WHAT'S NEXT FOR OPEN HARDWARE AND DESIGN?

by *Peter Troxler*

On Giants' Shoulders
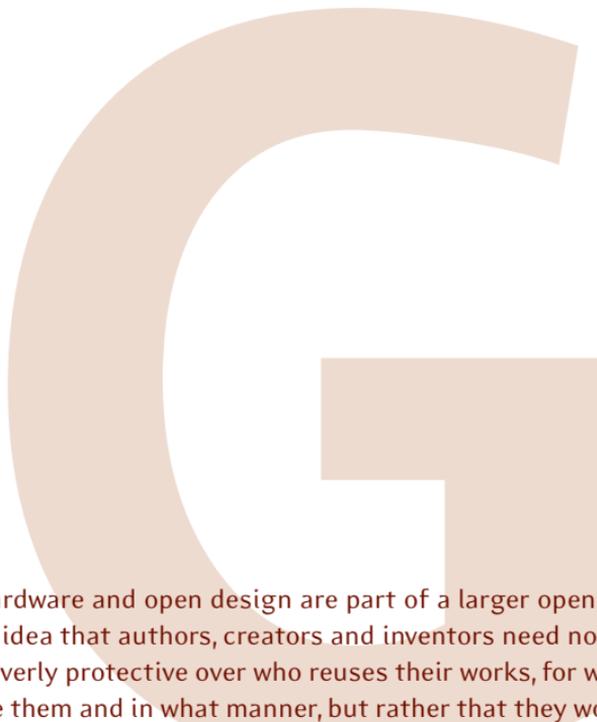
Open hardware and open design are part of a larger open source idea. It is the idea that authors, creators and inventors need not and should not be overly protective over who reuses their works, for what purpose they use them and in what manner, but rather that they would actually want to make their works free to use, to modify, to distribute and to build upon. It is the idea that 'standing on the shoulder of giants'—first recorded in the twelfth century and attributed to Bernard of Chartres, commonly ascribed to Isaac Newton, e.g. on the British 2-pound-coin, delightfully studied by Robert K. Merton and popularised by Google Scholar—is a preferred mode of production, insight and creativity. This is because building on what others have already done does not require basic principles to be rediscovered over and over again.

In this chapter, I approach open source in hardware and design from a personal view, rather than trying to formulate definitions. Building on my earlier research, I outline the understanding of 'open source beyond software' through three stages: exploration, explanation and extrapolation. The chapter ends with the key questions that deeply concern us today when we plan to 'do' or implement open hardware and open design—beyond the current group of consenting nerds. But let me start with a brief sketch of where I am coming from and how I got involved in open source, and, more specifically, in open hardware and open design.

My motivation for working in this area dates back quite a bit. My earliest memories of open source are from my time as an engineering and computing science student in the 1990s when I was inevitably exposed to the open source phenomenon and hacking culture. It was the times of the first browser wars, the famous O'Reilly freeware summit, the US vs. Microsoft antitrust case, and the infamous Halloween documents—leaked Microsoft memos portraying open source as a 'long-term developer mindshare threat.' Having grown up in a humanities world—my parents met when they were studying ancient languages—I found the parallels between academia and open source to be immediately obvious. One of my first public interventions on the subject was at an otherwise placid seminar on literature and the Internet in September 2000 where I was co-organiser. While colleagues were presenting and discussing early hypertext fiction and Internet novels, particularly Mark Amerika's Grammatron, I introduced them to the concept of copyleft, to astalavista.box.sk and other, darker sides of the Internet. The topic was set and around Easter 2001 in Lucerne, Switzerland, we organised the literature festival 'surf—sample—manipulate'. Mark Amerika was present and on the fly wrote a short piece on the city, copying and pasting from tourist office leaflets, tax authorities' websites, Mark Twain and Leo Tolstoi; Raymond Federman performed Surfiction with his band Art | de Fakt.

A more recent experience stems from my time at Amsterdam's media think tank Waag Society where I was project manager for the Amsterdam Fab Lab and Waag Society's involvement in the Creative Commons movement. This must have been in 2008: we were discussing the potential extension of the work of Creative Commons Netherlands

into design and hardware—and found it to be outside our remit at the time; only now have Creative Commons Netherlands started cautiously venturing into the subject.

Explore, Explain, Extrapolate

My exploration of the open source phenomenon started in 2008 in this field of new media, where Creative Commons licensing had become a popular extension to traditional copyright terms. In the same year, the first international arts award of the digital era dedicated entirely to free culture, the Barcelona oXcars, was held, a not-for-profit gala with over 100 artists and seven hours of non-stop free culture. Indeed there are quite a number of case studies from the creative industries—be it musicians, filmmakers, news producers or moving image collectors—all of whom actively use open source principles to innovate their business models and earn money.

The book 'Open Design Now' (which I published in 2011 together with colleagues from Waag and Premsela, the Netherlands Institute for Design and Fashion) is an important snapshot of the state of open design as it stands now. The book explicitly did not want to produce a defining description of open design and I think we succeeded in collating a good and varied corpus of approaches: the purpose was to bring together an understanding from various perspectives. The authors of the book tried to make sense of what was happening 'out there'. The book puts different views and approaches from different disciplines into context. This is an important element of explaining the nature of open design, which essentially has to be a dialogue, not a monologue. This dialogue has been ongoing through a series of other publications, addressing the questions of business models, hybrid innovation systems that include both open and closed source and following and bending the rules of intellectual property regimes. A varied audience—from educators to ecologists, from designers to policy makers—have shown interest in the phenomenon. A number of more structured dialogues and discussions have sprung up around the topic of open design and open hardware, where further work is being done to explain what open design and open hardware are and mean.

The Open Knowledge Festival in Helsinki in September 2012 was aptly timed to start the transition from explaining to extrapolat-

ing—even if just from a provisional position—open hardware and open design (and what we believe to understand when we hear those terms) are far from being the 'place to stand to move the Earth'. The process of exploring and explaining will have to go on, and those varied discussions we are having on the definitions of open design and open hardware certainly still have their place. Yet definitions are not an end in themselves; they should serve as a means of helping to address the real issues that we face in open hardware and open design. I shall try to summarise those issues in five main questions, which I presented at the OKFestival and put in context in a couple of other texts.

Five Questions to Move Us Forward

In the context of open hardware, there is the emerging Fab Lab community, which can be seen as a representative of the wider open design and hardware ecosystem. This community faces some interesting challenges that are typical for the whole ecosystem: how to find adequate forms of organisation and institution. In design itself, open source can be seen as either a massive disruption to current practice or a new future that designers would like to achieve. All those developments are not only interrelated; they also take place in a global economic context that is marked by economic and ecological crises. These crises will lead —if we believe Jeremy Rifkin—to a third industrial revolution, which will strongly affect the designing and manufacturing of hardware.

Thinking about the future of open hardware and open design, I feel we need to address a set of five essential questions. These questions are strongly inspired by Elinor Ostrom and Charlotte Hess's book on 'Understanding Knowledge as a Commons' (2007). They are not so much concerned with what open hardware or open design are; rather the questions put forward some deep concerns as we strive to organise and arrange a world in which open hardware and open design actually play a pivotal role in that preferred open source mode of production, insight and creativity:

----➤ How can we build effective forms of collective action and self-organisation?
----➤ How can we break free from traditional systems and creatively design new systems that tap into the new capabilities?

-----➤ How can we protect the interests and creative freedom of individuals while also ensuring wide access to new knowledge, processes and products?

-----➤ How can we appropriately and effectively create and capture value?

-----➤ How can we achieve equity and fairness?

It would be presumptuous to try to solve all these questions in this chapter. However, I aim to present initial, tentative thoughts as to where to look for answers to these questions.

Effective forms of collective action and self-organisation can draw on best practice collected by social scientists over the past decennia. However, in applying those insights, it is crucial that we as a community take responsibility ourselves and that we do not rely on external 'professionals' to advise us; they might be a necessity in circumstances where thinking and doing, planning and executing are structurally separated, as is the case in traditional manufacturing industries. *In a situation where the designer-maker is the dominant paradigm, new solutions will have to come from within, from our peers who are actually part of and contributors to the open hardware and open design movement.*

Traditional systems of organising what we do—observational research, prescriptive theories, hierarchical organisations, power and influence as a function of institutional ranks—have clearly failed to create new solutions today. New, contemporary ways of organising will choose different approaches: participative research, engaged scholarship, lateral power and meritocracy. These, however, mean exploring the unknown (or little known) and we have to be prepared for a journey of ongoing trial-and-error and 'perpetual beta'.

In protecting the interests and creative freedom of individuals we will need to re-establish what those interests and that freedom really are—current understanding and propaganda portrays interests almost exclusively as efficiency in the monetary domain, while research and practice sketch a more varied picture of effectiveness: hedonic gains, altruism, positive effects of learning on future earnings (Mincerian earnings), reputational benefits and signalling effects. In such a new environment, copying could actually be OK (and there are

indeed disciplines in design where copying actually is OK and never was considered problematic—fashion, for instance).

Creating and capturing value, particularly monetary value, is typically discussed under the heading of 'business models'. Yet many discussions of business models are still too strongly dominated by age-old 'economies of scale' thinking, which approaches the issue from the supply side. No wonder—it's so much easier to ask how much (if at all) people would be willing to pay for what I have to offer than to reframe the questions, for example: what would people be willing to pay for? And are we actually able to supply what people are willing to pay for?

The last question about equity and fairness opens up a much wider field. Yochai Benkler and Helen Nissenbaum started that discussion in their 2006 paper 'Commons-based Peer Production and Virtue' where they argue that open source activities are not only an expression of virtuous character but actually a training ground for virtue. To put it even more strongly, they warn of a threat of omission: 'We might miss the chance to benefit from a distinctive socio-technical system that promotes not only cultural and intellectual production but constitutes a venue for human character development.'

However, I am convinced that virtue is not automatically guaranteed by being open source, and that on the journey towards that imagined better world we need two fundamental qualities: (1) to be prepared to be surprised and dare to fail; (2) to review decisions and choices critically as to whether they meet the requirements of equity and fairness. And I am sure we will probably disagree, though I hope it will be in a constructive manner.

Sources Used and Acknowledgements

Palgrave Macmillan in New York—there is also a (video) summary by Jeremy himself, presented at the EU's Mission Growth conference (http://ec.europa.eu/avservices/ video/player.cfm?sitelang=en&ref=85716, Jeremy starts around minute 47)—and 'The Piracy Paradox. Innovation and Intellectual Property in Fashion Design', a paper by Kal Raustiala and Christopher Springman on the low-IP regime in fashion (Virginia Law Review 2006, Vol. 92, Nr. 8, pp. 1687–1777, online at http://www.virginialawreview. org/content/pdfs/92/1687.pdf).

Robert K. Merton's 'On the shoulders of giants: A Shandean Postscript—The Post-Italianate Edition' was published in 1993 by the University of Chicago Press. Eric S. Raymond's writings are available online at http://www.catb.org/~esr/, all of which are worth reading: the 'Cathedral and the Bazaar' for its fundamental insights into open source practice, 'How to become a Hacker' for exactly that, and 'Homesteading the Noosphere' from 2000, from which I have taken the idea of not having to rediscover again; the leaked internal memos from Microsoft—known as the Halloween documents—are available there as well.

Mark Amerika's html novel 'Grammatron' is still online after all these years at http://www.grammatron.com/index2.html and his essay 'Surf-Sample-Manipulate: Playgiarism On The Net' (published by Telepolis on 23 July 1997) can be found at http://www.heise.de/tp/artikel/3/3098/1.html. Most of Raymond Federman's songs that he played with Art | de fact are available online at http://www.artdefakt.de/ mp3/mp3.htm if you wish to catch some of that atmosphere.

Creative Commons Netherlands' first steps into the area of open hardware and design are Catherine Jasserand's 2011 paper on 'Creative Commons Licences and Design. Are the Two Compatible?' which appeared in the Journal of Intellectual Property, Information Technology and E-commerce Law (Vol. 2, Nr. 2, online at http:// www.jipitec.eu/issues/jipitec-2-2-2011/3085), and Tomas Magroni's presentation on 'Open Design, IP and Creative Commons Licences' at the OKFestival, 19 September 2012 (there is a video online at http://bambuser.com/v/299312).

More discussions on open hardware and design can be found—among other great places—at High Wire, imagination Lancaster, Lancaster University, led by Leon Cruickshank (http://imaginarium42.blogspot.com); the Open Knowledge Foundation's Open Design Working group masterminded by Massimo Menichinelli (http://design. okfn.org); and the Open Design Meetup in Amsterdam facilitated by Bram Geenen (http://www.meetup.com/Open-Design/).

I drew a lot of my inspiration and insights from the many discussions I have had at various meetings and conferences, and I am grateful to the organisers who invited me: the Open Knowledge Festival in Helsinki in 2012, the Artilect conference, Toulouse (18 –21 October 2012), Fab*Education, Bremen (15–17 June 2012); A–Z lezingen, Hasselt (8 May 2012), a meeting on prosumerism at the Institut für ökologische Wirtschaftsforschung (IÖW), Berlin (16 December 2011), the 7th Design Symposium Vorarlberg, Dornbirn (18/19 November 2011), a lunch talk at the European Commission, Information Society and Media Directorate-General (INFSOC), Brussels (15 November 2011), Futur en Seine, Paris (22–25 June 2011), the Creative Industries Syria Design Convention, Graz (1 June 2011), and Innovafrica 2010, Bamako, Mali (10–15 December 2010).

My podcasts from 2008 on 'Status, Use and Trends of Open Content Models in the New Media Industry' and 'Los oXcars 2008' are available at http://aworldofopen.cc/podcast/status_of_open_content_in_new_media_picnic_200 and http://aworldofopen.cc/podcast/los-oxcars-200 respectively. The chapter 'Open Content in the Creative Industries: A Source for Service Innovation?' appeared in 2009 in the collectively-edited book 'Supporting Service Innovation Through Knowledge Management' (with Patricia Wolf, Sami Kazi and Ralf Jonischkeit) and can be accessed online at SSRN (http://ssrn.com/abstract=1597357). A few more publications are 'Commons-Based Peer-Production of Physical Goods: Is There Room for a Hybrid Innovation Ecology?' (a paper presented at the 3rd Free Culture Research Conference, Berlin, 8–9 October 2010, http://ssrn.com/abstract=1692617) and 'Bending the Rules: The Fab Lab Innovation Ecology', a paper written with Patricia Wolf that I presented at the 11th International CINet Conference, 5–7 September, Zurich, Switzerland (http://square-1.eu/site/wp-content/uploads/2010/09/TroxlerWolf2010_BendingTheRules_FablabInnovationEcology_pub.pdf).

A couple of chapters on the open hardware and design ecosystem are due to appear in 2013: 'Making the 3rd Industrial Revolution. The Struggle for Polycentric Structures and a New Peer-Production Commons in the Fab Lab Community' in the book 'Shape your world with FabLabs' (edited by Julia Walter-Herrmann and Corinne Büching), and 'Open Source Design: Disruption, Desire, Destiny? On the Impact of the 3rd Industrial Revolution on Design' in the Swiss Design Network's publication on 'Disruptive Interaction' (edited by Massimo Botta and Martin Wiedmer). Together with this chapter they form a trilogy outlining the challenges we face in open design, hardware and manufacturing and making.

- - - - - - - - - - -

Peter Troxler is a Research Professor on the topic of the Revolution in Manufacturing at Rotterdam University of Applied Sciences. His field of research is the impact of readily available direct digital manufacturing technologies and the design and manufacturing practice of 'fabbers' and 'makers' on the creative and manufacturing industries, and the emergence of networked co-operation paradigms and business models based on open source principles.