The future of product creation is open and community-based

Professor Roland Jochem from the Technische Universität Berlin is coordinating the European research and innovation project OPENNEXT, a project that is enabling small and medium sized enterprises (SMEs) across Europe to engage in communities with consumers and makers, in order to fundamentally change how products are designed, produced, and distributed. Product creation is inaccessible to most people, but open source hardware (OSH) product designs are available for anyone to modify, make, distribute and sell. OSH offers enormous potential for restructuring the social organisation of product development and reforming conventional industrial practice. This joint participation can bring benefits to both SMEs and consumers. OPENNEXT thus facilitates collaborative product creation by companies and communities of consumers and makers through new mindsets, new business models, and new collaborative software solutions.

Open source hardware (OSH) are products for which all rights of usage are granted freely to the general public and whose technical documentation is completely available and freely accessible on the internet. While free and open source software (FOSS) has become widely available for anyone to study, change, use, and distribute, OSH is a concept that still has some way to go before it catches the attention of industrial players. The field of OSH has resulted from the extension of the free and open source movement from software development into physical products. For centuries, companies have designed and manufactured products using their specialised technical expertise, which they then sell to consumers. This process comes with the non-desirable trade-off that we as customers without even recognising it have to accept problems such as over-engineering, planned obsolescence and redundant functions and features as a given. But why settle for the centrally controlled one-size-fits-all results of closed innovation environments? Imagine if anyone anywhere was able to customise products of high quality according to a transparent knowledge source and have it manufactured in their own vicinity at no extra cost. That is the potential the researchers are exploring for open source hardware (OSH) in a new project under the EU's Horizon 2020 programme, called OPENNEXT.

OPENNEXT is a project that enables small and medium-sized enterprises (SMEs) across Europe to engage in communities with consumers and makers in order to fundamentally change how products are designed, produced, and distributed. The project is coordinated by Professor Roland Jochem from the Technische Universität Berlin and brings together a network of partners from 19 EU countries, bridging the gap between business and consumer. Participating companies will openly share ideas and knowledge on digital platforms. The researchers explain that, "we want to empower both companies and consumers by giving them equal access to knowledge in order to co-design and manufacture user-centric products".

FROM FREE AND OPEN SOURCE SOFTWARE TO HARDWARE

The design specifications of OSH objects are licensed so that anyone can study, modify, create, and distribute the objects. Just as source code is available for FOSS, OSH information including schematics, blueprints, logic designs, and CAD drawings, is available for modification or enhancement by any user with access to the tools that can read and manipulate these source files. Users can contribute design changes, fix errors, and add new features. They can modify the design of the object and, if they wish to, share their modifications.

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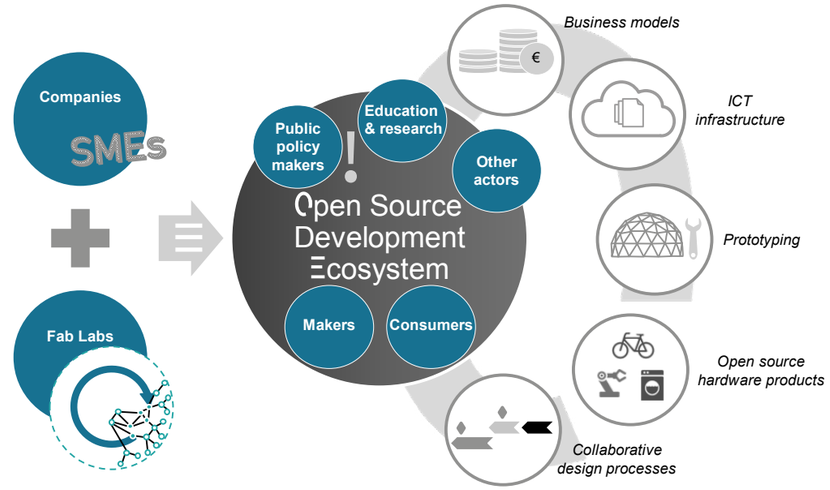


OPENNEXT aims to transform how products are created by connecting companies and communities in creative and productive open source development ecosystems and thereby introduce OSH as a viable business strategy.

The original manufacturer, who initially shares the OSH, benefits from the feedback from the OSH community and the potential improvements to the design. There is evidence that this sharing can drive a high return on investment for highly-customised products produced in small batches for the benefit of the scientific community and consumers.

OSH offers enormous potential for restructuring the social organisation of product development and reforming conventional industrial practice. The free and open source movement has made outstanding contributions to the development of the internet through FOSS. For example, projects such as Apache and Linux have benefitted from company participation while still keeping their community structure. It is the goal of this project to foster the same innovative energy and user-driven value in OSH communities to the benefit of the user, of course, but also of the designers, the manufacturers and society as a whole, minimising over-production (and thereby waste) and democratising the way we consume.

With OPENNEXT, the researchers are raising awareness of the shared values within the OSH domain and are offering support to companies that are participating in OSH communities. They are dealing with a number of significant aspects of transitioning from a proprietary logic to an open source paradigm. Through the OPENNEXT project, they can offer practical advice to companies making this transition, transforming how products are created and making working in an open source fashion more accessible, thus benefitting both businesses and citizens.

We want to empower both companies and consumers by giving them equal access to knowledge in order to co-design and manufacture user-centric products.

FOSS has given rise to a billion-euro economy through the freeing of software development practices from proprietary IP models and opening the process to citizen participation with open source development. OPENNEXT is extending these principles to the realm of physical objects.

REDEEMING CONSUMER AGENCY

The open-source model could potentially transform all manufacturing industries, from medical equipment and mobility to power generation. If consumers have access to specific production methods and techniques, they will, for example, be able to 3D print a spare part for their product. Similarly, even with limited resources, SMEs will have the ability to customise products in order to meet individual consumers' requirements.

Open source development of modules/ add-ons for cargo bikes: XYZ CARGO TRUCK with an open lab module.

The OPENNEXT partner Danish Design Centre developed this derivative version (CC BY-SA 4.0) of the Open-o-Meter by Bonvoisin & Mies (2018) to help manufacturing companies to develop new business models based on open source principles.

OSH emerges against a backdrop of increasing sensitivity to social and environmental issues which have steered industries towards integrating new requirements including eco-friendliness and fairness in their production activities to satisfy consumers. Ideally, this new OSH production model will encourage social product development and extend the product life cycle by encouraging consumers away from a disposable ethos towards a make-and-repair culture that no longer uses and throws away products that can be repaired or reused.

Open source hardware offers enormous potential for restructuring the social organisation of product development and reforming conventional industrial practice.

LACK OF STANDARDS A BARRIER

To date, OSH has been the domain of grassroots communities, NGOs, and academia and has yet to reach large-scale industry. If OSH is to become a mainstream phenomenon, conformance will be a critical issue for both producers and consumers. Establishing a set of such criteria is thought to be difficult because of the multifactorial nature of applying the concept of openness to physical products. Openness seems to spread across a spectrum from fully closed to fully open and is not a binary value, so the challenge moves away from establishing whether a product is open, to measuring how open it actually is. As a step towards establishing clear OSH standards, the research team developed an Open-o-Meter to assess the openness of a physical product. The Open-o-Meter makes way for measuring both product and process openness and allows the user to check whether a product's technical information will allow anyone to study, modify, make and distribute it. It provides a simple checklist for members of the public to judge the efforts of a product originator to meet the principles of open source. In addition, the Open-o-Meter provides practitioners with guidelines for managing their products' data during and after the development process. It also helps companies integrate open source approaches into their business model. Moreover, the Open-o-Meter exposes the multifunctional and contextual qualities of openness and provides a basis for the researchers to investigate whether criteria of openness are mandatory or optional in a move towards standardisation.

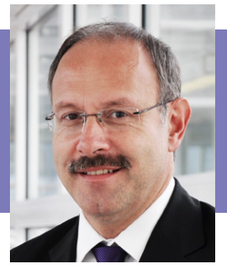
LOCAL COMMUNITIES AS A PATHWAY

The OPENNEXT project is supporting the adoption of OSH development practices among companies. OPENNEXT focuses on enabling and engaging fab labs/makerspaces in order to provide a pathway for the new OSH model and support SMEs in turning their open hardware into marketable products.

To fully unleash the potential of OSH, OPENNEXT researchers seek the participation and engagement of consumers and citizens through open design and co-development of products with SMEs. The researchers are demonstrating successful company-community collaboration through their use of case studies featuring open innovation among companies and both online and grassroots communities.

Their support to the communities will be through the companies, whereby they provide guidance to them on how to reach out, engage, and maintain the collaboration with these communities. Throughout Europe, the researchers from the OPENNEXT project are raising awareness of the values of OSH and facilitating participation within OSH communities. They are currently running a series of workshops, gathering academics, stakeholders and practitioners to exchange ideas and explore the challenges involved in making OSH. The researchers explain that "we see open source sharing and co-creation as the natural next step in a digital transformation that is already upending global production and providing access to new, specialised knowledge everywhere". They view closed business models and closed innovation environments as something of the past – the future of product creation is open and inclusive.

The project follows the progress of 18 SMEs from three different consumer market sectors: eco-friendly mobility, built-to-order furniture, and consumer electronics. Their journeys will be documented. OPENNEXT provides SMEs with the required infrastructure and business support to enable them to integrate OSH into new marketable user-friendly products. For more information about the OPENNEXT project, visit https://www.opennext.eu.



Behind the Research

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Detail

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Bio

Professor Roland Jochem is Head of the Chair of Quality Science at the Technische Universität Berlin, Germany. He is also an Extraordinary Professor for Quality Management at the Stellenbosch University, South Africa. He obtained his doctorate of engineering sciences in 2002 at the Technische Universität Berlin. He is a member of the Scientific Council of the Deutsche Gesellschaft für Qualität e.V. (DGQ), the Research Council of the Forschungsgemeinschaft Qualität e.V. (FQS), and the Gesellschaft für Qualitätswissenschaft (GQW).

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Project Partners

Research Objectives

The research of Professor Roland Jochem focuses on model-based process-oriented quality, standardised quality processes, quality management, quality excellence, organisational design of quality departments, and innovation and requirements management.

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Personal Response

How would you advise an SME to go about adopting the open source hardware model?

"SMEs are believed to be in an ideal position to take on a leading role in the open source evolution as key drivers of socioeconomic development all over the globe. By engaging in company-community collaborations, SMEs can grasp the opportunity of collaborative product creation working together with fab labs/makerspaces, as well as corresponding user communities, utilising what we call open source development (OSD) framework and the right IT tools. This collaboration promotes great opportunities in terms of cost reductions, market share expansion and higher customer satisfaction through the creation of user-centric consumer products."