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## **II Opening Production—Design and Commons**



## 5 Opening Production: Design and Commons

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In recent years, new ways have arisen for organizing and carrying out production in open and collaborative fashions. Here *open production* refers to all value creation, either of intangible (immaterial, digital) or tangible (material, physical) resources, done through open and collaborative processes. It is *open* in that it encourages broader participation in which users often become producers, relying on some forms of shared *commons*. It is *collaborative* in that its sustainability is based on generating new social bonds and alliances, i.e., social capital. Processes of open production often tend to happen outside of traditional social and economic structures, and challenge how value production processes generally are organized. The chapters in part II of the book address issues and questions that this claim generates. The aim is to contribute to the current discussion about open production by providing insights from three cases with different approaches.

In the present chapter, we discuss how the development toward openness and collaboration builds upon, and extends, ideas that are present in participatory design and in the free-software and open-source communities. In these communities, people participate in cumulative peer-to-peer production and are given radically better possibilities to participate in society without middlemen, special skills, or resources.

The three case studies presented in coming chapters—those of Fabriken, Illutron, and Arduino—introduce different approaches to opening design and production. Through practice, design researchers discuss both the opportunities and challenges that openness presents. Special attention is given to processes involving tangible resources, such as physical space and hardware. Among the topics covered in these chapters are the means of opening production, the emergence of open and collaborative design, peer-to-peer cultures, issues related to inclusion, the challenges of collaboration, and difficulties associated with achieving sustainability.

## Tracing the open production back to its origins

The rise of open production practices are often associated with the emergence of the free-software and open-source movements. However, their origins can also be traced back to the development of the Participatory Design (PD) approach.

When the PD approach entered workplaces in Scandinavia in the 1970s, the vision was one of making workplaces more democratic and empowering people to fully participate and influence their working conditions, this by establishing more open and collaborative design processes (Bjerknes et al. 1983; Ehn 1988). Since then, the PD community has persistently tried to democratize design and decision-making processes in companies and organizations. In recent years, PD has also moved outside traditional work environments and has engaged with issues in the public realm (Björgvinsson et al. 2010, 2012; Halse et al. 2010). The original premises have not changed; PD is still a matter of letting those involved in the process have a say (Gregory 2003).

Parallel to the emergence of the PD approach, and with a similar political aim, the free/libre/open source software (FLOSS) movement arose. A distributed community of software developers and end users engaged in collaborative design and development processes, applying and developing new tools, methods, and work practices (Raymond 1999; von Hippel 2005).

Until very recently people with no technological expertise or knowledge of specific coding languages or programming skills have had a rather limited opportunity to take part in these ambitious projects due to gaps in competence and abilities, but things are changing rapidly.

## New technologies and tools

New communication technologies and new tools for networking and sharing have contributed to the shaping of cultures of participation (Fischer 2011; Castells 1996; Jenkins 2006; Lessig 2004). These new technologies and tools have supported the rise of social networks offering the possibility to process and manage data and information in ways that weren't possible before. According to Yochai Benkler (2006, 60), "the networked environment makes possible a new modality of organizing production: radically decentralized, collaborative and non proprietary; based on sharing resources ... among widely, distributed, loosely connected individuals who cooperate with each other without relying on either market signals or managerial commands."

Today, a wide range of Web-based collaborative media services, channels for knowledge transfer, open-software and open-hardware platforms, do-it-yourself technologies, and prototyping and production platforms allow users to take part in open and collaborative commons-based peer-to-peer production. Peer-to-peer production is viewed as a particular form of collaboration relying on the interaction between the diverse

participants, without any central hub (Bauwens 2006, 2009). Such production processes can include the generation of knowledge, the making of content and artifacts, the enrichment of meaning, and even the construction of individualized applications (Benkler 2006). This development fosters cultures in which users become producers (Toffler 1980; Bruns 2008; Fischer 2011) and everyone can be a designer, not only of content and artifacts, but also of production systems (Gerritzen and Lovink 2010; Schäfer 2011).

### **Empowerment or free labor?**

The open-production movement has also been boosted by the economic success of open-source software, which paved the way for the emergence of an open and democratic innovation paradigm within the business sector (Chesbrough 2003; von Hippel 2005). This development has been generating tension between the idea that opening up production is a way to improve democracy and empower people and the idea that it represents just a way to squeeze out value for profit. Some define commons-based peer production as an alternative model of production, whose sustainability builds on social recognition, relationships between participants, and shared resources (Benkler 2006); others describe how companies are, essentially, harvesting free labor from user-led production (Weber 2004; Kommonen and Botero 2013).

Open production can be viewed and understood from many different angles. From a business angle, it represents a new paradigm for innovation. One claim often put forward is that bringing more people and more ideas into production processes supports innovation (von Hippel 2005). Some companies even have based their business model on open processes, either by creating a system of services around a pool of open and shared resources or by harvesting free labor from participants taking part in open production (Bauwens 2009). In contrast to the business world, some hacker- and activist communities view open production as having the potential to restructure how value is generated, and, as a consequence, to change economic structures and change society (Bauwens 2009). Between these two positions there are nuances of diverse understandings of open production practices. It may be about fostering citizens' participation and engagement in the public sector, or providing new opportunities for the cultural and arts sector, or generating new tools and modalities for education, or becoming a way to strengthen local communities and economies.

### **A landscape of open and collaborative cultures**

To better understand the landscape of open and collaborative cultures, and how to enable such cultures, stimulate them, and act within them, let us look briefly at some intellectual antecedents and some societal developments that have contributed to the proliferation of open production practices.

## Defining openness

The origin of open production practices as presented here can be located to the free software movement and to year 1983, which is when Richard Stallman launched the GNU project. (See Stallman 1984) In a manifesto he formulated for the project, Stallman set forth four freedoms associated with free software development: “the freedom to run the program,” “the freedom to study how the program works, and change it,” “the freedom to redistribute copies,” and “the freedom to distribute copies of your modified version to others” (Free Software Foundation 2013, no paging). These principles have contributed significantly to the ethics of other projects and movements, including free and open culture and open access in education and science. By using the word ‘free’, Stallman wanted to emphasize the political implications of the project and how the point of departure was about developing software that could be available to everyone. Later, particularly after the development of the operating system Linux, the free-software community decided to use the word ‘open’ instead. This was a strategy to depoliticize and normalize free software, shifting the focus from political stands to how this form of software production could be more effective than traditional development methods (Benkler 2006).

The Open Definition project initiated by Open Knowledge Foundation defines openness in relation to content and data (Open Knowledge Foundation 2014). A work is defined to be open if it meets eleven requirements, of which the first three, as in Stallman’s manifesto, are access, redistribution, and reuse. Similarly, the free-culture movement promotes the freedom to distribute, use, and reuse creative works. Lawrence Lessig (2004) coined and defined the term ‘free culture’, and various organizations (among them Freedom Defined, Students for Free Culture Organization, and Open Everything) have built upon this legacy and continued to define free and open cultural works. Creative Commons is probably the most prominent example of an organization advocating the sharing, use, and reuse of knowledge and cultural works through standardized permissive licenses and other legal tools. These licenses allow people to modify the default terms of copyrights they hold and give more freedoms (for example to share, distribute, and create derivative works) to others (Creative Commons 2014).

Recently, principles of openness have also reached fields that traditionally have been perceived as more closed. Among these fields are product design and manufacturing, in which discussions about open production are now emerging (van Abel et al. 2011; Roel 2012). Two main strands can be located in the contemporary practice and literature of open design and production: one focusing on open-ended collaborative design activity and practice, and the other producing open design documentation (e.g., blueprints). These strands address both how to develop the technical infrastructure for opening tangible production, such as licenses, open standards, and open tools, but also how to foster collaboration and open processes (van Abel et al. 2011). Thus, there is a

connection between open production and PD—a connection related to the expertise in establishing and fostering processes of co-design that can be found within PD. Such expertise could be particularly valuable when it comes to dealing with issues and controversies that may emerge in collaborative and open design processes.

Open production practices are also presenting other challenges that require changes in production cultures and ways of operating. One question that arises is how to deal with technical issues of liability when it comes to complex products (Cruickshank and Atkinson 2013). For example, who ensures that open-source medical equipment meets safety standards? Other subjects of controversies are how to handle ethical and systemic questions having to do with labor and society organization, with empowerment, and with exploitation (Bauwens 2006, 2009).

### **Collaborative cultures and production practices**

In social production, collaboration obviously plays a central role (Benkler 2006; Fischer 2011). In open production of software, the peer-to-peer model has emerged as a specific modality of collaboration in which participants are autonomous and can freely determine their behavior and linkages without the intermediary of an obligatory hub (Benkler 2006). Although peer-to-peer projects are most widely known in the areas of software development and the Internet, collaborative production is spreading rapidly in open culture and education, in hardware manufacturing, and in social movements such as Occupy Wall Street.

In social innovation, the idea of *collaborative services* has been developed (Jégou and Manzini 2008). Collaborative services can be described as new economic initiatives that, while economically sustainable, generate social value on a local level by binding together producers and consumers. Such initiatives can include such things as neighborhood kindergartens and farmers' markets. They are seen as having the potential to improve environmental and social sustainability by creating stronger bonds between economic activities and the local context.

More traditional forms of production also are being shaped by collaborative behaviors. *Collaborative consumption* accounts for emerging business models in traditional consumer markets where sharing and swapping are replacing consumption (Botsman and Rogers 2010)—for example, car-pooling and clothes-swapping services.

This diversity clearly demonstrates the spreading of collaborative production practices, and it shows that the open-production movement is diffusing into diverse sectors and assuming diverse connotations and aims. A central role in this development is played by open physical lab spaces, such as fab labs, hackerspaces, and makerspaces, where people can prototype and experiment with technology and production (Gershenson 2005; Hackerspaces 2013). These spaces, currently being established all over the world, support bottom-up local production initiatives by providing access to resources

and the possibility of developing projects and learning by doing. In these spaces, people get access to tools and machines, and they develop skills and share knowledge and ideas in cumulative and collaborative processes.

### **Commons and ownership**

Open production processes often rely on and generate *commons*, here understood as shared resources that are managed and governed through collective action (Ostrom 1990). How to organize access and handle resources is connected to the nature of the production process. Intangible processes are often constituted by open-access regimes in which individuals do not have “exclusive control over the use and disposition of any particular resource” (Benkler 2006, 61) and the shared materials and resources are available to all. Tangible processes, on the other hand, usually present a range of diverse possibilities, owing to the fact that materials, unlike information, get worn by use and the possibility of accessing them is limited by their physical characteristics.

To characterize the shift from producer-centered production to collaborative processes, the term *produsage* has sometimes been used, meaning “the collaborative and iterative content creation practices within many user-led environments as a hybrid and often inextricable combination of production and use” (Bruns 2007, no paging). According to Bruns, collaborative user-led content creation by online communities has four main characteristics: creation and production is community-based, participants have fluid roles in production, the content is constantly under development and the artifacts are unfinished, and the productions and the knowledge are community-owned common property (Bruns and Schmidt 2011; Bruns 2008).

Similarly, the founder of the Peer-to-Peer Foundation claims that, in comparison to corporate-driven production, the peer-to-peer systems have three novel modes: the mode of production (the use value is created through collaboration of people “who have access to distributed capital”), the mode of governance (the community is governed by itself, without corporate hierarchy), and the mode of distribution (property is common and freely accessible) (Bauwens 2006). Common to all these characterizations is that the information produced by a community forms a shared information commons that develops in a continuous social process of enriching, extending, and evaluating the shared resources (Bruns 2008).

### **Open tangible production and the role of the designer**

Open production practices have now spread beyond the realm of the software world, and intangible production towards other domains. What happens when production processes and chains are opened up in relation to tangible artifacts? Is it possible to



open tangible production? These questions are now widely discussed, particularly because of the proliferation of personal fabrication machines—smaller, cheaper versions of mass-production equipment (3D printers, laser cutting machines, CNC mills) that allow for small-scale industrial production (Lipson and Kurman 2010). Could these machines play the same role in opening tangible production processes that new technologies, social networks, and platforms have played for software and for intangible artifacts? Could the emergence of open physical lab spaces and prototyping platforms allow the creation of a non-proprietary and collaborative mode of production for tangible goods?

Many challenges arise when tangible production is opened with the aim of democratizing tangible processes of value production and making them more accessible. A direct translation of intangible production forms and paradigms doesn't seem to work very well. Thus, when moving from software to hardware, the opening of production ought to be understood and fostered differently (Powell 2012). First, open production practices in the tangible realm faces the constraints that the tangible nature of the artifacts themselves represent. Second, there are diverse communities of practices that are engaged in the opening of tangible production, including not only hardware developers, but also long-tail bricoleurs and artisans, production financed through public investments, open hardware for development, and industrial piracy (*ibid.*).

The modularity of open production, the shared ownership of process and outcome, and the fluid roles and modes of governance challenge the traditional role of the designer and the traditional design process and raise the question of how designers can operate in open production frameworks. When dealing with open tangible design and production, a designer has to create new methods and practices to include open and collaborative cultures in a tangible realm dominated by industrial design practices in which intellectual property rights are seen as crucial to the design and production process and in which a number of hindrances related to tangibility and scarcity of resources have to be faced. (See chapter 6.) In addition to these challenges other issues arise, some related to liability and roles and some to the future of production: What new responsibilities do designers face in relation to these transformations? How should technical issues of liability be dealt with when it comes to complex products (Cruickshank and Atkinson 2013)? How should ethical and systemic questions having to do with new forms of labor organization, empowerment, and/or exploitation be addressed (Bauwens 2006, 2009)?

The design research community has recently introduced the concept of *Open Design*. (van Abel et al. 2011; Roel 2012). Both academics and practitioners have attempted to tame this concept by aiming at describing the multi-faceted nature of the phenomenon (Avital 2011). Up to now it has been practice rather than theory that has driven openness in design. There is, however, a growing body of empirical research evaluating open

design projects producing both intangible and tangible goods (Balka 2011). Examples of this are provided by the Fabriken, Illutron, and Arduino cases.

### **Co-constructing participation platforms for open collaborative production: Fabriken, Illutron, and Arduino**

In chapters 6, 7, and 8, three stories about how design researchers and practitioners strive to run open design and production processes in collaborative cultures, and how they pursue the goals of empowerment, inclusiveness, and democratization of design and production processes inspired by PD and by FLOSS, are discussed. Those stories shed light on the strategies, opportunities, and challenges designers face when co-constructing open frameworks together with other stakeholders. Chapter 6 also describes the challenges that transferring practices and values from intangible open production practices to tangible production and into a physical realm present.

The first case is Fabriken, a makerspace in Malmö that has been jointly developed and run by a research center, a non-governmental organization, an interaction design company, and the users of the makerspace. Fabriken provides diverse possibilities of opening production: from tinkering with electrical circuits to sewing cloths, from fixing bikes to woodworking. By discussing practices and the way the space evolves, chapter 6 highlights problems and possibilities that arise in the course of moving from intangible forms of commons-based production to tangible ones.

The second case, Illutron, is presented in chapter 7. Illutron is a studio for experimentation in technology and art located on a barge in Copenhagen's harbor. It is a non-profit private initiative that was founded by a multidisciplinary group of people with backgrounds in various fields, including art and engineering. The chapter focuses on how a shared interest in exploring digital material became a common ground for collaboration, encouraged the formation of a community with shared values, and helped to keep the barge literally and figuratively afloat despite the absence of a formal organizational structure.

The subject of chapter 8 is Arduino, an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. Arduino was originally intended for artists, designers, hobbyists, and others interested in creating interactive objects or environments, but it has grown into a global online community. The chapter discusses how Arduino applies the concept of openness. After introducing the open-source hardware scene through a first-person narrative, it draws some conclusions about how the ideals behind the commons change when the everyday reality of a company with investors and clients, instead of concepts and users, must be faced.

As the cases of Fabriken, Illutron, and Arduino demonstrate, open platforms for collaborative production can take many forms: they can be formal infrastructures initiated by officials, established public venues maintained by communities, or ad hoc constellations created by random strangers driven by a shared urge or question.

Although the cases of Fabriken, Illutron, and Arduino involve the use of very different processes and tactics to empower, enable, and engage people, there are some similarities. They all strive toward an open and inclusive platform for participation that supports the flexible agency and multiple levels of participation. Various design-in-use activities are facilitated, from social practices and agreements to digital design and fabrication. Collaboration is recognized as an important asset in iterative and open-ended production. Through these cases, the authors discuss some of the challenges that arise in the course of opening tangible production, but they also put forward some of the core values and virtues of openness in design and production.

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