hardly a hiccup. It is based on robust design. As for the content and quality of information that the Internet conveys, however, it has indeed been tragic' (Ceruzzi, 2003, p. 330).
- ⁴⁰ Statistics breaking down internet usage on a continental basis at <www.internetworldstats.com/stats.html> point to the enormous take up on the net in Africa (424%), the Middle East (454%), and Latin America (353%), in the period 2000-2005. In contrast, North America had the lowest take up (110%). Detailed internet statistics are available at

leading research Nielson Net Ratings at <www.nielson-netratings.com>.

⁴¹ See McLuhan, M. (1967). *The Medium is the Massage*. London: Penguin Books.

⁴² See for example Lawrence Lessig's blog describing the poetry slam on free culture by Brazilian Minister of Culture, Gilberto Gil. Lessig also notes the visionary '*Thousand points of culture project* — to build a thousand places around Brazil where free software tools exist for people to make, and remix, culture'. Source: <www.lessig.org/blog/archives/2005_01.shtml>.

⁴³ In *The Problem with WSIS*, Alan Toner (2003) critiques the colonial relations between 'information society' and 'intellectual property' with reference to the World Intellectual Property Organisation (WIPO). It could be argued that this new form of colonial domination is strengthening the political resolve in Latin America, the Caribbean and Africa to use free software as a central platform for social transformation.

Where once corpses accumulated to the advance of colonialism or the indifference of commodity capital, now they hang in the profit and loss scales of Big Pharma, actuarially accounted for and calculated against licensing and royalty revenue. With the aid of stringent IP law, companies are able to exercise a biopolitical control that takes to new extremes the tendency to liberate capital by restricting individual and collective freedoms and rights - even the right to life itself. (Para. 1)

In 1986, with the Uruguay Round of the GATT negotiations on the horizon...the Intellectual Property Committee (IPC) determined to ensure that corporate IP concerns be inserted into the negotiation agenda and fully integrated into any ultimate agreement. It was the IPC's efforts to orchestrate business lobbying efforts on a global basis which culminated in TRIPS, now administered by the WTO. TRIPS will transfer an estimated 40 billion dollars from the poorest states over the next ten years, according to the World Bank, via patented medicines and seeds, and net rent transfers through royalties and licenses. (Para. 10)

⁴⁴ In *5 Theses on Informational-Cognitive Capitalism*, George N. Dafermos (2005) states:

The realm of such networks of cooperative development is underpinned by the pleasure principle...they re-discover the joy...that accompanies creative work...collective subjectivity is impregnated with the sperm of radicality, as people are suddenly becoming aware of the reversal of perspective that lies in the shadows: a production setting...[which] exposes the poverty of production effectuated for the sake of profit. A direct confrontation stretching from the terrain of ideas to the very institutional nucleus of capitalist society is underway. On the one side stands the beast of living labour organised independently of the capitalist demand, and, [on the other], the imaginary of intellectual property law...