UTOPIA and the Metainterface

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Graphic designers, journalists, and researchers in a 'battle over the midfield'. From the magazine Graffiti (issue 7), published by the UTOPIA project in 1985.

– Participatory Interface Design from the Print Press to Today

The computer interface today is both omnipresent and invisible, at once embedded in everyday objects and characterised by hidden exchanges of information between objects. Cloud services, smart phones, data capture and streaming services are the representatives of a new global technological paradigm that profoundly affects everyday practices – from the workplace to social interactions and cultural consumption. This is the paradigm of the 'metainterface', where the user interface is optimised to the user's needs, but simultaneously conceals hidden layers and processes of labour.[1] However, despite attempts to make the interface disappear into smooth access and smart interaction, its grammar gradually resurfaces as users realise that behind the design's benevolent smoothness and seemingly beneficial exchange of information there is a politics of the interface. How can the user be empowered in ways other than through the translucent contiguity and proximity of data feeds and media streams suggested by the global interface industry? How can interface design act in new ways – critically, politically and tactically – in this situation? These are questions that address how to cope with this new imperial interface industry, and how to seek out creative and positive alternatives.

In this article, I return to the history of user-friendly interfaces, and how the smart and cool gadgets that pervade all aspects of our lives came to be. I focus particularly on critical and politically aware interface designs created in Scandinavia during the 1970s and 80s, specifically the 'UTOPIA project' undertaken by computer-system designers and newspaper trade unions. At the time, computer system and interface design became particularly problematic with the introduction of computers into the workplace, where workers often felt alienated by the automation of labour. The Scandinavian participatory design tradition and collaboration with workers' unions presents us with a set of concerns and challenges that are well worth revisiting in today's interface culture. The intention is to reflect on what can be learned from these case studies, and how to repurpose their insights and techniques today, at a time when smooth media players, apps, custom services etc form the basis of new world views in a cultural economy of

sharing.

Apple's 1984 – the dawn of a new industry

Any design object represents a way of thinking about the world. The design as a 'thought-object' and its implied perspective on the world is often conditioned by the process leading to the design. In other words, 'design' may not only refer to the object, but also to the process: it is a verb and not just a noun. Thinking about design as a process, and how interface design objects may embed particular ideologies in their process of making, is of course not a new thing. One example is Apple's user-driven innovation and experimentation with how to meet people's needs, which was originally (in the 1980s) presented as a counter to IBM's large-scale administrative systems. This ideological aspect is particularly evident in Apple's promotional video of the first Macintosh computer in 1984. The video shows an Orwellian society where 'Big Brother' speaks through a screen to a community of users (or slaves of the machine), and ends with a young athlete smashing her sledgehammer through the screen. With voiceover and text, the advertisement reads: 'On January 24th, Apple Computer will introduce Macintosh. And you'll see why 1984 won't be like "1984".'[2]

Arguably, Apple was fuelled by an ethos of taking the user seriously and seeing computing as a potential way of revolutionising not just bureaucratic processes, but life more generally, in all its aspects. Apple was, in other words, driven not just by the quest for big business, but also by the kind of ideological critique that followed American West Coast counterculture: a critique of military computing and bureaucracy.[3] This ideological construct is fundamentally understood by considering what an interface is. Conceptually speaking, a computer interface is the point where the signal processes of the computer meet the human processes of signification – where representation meets computation, where media meets instrument.[4] As such, the interface governs the communication between the user and the computer. In this way, it is both a very specific thing – one can point to the interface and identify it – but it is also a conceptual thing. This means that the protocols of the interface – the ways in which one can do things with signs – are not innocent, but rely on cultural values and politics. When Apple introduced its Macintosh computer in 1984, the interface became what it is today: a graphic surface between user and workstation. The quest for user empowerment came about by thinking of the interface as something that paradoxically gains a presence and potency from its transparency and disappearance. It is, in the words of Gregory Ulmer, an expression of 'the twin peaks' of American idealism: realism and individualism.[5]

This is a very potent cocktail. Making the interface realist – by introducing 'windows' and 'menus' and 'desktops' – empowered the user with a brand-new tool for self-expression. The interface became not only the outcome of user studies, but also an object of consumption. It became a product carefully designed to be used, but also a product that produces its users: the inhabitants of a brand new world to come, where mankind is no longer the slave of the machine. In other words, the interface is not just the mediator of a machine, but brings with it a whole new emancipatory form of life.

However, the urge to make the interface disappear and to ignore its bureaucratic nature in order to liberate the user comes with a risk. The American hypertext author Stuart Moulthrop noted in his essay 'You Say You Want a Revolution' that the responsibility for the great changes of which Apple dreamed lay in the hands of a diverse elite of software developers, academics, legislators and others with a clear interest in intellectual property and the protection of copyright. Therefore, it would seem 'equally possible that engagement with interactive media will follow the path of reaction, not revolution'.[6] When looking at the services and platforms of Apple today, it is obvious that the emancipatory dream of a smooth interface and liberated individual user is accompanied by strict control mechanisms that even follow the schemes of military super-computer control centres, like, for instance, those provided by IBM.[7]

The Metainterface – the mechanisms of interface empires

These control mechanisms – or 'protocols' – are what prescribe and restrict communication with the computer at different levels. They prescribe what language can be used, what directories can be accessed, what plugs can be plugged in, and so forth. The layers of the interface, both technical and political, may be difficult to comprehend, and sealing them off is therefore often experienced as 'user-friendliness'. It is this double bind of transparent windows and strict protocols for communication that makes the computer appear useful and persuasive, but at the same time leaves its users with the feeling that it is becoming increasingly difficult to define the exact nature of the paradoxical situation in which they are caught.

This double feeling of smoothness and opaqueness is a signature feature of the contemporary interface; it has become the imperative logic of the user's interface experience. Once, the user interface was a confined set of relations between the different components of the computer and the user. In no way were the sealed-off mechanisms of the computer so unlimited as today. The computer devices that we carry in our pockets or are embedded in our surroundings are profoundly promiscuous and leaky. If the user streams a piece of music, or composes a post on Facebook, or even just happens to walk around with a smartphone in his or her pocket, piles of data processes are set in motion. For instance, users tend to produce and share incredible amounts of text, but it is not just meant to be read by a community of socially engaged individuals. It is generally estimated that half the reading of all text is done by machines, or 'bots', that monitor, search, look for system vulnerabilities, etc.[8] More generally, every behaviour of the user is captured, calculated and exchanged across an incomprehensible number of platforms. Some have malicious intentions, but mostly aim to meet commercial or service needs to make the interfaces more realist and individualistic: make better maps, better recommendations, better commercials and so forth.

Conversely, the piles of computing processes involved in these customisations also set the user in motion: the user sees and acts differently. She makes herself visible to data capture and does things that can be captured; as explained by Phil Agre in 1994, systems have their 'grammars of action'.[9] For instance, when a user produces text, he or she publishes it in places where it can be measured – where it can be 'liked' or 'shared' in social media; where it can be registered and accredited by the research institution for which he or she works, and so forth. More generally, every behaviour of the user is guided by the mechanisms of the interface that constantly let the user know how well he or she is performing; or, to be more specific, how well it is monitoring and capturing the user's behaviours.

The absurdity of the extent of this kind of user design becomes evident in the sex performance app 'Spreadsheets' – a now abandoned mobile app that 'monitors your performance in bed to provide statistical and historical feedback' by tracking 'movement and audio levels through the accelerometer and microphone'.[10] Supposedly, such statistics empower the user and enable lovers to do better, but at the same time they prescribe the nature of making love, and also make the lovers vulnerable in the sense that they willingly let a commercial enterprise into their bedroom and provide it with the most intimate data.[11]

One could ask if the focus on the user in the design process and product has, as Apple intended, liberated us from bureaucracy or, on the contrary, has bureaucratised all aspects of our lives. Has it empowered us or has it made us more vulnerable? One may speculate that the success of user-centred interface design depends on users who have bought in to the myth of user friendliness. Perhaps, in the end, the real ingenuity of Apple's interface design, and that of many others, is the ability to design its users.

Interface criticism by design

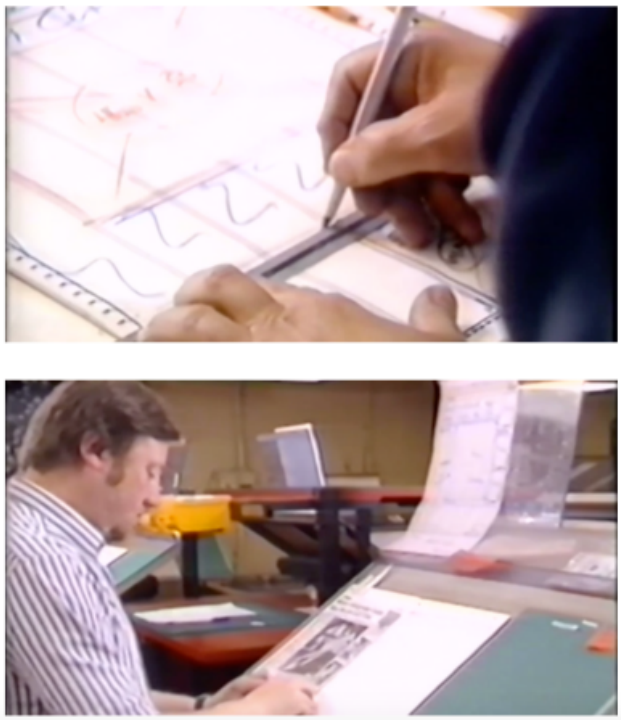
The interface is a 'metainterface'. It is not just an interface to the networked computer, but depends on numerous hidden exchanges of signals between platforms in a global interface industry that partakes in

the formation of the contemporary user. The smart phone that fits into the user's pocket is an interface to a displaced computer. Commonly speaking, this is referred to as 'the cloud', but really, the cloud is just an expression of how technical infrastructures are displaced (out there, in the blue, not to worry about), and how this is tied to a large industry that thrives on the reading and exchange of behaviours. Such processes do not just accommodate user needs, but also design users and bring about certain grammars of action, behaviours and vulnerabilities.

Solving the double bind and uneasiness of the metainterface is not easy. The intention of this article is not to do away with the metainterface industry – arguably, it is an industry that depends on the consents of its users, and whose services canprove useful to them – but designers need to get a grip on the new kinds of vulnerabilities to which users are exposed. The mechanisms of the metainterface, its language and grammar, need to be exposed in order to make transparent phenomena such as social media, mapping, Airbnb and other services of the sharing economy. This kind of exposure commonly takes place in art projects, but as recently argued, similar critical qualities are needed within contemporary interface design: a kind of critical interface design, or 'interface criticism by design'.[12]

One could argue that Apple's user-centred design of the 1980s was critical, in that it was created in opposition to large-scale corporate and military computing systems. However, there were other, more radical approaches at the time. In Scandinavia, in particular, Apple's individual user-centred design was countered by what is commonly labelled 'participatory design'. In contrast to user-centred design that builds on an assessment of the user (e.g., his/her cognitive capabilities), participatory design encourages collective collaboration and design *with* the user. The introduction of new technologies to the workplace involved research into the larger organisation of labour of which they were a part, and into how to engage the worker in this process. Its intentions were to democratise the workplace by allowing the skilled labourer to influence the development and implementation of technologies in the workplace. At this time of the metainterface, the question is whether there is something to be learnt from the development of critical and participatory design from the 70s and 80s.

Although similar concerns of vulnerability, democratisation, empowerment and more were raised by the introduction of computers into the workplace, there are of course also substantial differences between now and then. Most notably, the scale of automated production is different today. The incorporation of new technology in the workplace is still an issue (robotics, machine learning, etc.), but the metainterface today enters all aspects of users' lives (including their bedrooms), and although some may be critical of this, it usually happens with the consent of the users. Nevertheless, a consideration of the kinds of user empowerments that were contemplated in early participatory design, as well as insights into the condition on which they relied in a larger social-technical and organisational context, may prove valuable today.[13]



Graphic newspaper design anno 1986. Still images from the documentary on Scaninavian participatory design, *Computers in Context*.

UTOPIA: The Computerisation of Newspaper Production

Early participatory design in Scandinavia dealt with all kinds of labour processes – from flight mechanics to banking – but the UTOPIA project, and its focus on the computerisation of newspaper production in the 1970s and 80s, stands out as a canonical example of how to empower workers and their labour unions in the technical implementation of new systems and interfaces in the workplace. The graphic-design field is a good example of an industry where labour processes changed considerably with the implementation of computerised automation. Before computerisation in off-set printing, an assistant editor would create a sketch of each page, and the graphic designers would then determine the exact layout of the page – with text and images – for the print plates. However, new computerised equipment made it possible to automate the graphic design. Text and images would be positioned directly by the assistant editors. The result was that graphic designers were left with jobs where they could no longer use their expertise. Many felt alienated by computer technologies and were eventually dismissed by their employers.

In many Western countries, this threat to the craft and jobs of graphic workers and typographers gave rise to immediate action. In 1975, for instance, pressmen at the *Washington Post* smashed the new computerised presses. But by 1985, Rupert Murdoch had built an automated newspaper plant in the UK that could print newspapers without skilled workers. An unskilled labour force took over production, with a final product that became very standardised and that to the trained eyes of the designers looked cheap. As noted 20 years later by Roy Greenslade, an executive at *The Sun* (one of Murdoch's four papers, which also included *News of the World*, *The Times* and *The Sunday Times*), 'Murdoch had prepared the ground well for his great revolution. 'The conservative government's Trade Union Act outlawed secondary picketing, and he had negotiated a deal with the electricians' union, the EETPU, to provide all the manual staff. Yet, Murdoch's move did not happen without violent protests, when 5,000 demonstrators tried to storm the

plant, and a forceful police response – eight policemen were injured and and 58 people arrested.[14]

In Scandinavia, however, graphic designers responded very differently to this usurping of their craft, predominantly because the Scandinavian system empowered them in various ways. The organisation of labour in Scandinavia is characterised by a detailed collective-bargaining system that covers large proportions of both the public and private labour markets. In addition, the practice of board-level representation for workers, or a co-determination framework, is widespread and ensured by law (as it is in a range of European countries). Companies of a certain size (in Denmark, for instance, the limit is 20 employees) are obliged to let their workers elect representatives to the board of directors; and through work councils, the workers have further mandatory rights in issues relating to the workplace and their working conditions.

In contrast to the *Washington Post* and Murdoch's newspaper plant in the UK, newspaper workers in Scandinavia had a say when technology was introduced into the workplace. The union of graphic designers contacted The Centre for Working Life (Arbetslivscentrum) – a unique Nordic government-sponsored research institution that assisted in the implementation co-determination. Together, they initiated the UTOPIA project: a collaboration between the Nordic Graphic Union and computer scientists from Aarhus University and the Royal Institute of Technology in Stockholm.[15] They engaged in a participatory research programme to explore – in a utopian way – how the workers could become lords of the machine, rather than victims of capital's legal right to lead and distribute labour. And, as stated by the chairman of the Nordic Graphic Union, Gunnar Kokaas, 'for the first time, the union has an advantage in the assessment of new technologies', and this happened without a 'conflicting interest between capital interests and demands for quality in education, work and product'.[16]

Insights from UTOPIA

The movement for workers' control and alternative production did not, of course, exist only in Scandinavia, and the UTOPIA project followed larger International Marxist trends that included The Institute for Workers Control in the UK, founded in 1968 by Tony Topham and Ken Coates (who later became a Labour Party Member of the European Parliament). Similar local initiatives at workplaces took place elsewhere in England, most notably with the aerospace workers at Lucas Industries, under the direction of trade-union activist Mike Cooley, who worked with leadership development for the engineer's trade union, and who became a well-known promoter of human-centred system design. It was to a large extent the ideas from the Lucas project that spread across Europe, and also to Scandinavia (including the Saab-Scania factory, and elsewhere).[17] According to Cooley, the insights afforded by the 'Lucas Plan' were predominantly:

- The importance of distinguishing between what a technology should do and what it actually does.
- Society's waste of its most valuable asset, the professionalism and enthusiasm of ordinary people.
- That computerisation most often liberates humans from monotonous tasks is a myth; the opposite is usually the case.
- Hostility to technology and science is great in society; it seems to be connected with failing to understand that technicians and researchers are used as errand-boys by large multi-national companies.[18]

Although Cooley's last point seems enigmatic (hostility to technology does not seem to be widespread any longer), these insights might well translate to our current time of metainterfaces that on the one hand thrive on the enthusiasm of consumers and promises of liberation from work, but on the other turn all areas of their lives into monotonous tasks (liking, sharing, monitoring, quantifying, etc.) whose production of data contributes to the value of the metainterface industry.[19] The conditions of

labour have in many ways changed dramatically from the early times of computerisation of the workplace. Most notably, there is no legally binding collective-bargaining or codetermination framework for users of apps, people whose data are tracked, etc. And further, a 'workplace' that potentially includes all aspects of life (as Apple imagined) seems out of scale compared to a relatively limited newspaper production. However, specific insights from UTOPIA have been influential in participatory system design. As noted by Yngve Sundblad in his retrospective account of the project's impact on the design discipline, the main results 'were not so much the pilot computer tool built and used at *Aftonbladet* (the Swedish newspaper that functioned as a key case study) as the experience and methods.' Sundblad highlights:

- How workers could craft technology themselves based on their use requirements (ranging from organisational requirements to working skills)
- How design could be considered a process of action (rather than an object) involving particular exercises, such as using prototypes and mock-ups involving the users
- How such processes could be studied and developed as an academic discipline
- How such 'design thinking' and practice can be brought into the design of software, 'bringing design to software'.

However, in a review of contemporary participatory design, Susanne Bødker and Morten Kyng (both with an active role in UTOPIA) criticise the legacy of early Scandinavian participatory design for its focus on the 'here-and-now co-creation', 'without much perspective', and 'with little concern for sustaining relationships and networks after the projects', its low technological ambitions, its 'do-gooding' and reduction of politics to ethics. [20]

In other words, in the age of metainterfaces and neoliberal economies of sharing and open sources, there is a need for an interpretation of the insights from the UTOPIA project that pays attention to how the design of an interface is not merely the discipline of creating user-tools that match the organisation of labour and the skills of the user in ethical ways (but with no further perspective). One should also consider how interface design is the creation of a larger techno-cultural 'apparatus'. Hence, any critical design discipline should consider not just how to design tools to interfere in reality in meaningful ways, but also how this is the design of an apparatus that also possesses the user and creates his or her (bureaucratic) reality: how it turns life into a computer system, the social and cultural conditions of this, and how to imagine individual or collective empowerment in this process.[21]

Overall, if there are lessons to be learned from UTOPIA and similar projects in this context, it is that technical and social infrastructures are intrinsically related, and – in the spirit of Worker's Control – that high levels of mobilisation and organisation are compulsory. Any technical reality is inherently also a social reality, and the collaborative and participatory development of tools, interfaces, technical workflows and more is not only a means to user-friendly functionality, but also a negotiation of existing hierarchies of power and control that demand corresponding social infrastructures. This negotiation may – as explained below – happen at two levels, the level of language (of the human and the machine), and the level of social negotiation.

To programme is to understand (object-oriented understandings of the world)

UTOPIA and early Scandinavian participatory design saw the need to develop sophisticated and accessible languages for the participants to understand and handle the grammar of action that are part of system designs. In his engagement with trade-union workers, Kristen Nygaard – one of the key figures in Scandinavian Participatory Design – made an interesting observation. He realised that when one programmes a system (like the system for graphic layout in a newspaper production setting) one depends

on a particular object-oriented and procedural perspective on the world. Nygaard was one of the inventors of Object Oriented Programming, where computer programming creates 'objects' and 'classes' such as 'articles' and 'pages' on the one side, and on the other, 'functions' and 'methods' that prescribe what to do with the objects (how to deal with 'bleeds', 'wrapping text', etc). Thus the system designer depends on a conceptual model of the world. She or he needs an ideal model of what objects or classes that world is made up of, and what behaviours or 'methods' they expose. To programme is in other words to understandthe world in an object-oriented way.

The model user is not just any user interested in having useful tools around, but someone who is engaged in understanding reality. Correspondingly, the designer's role is not just to provide the tool, but to carefully guide the process by which the user can conduct critical 'object oriented' research into his or her reality. Such research does not necessarily involve a computer or programming skills, but should rather rely on materials and vocabularies that are accessible and can be shared between the participants.

For instance, reporting on the retraining programme of typographers at the Danish newspaper *Berlingske Tidende*, computer scientist Merete Bartholdy stressed how the union insisted on educating both the 200 workers who remained in the workplace after the introduction of new computer tools, as well as the 200 who were dismissed in the process. This re-schooling included not only tutorials in the new automated type-setting system, but also a more conceptual understanding of electronic text and image processing. This was seen as essential in retaining the transparency of labour. The course therefore not only introduced the participants to programming, but also to computerisation's societal effects.[22] In fact, Bartholdy concludes that an introduction to programming and the layered structure of computers is essential for a critical understanding of the technology's possibilities, but she also concludes that workers do not need to know the tedious syntax of programming, which demands a lot of effort to master.[23] They need to understand what programming means, however; they need to know the wider semantics of programming and create models that reflect the execution of the system programme as an execution of a labour process.[24] One example of how to do this, often quoted within the design field, is the use of 'mock-ups'. Pelle Ehn and Morten Kyng, for instance, when training staff for the Utopia project, used cardboard computers that allowed participants to create a conceptual template for the technology with which they would work.[25]

System design is a social process

Participatory system designers realised the need to see technical design as a social process. There is no one true way of programming the labour process into objects and methods, nor one true understanding of the world. In designing systems, understandings need to be negotiated between different stakeholders. What is an object or method for the graphic designer may be something completely different for the journalist or editor. This is why computer systems are fragile. If the worldview they represent is not shared amongst the users, or do not make sense, they are likely to break down: they are used the 'wrong way' or not used at all. Overcoming this problem is not solved by finding the right representation of reality, but by understanding that realities should be negotiated.

One example of this in the UTOPIA project is found in the division of labour between editors, journalists, graphic designers and typographers. Editorial layout was considered a natural part of editorial secretarial work, while layout that includes careful calculation and rendering of editorial sketches was considered graphic work. However, the introduction of automated text and image processing done with codes by the editorial secretaries often challenged existing labour boundaries. A collective agreement between the trade unions and the newspaper trade organisation stated that cases of disagreement were to be dealt with by a special committee of graphic workers and journalists.[26]

In a larger perspective, this observation made the system designers realize that just as important as

any functionality of the system, is the need for system design to take root in the culture; meaning that it needs to be accepted as a collective responsibility. As a consequence, in the UTOPIA project, the researchers and system designers not only programmed the systems, but also engaged in social activities such as football games with the other participants in the project. They also invented a range of more formalised 'design games' to make the worldviews explicit and negotiable.

Moving the codetermination framework outside of the factory

I have sought to bring forward some of the qualities that in my opinion are lacking in contemporary interface design: virtues of language, of influence, of mobilisation, of access to infrastructures and of strong co-determination frameworks. There is no access to infrastructures in the metainterface (how can we design our own social realities when all infrastructures are displaced in 'the cloud'?). There is no co-determination framework for the implementation of information technologies in our lives (and bedrooms), since there is no union for either Facebook users, lovers, drivers, commuters or any others whose data contributes to the metainterface industry. Finally, there is no co-determination framework for our work-life either.

This last lack seems particularly relevant. The metainterface has led to a new job market to which we commonly refer as a 'sharing economy'. This is an industry that is seemingly for the common good: innovative people can make a living out of sharing. But when sharing is automated, people who share – who have a spare car they can use as a taxi or a spare flat they can use as a hotel – potentially end up in precarious situations. A platform like Uber is not just a platform for sharing, but is heavily data driven. It collects massive amounts of data that makes it easier for any person to become a cab driver. The sharing economy not only produces a labour force with minimal rights, but also a deskilled labour force whose labour may very well be automated and replaced in the future, for instance, with self-driving cars. Uber ultimately seeks to replace rather than augment the driver.

Potentially, many other questions could be raised, based on observing the differences between participatory interface design and today's smooth and user-friendly metainterface design (how there is no co-determination framework for the inhabitants of the cities where Airbnb has drastically changed the landscape, for example). The key questions, however, remain: what could a 'Centre for Working Life' achieve today? Will a second UTOPIA be possible at the time of the metainterface?

[1] See Christian Ulrik Andersen and Søren Pold, ed., *Interface Criticism – Aesthetics Beyond Buttons* (Aarhus: Aarhus University Press, 2011).

[2] The advertisement was directed by Ridley Scott.

[3] See Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago: University of Chicago Press, 2006).

[4] See Anderson & Pold, 2011.

[5] Gregory L. Ulmer, 'Grammatology Hypermedia', in *Postmodern Culture* 1.2 (1991).

[6] Stuart Moulthroup, 'You Say You Want a Revolution', in Nick Montfort & Noah Wardrip-Fruin, ed., *The New Media Reader*(Cambridge, Massachusetts & London, England: The MIT Press, 2003 (1991), p. 703.

[7] Anderson & Pold, 2011, p. 159.

[8] Imperva Incapsula Bot Traffic Report,2017, www.imperva.com.

[9] See Philip E Agre, 'Surveillance and Capture: Two Models of Privacy', in Montfort & Wardrip-Fruin, 2003, pp. 737–60.

[10] See Julie Zeilinger, 'Spreadsheets App Will Tell You If You're Good in Bed', *HuffPost,*

Women (August 2013).

[11] As noted by Wendy Chun and Sarah Friedland, 'Habits of Leaking: Of Sluts and Network Cards', *Differences: A Journal of Feminist Cultural Studies* 26.2 (2015), pp. 1–28, vulnerability has come to characterise the contemporary online subject. It is easy to blame users for being 'promiscuous' or 'leaky' and not knowing how to protect themselves, but this ignores the systemic nature of the vulnerability, the so called 'slut-shaming' and 'cyber bullying' on the Internet, and how it has created a sense of entitlement to circulate what is otherwise private.

[12] Andersen & Pold, 2011, 157–82.

[13] For an insightful as well as critical account of participatory design that lays out some of its current challenges see Susanne Bødker and Morten Kyng, 'Participatory Design That Matters – Facing the Big Issues', *ACM Transactions. Computer-Human Interaction* 25.1 (2018): Article 4.

[14] See Roy Greenslade, 'The Day They Buried Hot Metal', *The Telegraph* (17 January 2006), www.telegraph.co.uk/finance/2930245/The-day-they-buried-hot-metal.html.

[15] UTOPIA stands for Training, Technology and Product in Work Quality Perspective; or in Swedish (but working in all Scandinavian languages): Utbildning, Teknik Och Produkt i Arbetskvalitetsperspektiv). UTOPIA was led by Pelle Ehn, who is considered one of the founding fathers of participatory design.

[16] Gunnar Kokaas, 'Meninger Om Utopia', *Graffiti,* 1985, p. 2.

[17] See Åke Sandberg, *Mellan alterantiv production och industriell FoU* (Stockholm: Arbetslivscentrum, UTOPIA, 1984), p. 23.

[18] See ibid, p. 24. An interesting addition in a British context is that UTOPIA later in the 1980s planned a collaboration with an IT company from The Greater London Enterprise Board, led by Mike Cooley. However, this project was not carried through because the Thatcher administration terminated the Greater London Council and this kind of development politics in 1986. Pelle Ehn in personal correspondence. See also http://www.wikiwand.com/en/Greater_London_Council).

[19] See Andersen & Pold, 2011, Chapter 2.

[20] See Bødker & Kyng, 2018.

[21] See Andersen & Pold, 2001, p. 165.

[22] This was done in COMAL 80, a Danish-developed programming language that resembles BASIC in that it provides a more 'procedural' and less 'object oriented' approach to the world. See Merete Bartholdy, *Omskoling På Berlingske Tidende* (Stockholm: Arbetslivscentrum, UTOPIA, 1984), p. 25.

[23] Ibid. p. 3.

[24] In programming, semantics is usually perceived as a model of the process that a computer follows when executing a programme, or how a programme is executed on a platform, and not the larger socio-technical execution of the programme.

[25] See Pelle Ehn and Morten Kyng, 'Cardboard Computers: Mocking-It-up or Hands-on the Future', in Joan Greenbaum and Morten Kyng, ed., *Design at Work* (Hillsdale, New Jersey: Lawrence Erlbaum Associates, Publishers, 1992), pp. 169–95.

[26] Angelika Dilschmann and Pelle Ehn, *Gränslandet – Om Arbetsorganisation Vid Integrerad Text- Och Bildbehandling (Projekt-Rapport Nr 11)*(Stockholm: Arbetslivscentrum, UTOPIA, 1985, p. 38.

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