



Health technology and medical innovation: why open-source is vital

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Resources that fulfill **fundamental needs** must have a **participatory** governance, regardless of who owns them.

Rodotà Commission and Italian Supreme Court
building on Nobel Prize Dr Elinor Ostrom

Examples

Open-source hand rub saves 8 million lives yearly



Interview with Dr Pittet
<https://www.openvillage.ch>

Crouzet T. Clean hands save lives. CreateSpace 2014.
<https://cleanhandssavelives.org/the-book/>



Open-source MRI scanners could spare 60-140 million € yearly in Germany alone



Interview with Dr Winter
<https://www.openvillage.ch>



<https://www.opensourceimaging.org>

Winter L et al. Open source medical devices for innovation, education and global health. Co-creation 2019. Archive at <https://www.researchgate.net>

Open-source prostheses

30000 volunteers, 0 € business model



Interviews with Dr Schull,
Gre-nable and Enable Nepal
<https://www.openvillage.ch>

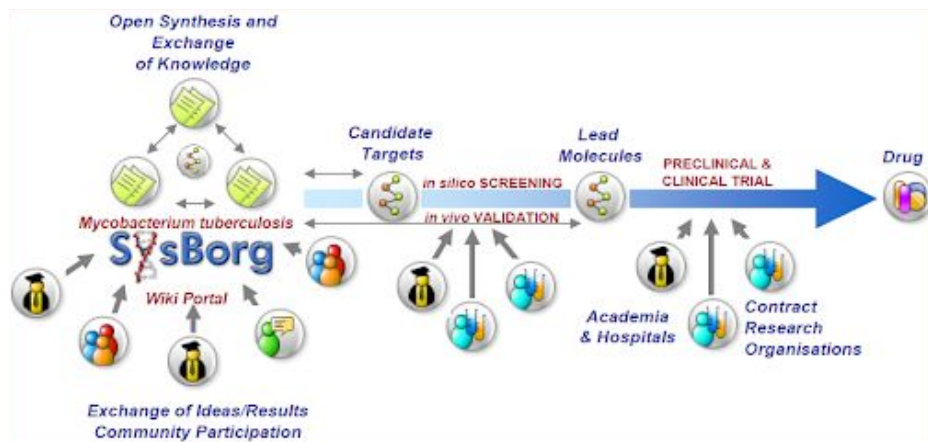


Open-source drug discovery

110 projects on neglected diseases



Interview with Dr Brahmachari
<https://www.openvillage.ch>



Open-source games for health

A ludic model to mutually take care



Interviews with Dr Kirszenbaum
and other commoners
<https://www.breathinggames.net>



<https://www.breathinggames.net>

Balli F et al. Mutual care taking GARD 2020. <https://doi.org/10.5281/zenodo.3451506>

Why it is vital

Being healthy requires commoning

"An ecolegal order would recognize the fundamental interconnectedness of our global problems and enable us to find appropriate, mutually supportive solutions that, instead of distinguishing law, politics, and economics at the local, state, or even international level, would mirror the interdependence of the problems they address."

Capra & Mattei, 2015

Doubling access to care

"At least half of the world's population cannot obtain essential health services [...] For almost 100 million people [medical] expenses are high enough to push them into extreme poverty."

United Nations, 2017

Fighting systemic corruption

"The industry's influence has expanded and a number of practices have developed which act against the public interest [...] linked to thousands of deaths [...] Public authorities seem] unable to prioritise the interests of patients and public health"

UK House of Commons, 2006

Cutting costs by 10 or 100

"Harnessing open-source methodology will ensure that funding used to develop scientific equipment is spent only once. A return on investment is achieved through digital replication of devices for just the cost of the materials required. This scaled replication saves 90–99% on conventional costs, making more scientific equipment available for research and education"

Pearce, 2014

Additional resources

Reminder of definitions

Freedom to use, modify, distribute

free/libre → social justice

open source → efficiency of development

≠

Gratis

open access → free of cost for users

Free Software Foundation. What is free software? 2021. <https://www.gnu.org/philosophy/free-sw.html>

Open Source Initiative. The Open Source Definition. 2007. <https://opensource.org/docs/osd>

Budapest Open Access Initiative. Read the Budapest Open Access Initiative. 2003. <https://www.budapestopenaccessinitiative.org/read>

Three steps to start

Balli F et al. Guide to self-organize after EUvsVirus. Unpublished.

Choose 3 goals you contribute to	Follow 3+ design principles	Make your project future-proof
<p>No poverty</p> <p>Zero hunger</p> <p>Good health and well-being</p> <p>Quality education</p> <p>Gender equality</p> <p>Clean water and sanitation</p> <p>Affordable and clean energy</p> <p>Decent work and economic growth</p> <p>Industry, innovation, and infrastructure</p> <p>Reducing seg inequality</p> <p>Sustainable cities and communities</p> <p>Responsible consumption and production</p> <p>Climate action</p> <p>Life below water</p> <p>Life on land</p> <p>Peace, justice, and strong institutions</p> <p>Partnerships for the goals</p> <p><u>More</u></p>	<p>Design with user</p> <p>Understand the existing ecosystem</p> <p>Design for scale</p> <p>Build for sustainability</p> <p>Be data driven</p> <p>Use open standards, open source and open innovation</p> <p>Reuse and improve</p> <p>Address privacy and security</p> <p>Be collaborative</p> <p><u>More</u></p>	<p>Document your work, share it on Internet with a licence that allows others to freely improve and build on it, even if you step out:</p> <ul style="list-style-type: none"> - <u>Creative Commons Attribution ShareAlike</u> for documents - <u>GNU Affero General Public Licence</u> for software - <u>CERN Open Hardware Licence</u> for equipment

Level 2

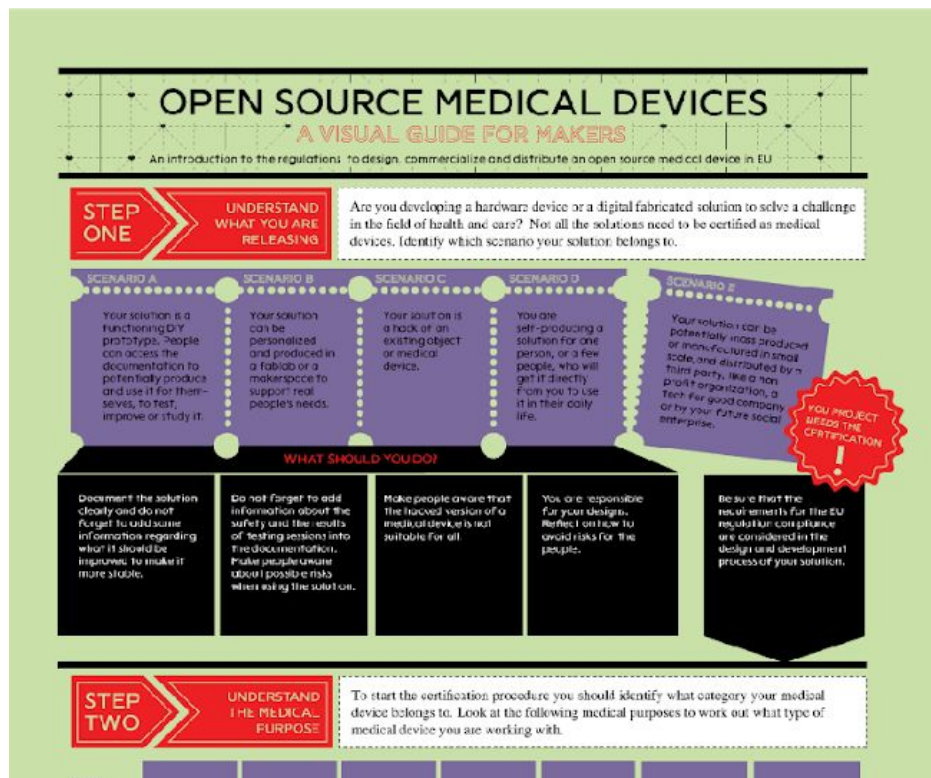
<p>Define the targets you contribute to.</p> <p>For example, <u>target 3.2</u>: we contribute to “end preventable deaths of newborns and children under 5 years of age” by...</p>	<p>Is your work</p> <ul style="list-style-type: none"> - as understandable as possible for vulnerable populations? - scientifically validated? - fulfilling with regulatory authorities? 	<p>Can a 10 year old child or a grandparent</p> <ul style="list-style-type: none"> - find and understand your work? - enhance it without technical knowledge? - get the material / support to reproduce it? - be rewarded for their contribution?
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Self-assessment

Balli F, Kellner E, Le Couedic C, Matringue M. GHF Open Village. Unpublished.

	0 - Minimum	1	2	3	4 - Maximum
Health (see Grenhalgh)	not acting, not supported (isolated)	coping with illness (disease management)	whole-system approach (prevention, promotion)	critical public health (political action)	holistic, lifelong wellbeing
	low adhesion ←				→ intimate adhesion
People	experts alone	users consulted in end product	users give inputs in certain stages	users participate on full life cycle	users adopt initiative for other aims (forking)
	top-down ←				→ bottom-up
Process, standards, documents, software, etc.	closed not shared	closed and shared	partly open and shared	fully open and shared	fully libre, contributing to other libre projects
	opaque ←				→ trustable
Licenses including for the core	patent, copyright	patent with free reuse	public domain (ex. CC 0)	non-commercial licence (ex. CC BY-NC)	Reciprocity (ex. Peer Production lic.)
	excluding use ←				→ building commons
Resource allocation (see Benkler)	for-profit company	social enterprise, cooperative	open access commons	open access commons with value accounting	as few projects as possible, as much as needed
	extractive, top-down ←				→ generative, emerging
Physical availability	not produced	centralized	decentralized	distributed, industries (mass production)	distributed, communities (crowd production)
	not available ←				→ locally reproducible
Impact (see Guba and Lincoln)	not tested	tested with users	positivist, quantitative studies	naturalistic, mixed methods, one setting	naturalistic, mixed methods, multi settings
	not validated ←				→ validated

Guide for makers



Download in English or Italian
<http://wemake.cc/digitalsocial/osmd-a-visual-guide-for-makers/>

Further examples

HEALTH TECHNOLOGY AS COMMONS: TRUSTABLE, AFFORDABLE, ADAPTABLE

Geneva Health Forum 2020 · Open Village · www.openvillage.ch

6 in 10 humans still have no access to care, or do not adhere to it, despite rising investments.¹⁻³

Alcohol-based hand rub⁴ and WikiMed⁵ illustrate how creating freely reproducible equipment and software with communities can: save millions of lives, increase integrity, cut costs by 90%.

Cooperation-driven care is the only way to realize the 2030 agenda in time: health for everyone.⁶

We present nine alternatives to the dominant proprietary excluding innovation model, to drive development towards a responsible, solidar society.

Hand prosthesis to ease one's daily life

A prosthetic hand usually costs 6-10 K€. Enable brings together over 30000 volunteers who design and distribute 3D-printed prostheses to vulnerable people. www.enablingthefuture.org + www.gre-nable.fr + www.enablenepal.org



Drugs produced with integrity

India has a pioneer approach in pharmaceuticals. Open Source Drug Discovery brings together 7900 people who collectively develop open-source, low-cost therapies for neglected diseases such as tuberculosis, malaria, leishmaniasis. www.osdd.net



Open-sourcing MRI could save the German healthcare over 200 M€ yearly⁷

Medical imaging is crucial in diagnosing, understanding and treating a number of diseases. The Open Source Imaging initiative gathers experts to create MRI scanners that can be built and maintained for a fraction of the cost of current MRIs. www.opensourceimaging.org



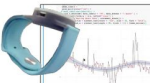
Ultrasound scanner in the pocket

One in three persons have access to medical imaging. A portable ultrasound device usually costs 8-22 K€. EchOpen develops a probe to visualise organs on a smartphone. It helps guide the diagnosis and make patient management more fluid. www.echopen.org



Detecting seizures with wearables

50 million people have epilepsy, 1/3 are drug resistant. Epileptic seizures lead to daily stress and social exclusion. We develop wearables and software to log and analyse biological data. www.aura.healthcare + www.openhumans.org + www.cri-paris.org



Making air pollution a visible matter



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Spanish, Portuguese, Russian,
Chinese, Hindi, Bengali, Arabic
<http://www.openvillage.ch>

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Thank you



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