Open Source Hardware Seminar – Class 3

Julieta Arancio
Robert Mies
Technische Universität Berlin, Institute for Machine Tools and Factory Management, Chair of Quality Science

TOC

- Phases of open source hardware development
- Core elements of OSH projects
- The OSH canvas
- Community-driven innovation
  - Tools for mapping values & assumptions
- Business models
  - Technology adoption life cycle (TALC)
  - Examples

Introduction
Phases of OSH development

Openness can happen at different stages

Table 3. Summary of main outcomes of open technology readiness levels.

Level no.	Short level description	Main outcome
OTRL-1	Ideation / needs identification	Product idea, needs and initial specifications are defined
OTRL-2	Conception / definition of product architecture	Mature product concept has been formulated
OTRL-3	Design and modelling	Product model is developed
OTRL-4	Prototyping and testing	Full functional prototype is built and tested
OTRL-5	Manufacturing development	Fairly reliable processes identified and characterised
OTRL-6	Product qualification	Certificate marking conformity assessment or comparable

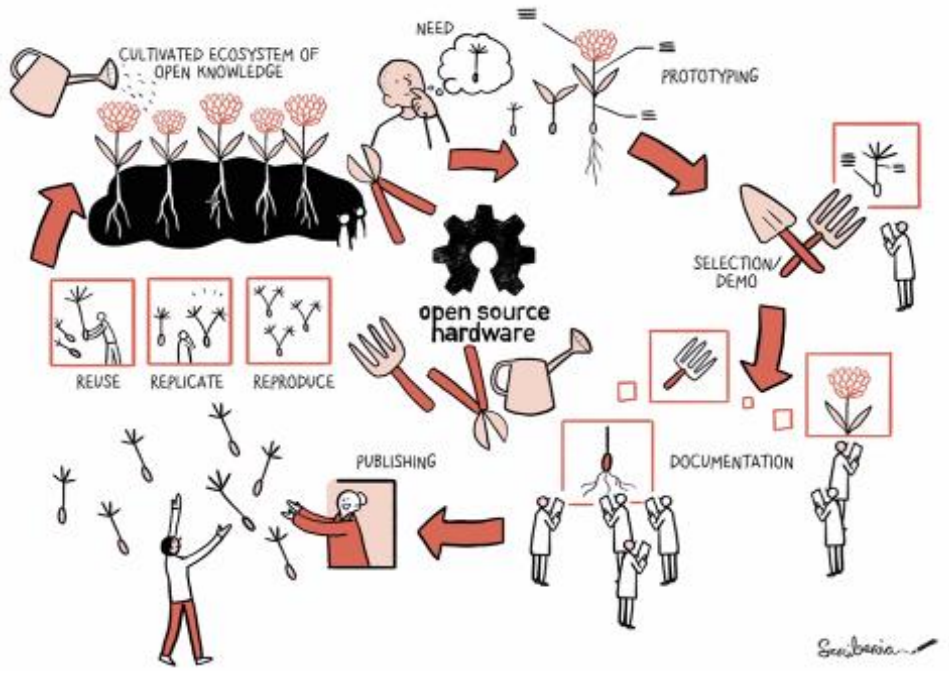
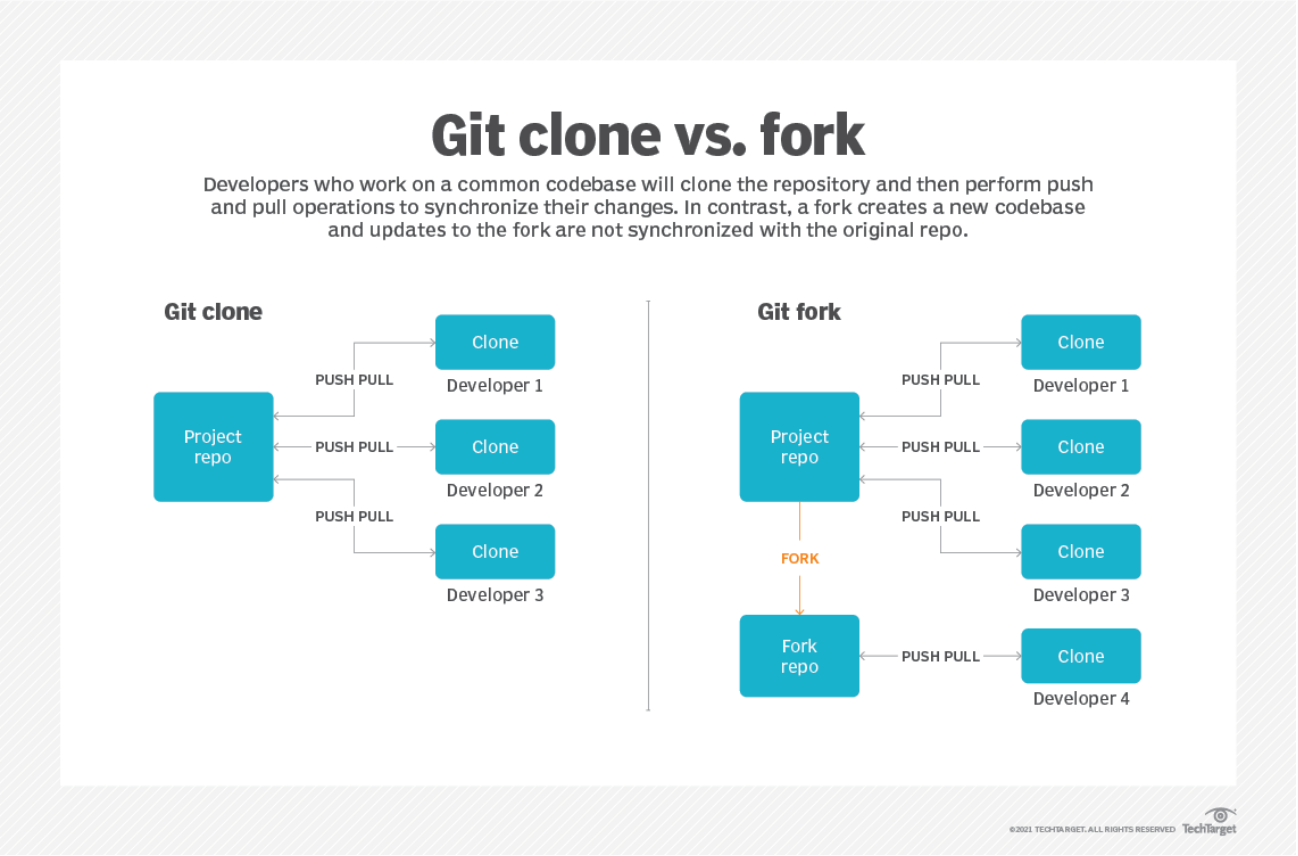


Table source: Mies, R., Häuer, M., & Hassan, M. (2022). Introducing readiness scales for effective reuse of open source hardware. Procedia CIRP, 109, 635-640.

Image source: Scriberia https://www.scriberia.com/

Staging a project
Understanding the community context

Original, contribution, fork…?



Source: TechTarget

Staging a project
Core elements of OSH projects

Working with value propositions

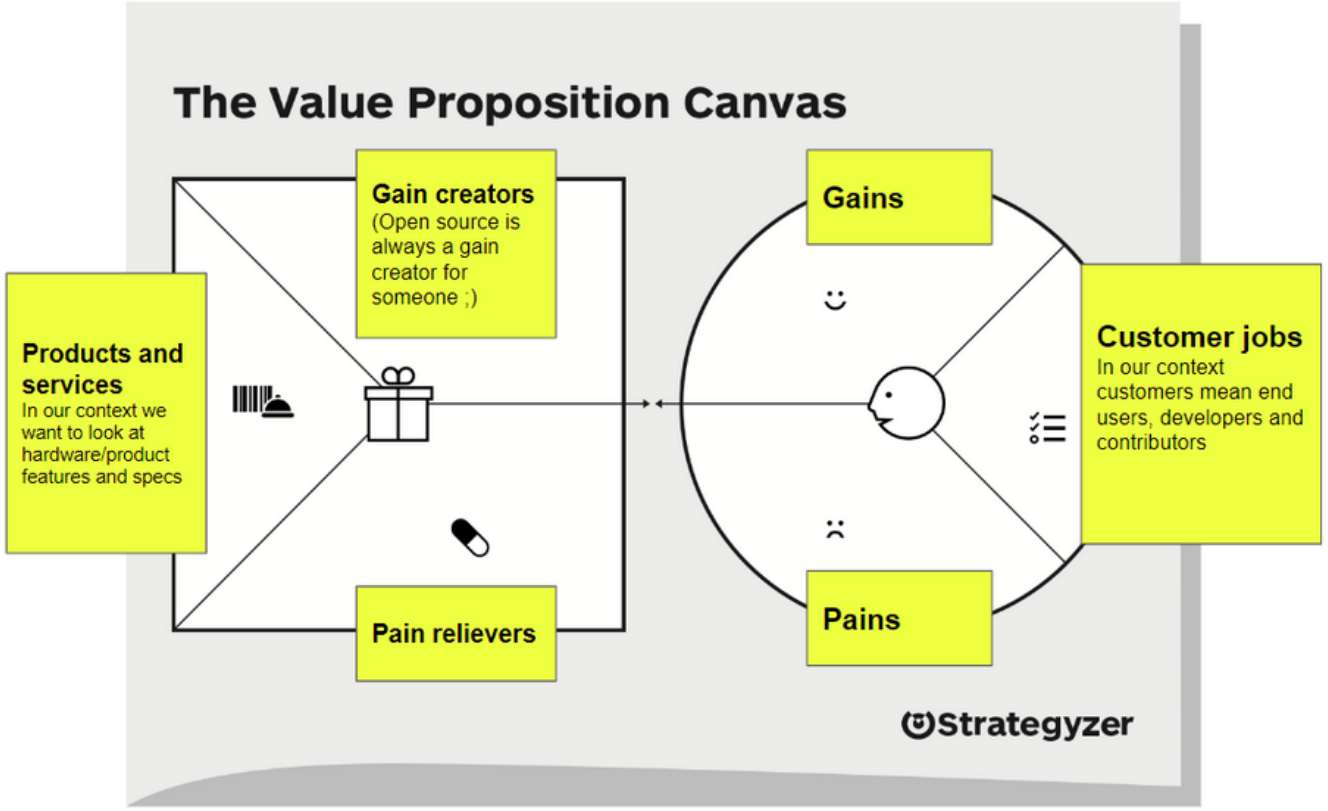
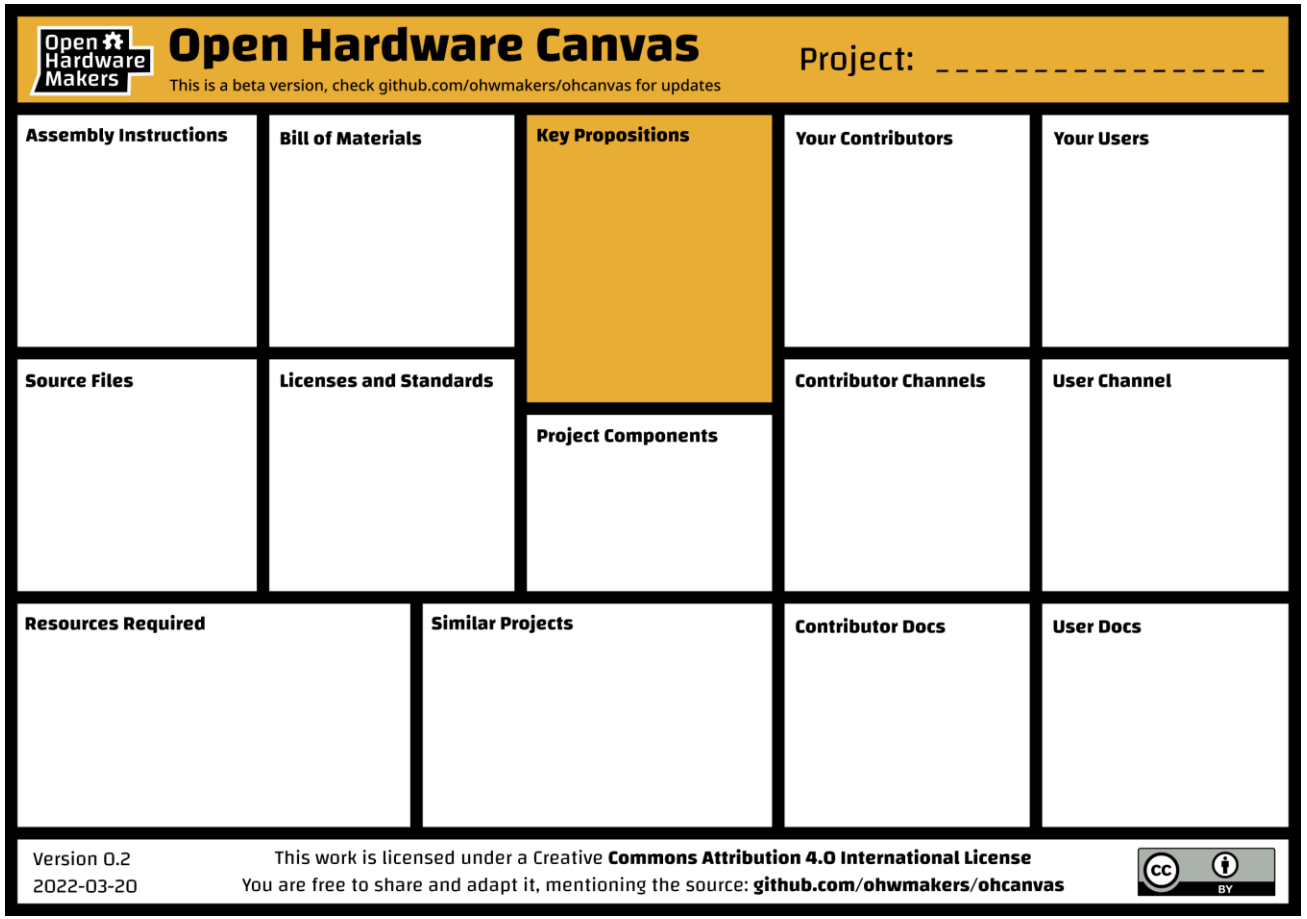


Image source: Open Hardware Academy
https://openhardware.academy

Staging a project

The open hardware canvas

All project components at a glance



Open Hardware Canvas

This is a beta version, check github.com/ohwmakers/ohcanvas for updates

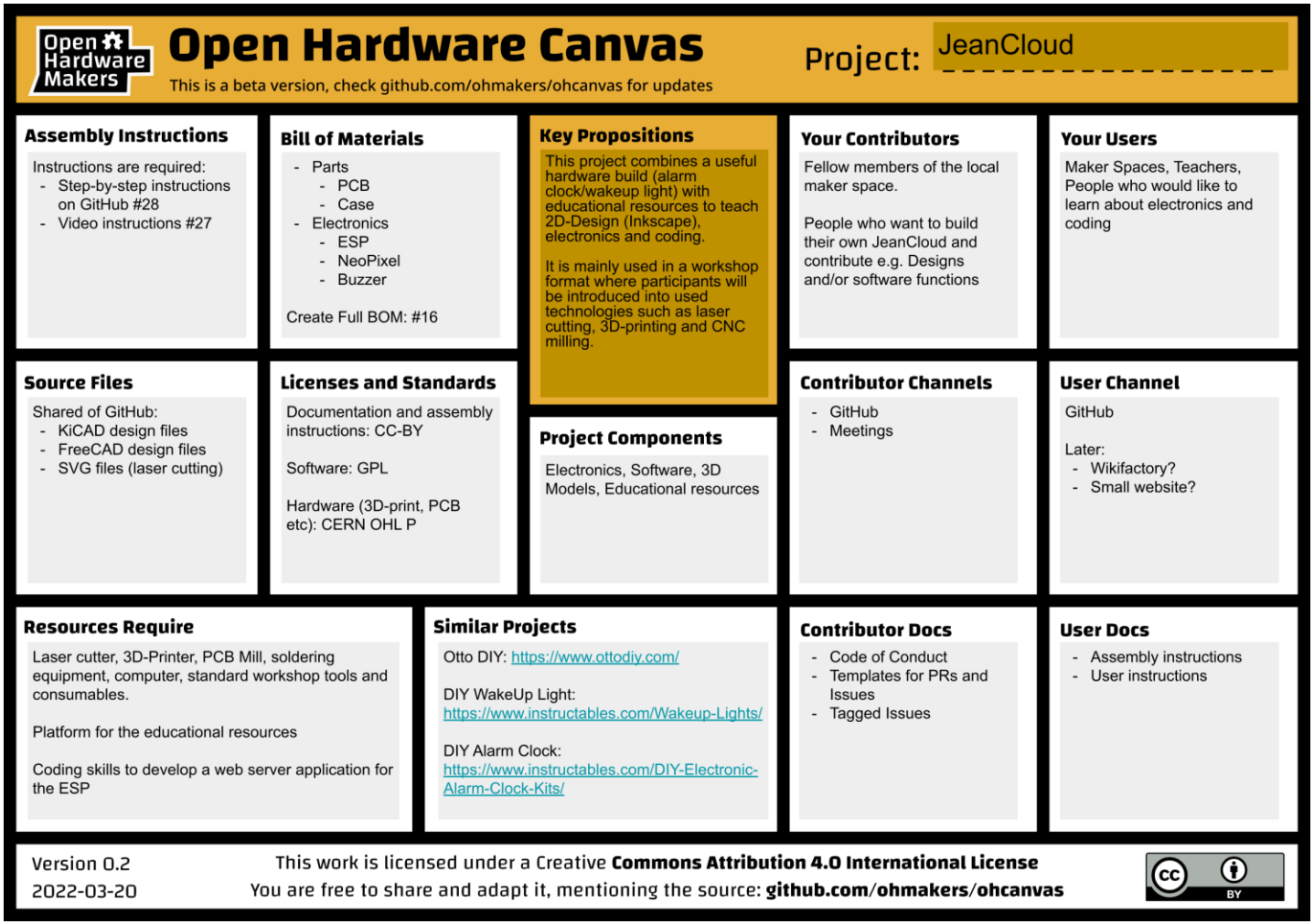
Project: _____

Assembly Instructions	**Bill of Materials**	**Key Propositions**	**Your Contributors**	**Your Users**
Source Files	**Licenses and Standards**	**Project Components**	**Contributor Channels**	**User Channel**
Resources Required	**Similar Projects**		**Contributor Docs**	**User Docs**

Version 0.2
2022-03-20

This work is licensed under a Creative **Commons Attribution 4.0 International License**
You are free to share and adapt it, mentioning the source: **github.com/ohwmakers/ohcanvas**

Staging a project
The open hardware canvas
An example project



Open Hardware Canvas

Open Hardware Makers

This is a beta version, check github.com/ohmakers/ohcanvas for updates

Project: JeanCloud

Assembly Instructions

Instructions are required:
- Step-by-step instructions on GitHub #28
- Video instructions #27

Bill of Materials

- Parts
  - PCB
  - Case
- Electronics
  - ESP
  - NeoPixel
  - Buzzer

Create Full BOM: #16

Key Propositions

This project combines a useful hardware build (alarm clock/wakeup light) with educational resources to teach 2D-Design (Inkscape), electronics and coding.

It is mainly used in a workshop format where participants will be introduced into used technologies such as laser cutting, 3D-printing and CNC milling.

Your Contributors

Fellow members of the local maker space.

People who want to build their own JeanCloud and contribute e.g. Designs and/or software functions

Your Users

Maker Spaces, Teachers, People who would like to learn about electronics and coding

Source Files

Shared of GitHub:
- KiCAD design files
- FreeCAD design files
- SVG files (laser cutting)

Licenses and Standards

Documentation and assembly instructions: CC-BY

Software: GPL

Hardware (3D-print, PCB etc): CERN OHL P

Project Components

Electronics, Software, 3D Models, Educational resources

Contributor Channels

- GitHub
- Meetings

User Channel

GitHub

Later:
- Wikifactory?
- Small website?

Resources Require

Laser cutter, 3D-Printer, PCB Mill, soldering equipment, computer, standard workshop tools and consumables.

Platform for the educational resources

Coding skills to develop a web server application for the ESP

Similar Projects

Otto DIY: https://www.ottodiy.com/

DIY WakeUp Light: https://www.instructables.com/Wakeup-Lights/

DIY Alarm Clock: https://www.instructables.com/DIY-Electronic-Alarm-Clock-Kits/

Contributor Docs

- Code of Conduct
- Templates for PRs and Issues
- Tagged Issues

User Docs

- Assembly instructions
- User instructions

Version 0.2
2022-03-20

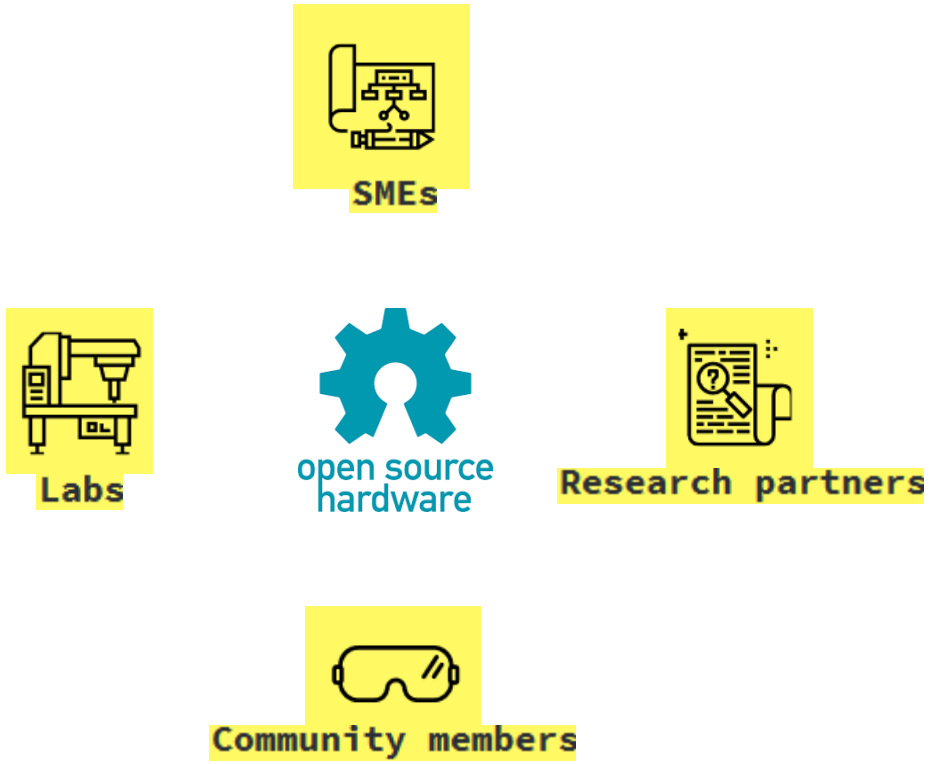
This work is licensed under a Creative **Commons Attribution 4.0 International License**
You are free to share and adapt it, mentioning the source: **github.com/ohmakers/ohcanvas**

Source: Open Hardware Makers
https://openhardware.space

Opening up the ideation phase
Community-driven innovation

Connecting innovative communities and SMEs

1. Getting ready to begin
2. Understanding each other
3. Understanding the context
4. Developing a concept
5. Framing the collaboration
6. Learning and validating
7. Building a community
8. Creating a prototype
9. Setting up production
10. Launching to public
11. Analysing and evaluating



Source: OPEN_NEXT (869984) Deliverable 4.1 “Draft demonstrator framework”, URL: https://cordis.europa.eu/project/id/869984/results.

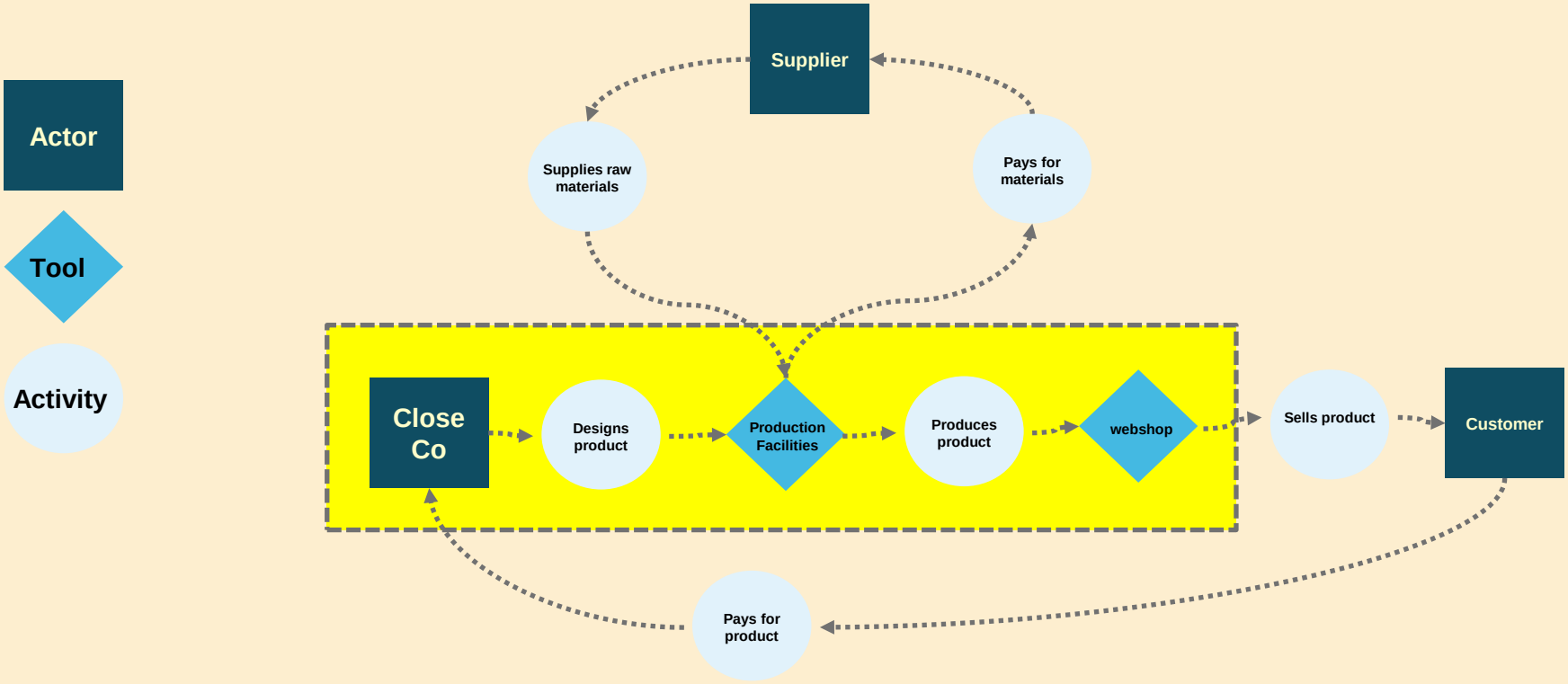
Community-driven innovation

Tools for success

Value system mapping

Example: Close Co.

Close Co. makes wooden closets they sell through their webshop



Community-driven innovation

Tools for success

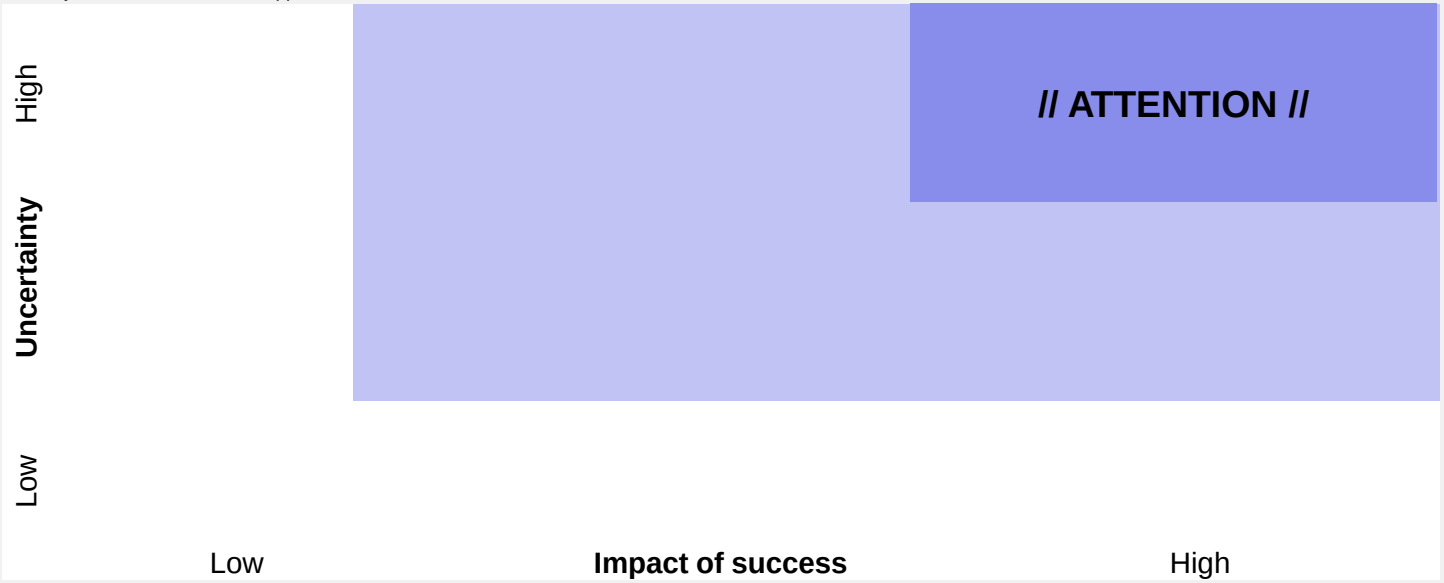
Assumptions mapping

1) Launch pad

Risks and opportunities to be mapped

2) Assumption mapping

Move your identified risks and opportunities into the matrix below



3) Action points

Note down how you are going to validate your most important assumptions

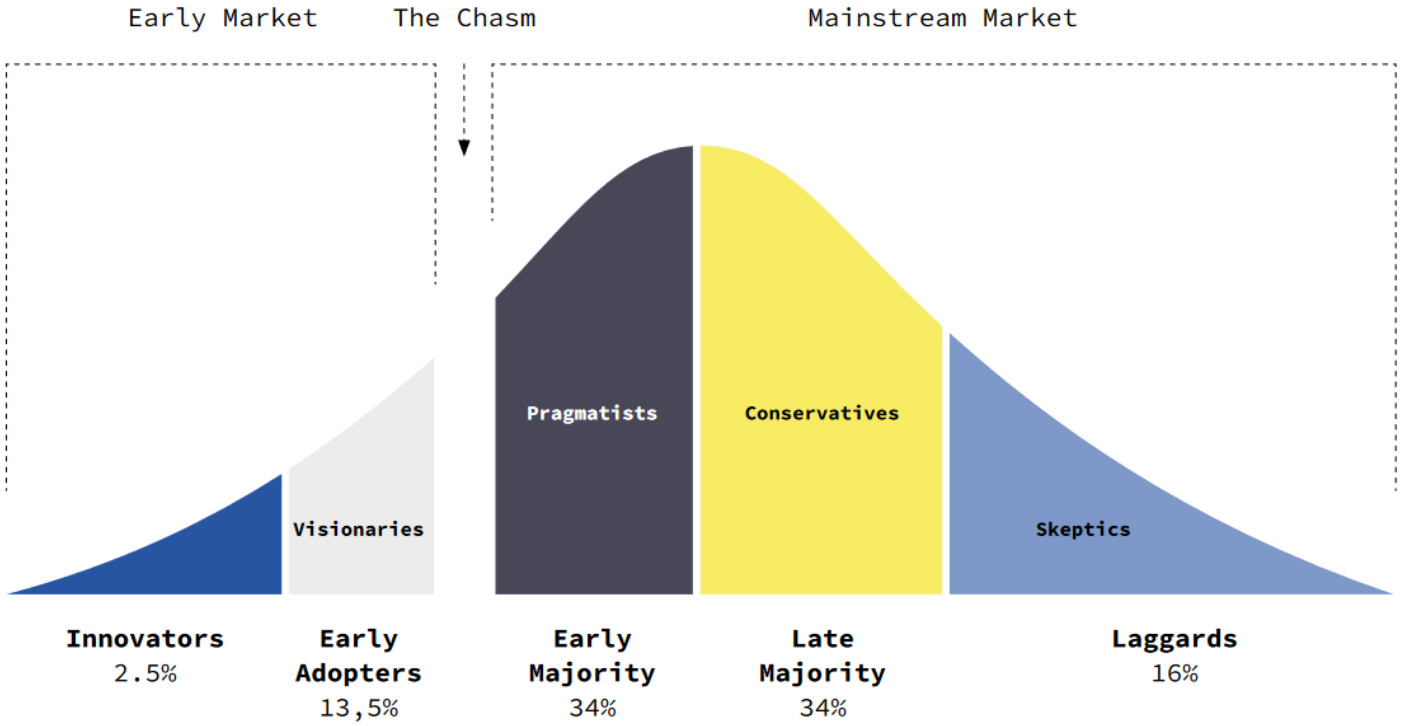
Business models
Strategic approaches model

Non-exclusive, complementary approach

OPEN_NEXT (869984) Deliverable 4.3
"Third release of the Open Source business model development framework"

Business models
Technology adoption life cycle (TALC)

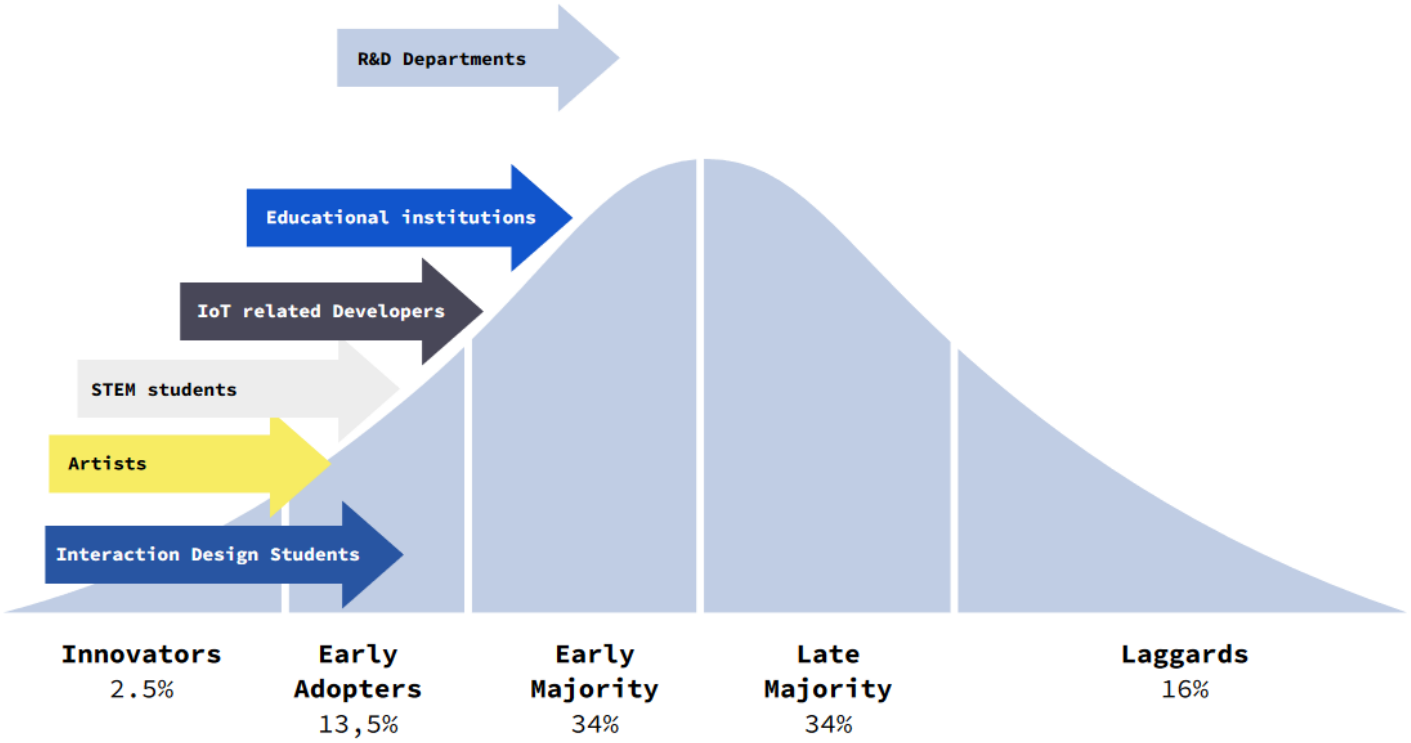
Understand your users through life cycle of a project



OPEN_NEXT (869984) Deliverable 4.3
"Third release of the Open Source business model development framework"

Business models
Examples

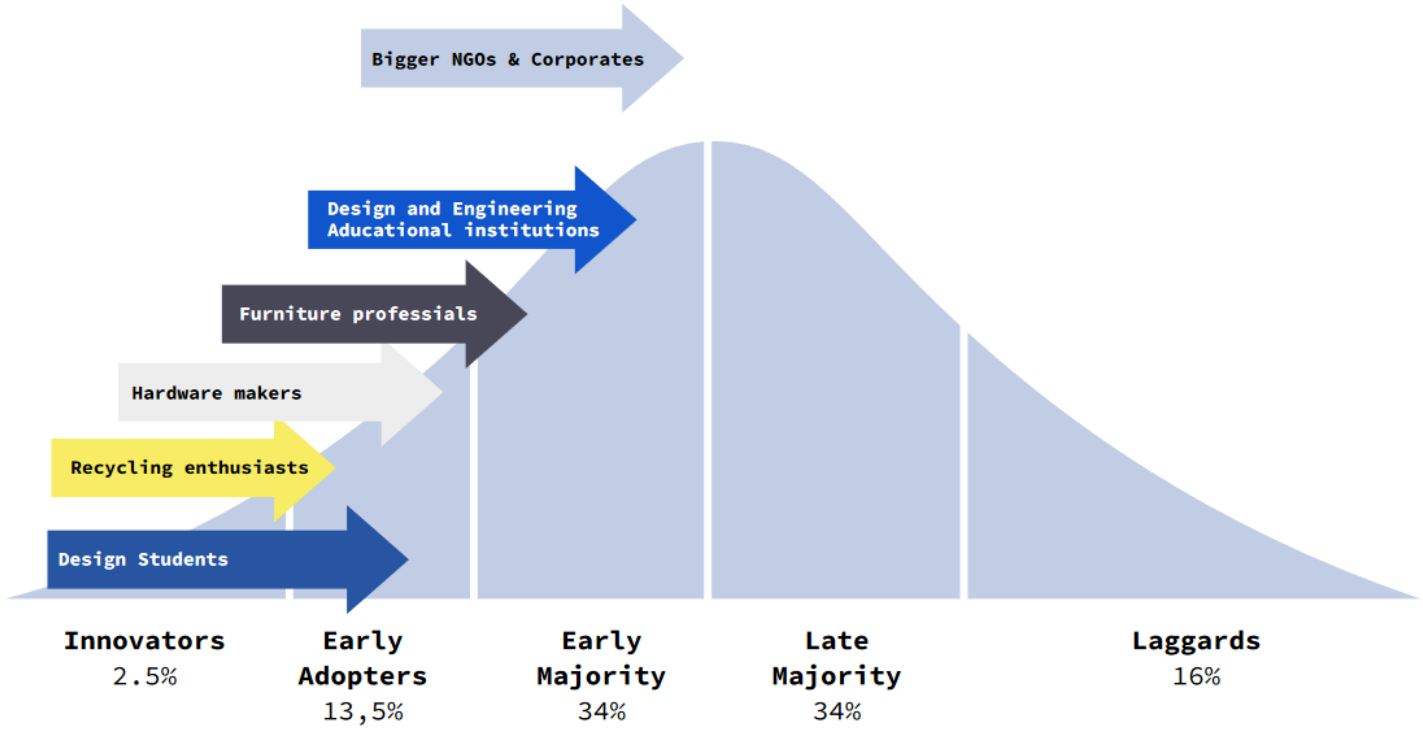
Arduino



OPEN_NEXT (869984) Deliverable 4.3
"Third release of the Open Source business model development framework"

Business models
Examples

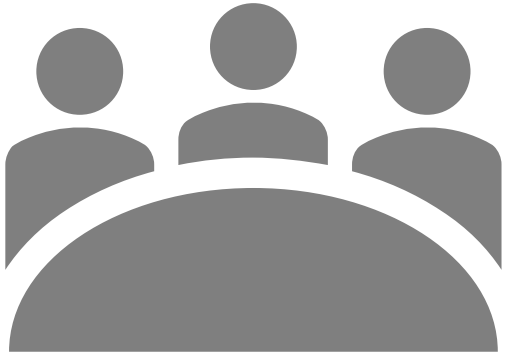
Precious Plastic



OPEN_NEXT (869984) Deliverable 4.3
"Third release of the Open Source business model development framework"

Summary

- Openness can happen at different stages in OSH projects
- Not all projects go through all stages
- Projects can emerge from original design work or forks
- Understanding the project value proposition is key both as a strategy and communications tool
- The OH canvas summarizes all elements of an OSH strategy: technical, user/contribution side, and value propositions
- Community-driven innovation facilitated by OSH is a potential pathway towards more sustainable and responsible innovation
- Community-SMEs collaboration has to be carefully designed to avoid conflict and prepare the teams for success; values and assumptions mappings are useful tools in this process
- Business models for OSH are essential to guarantee dissemination and sustainability
- The strategic approach proposes a set of complementary business models for OSH companies
- TALC is a useful model for OSH companies aiming to understand the dynamics of user adoption



Julieta Arancio, Guest Researcher
Robert Mies, Research Associate
Technische Universität Berlin
Institute for Machine Tools and Factory Management
Chair of Quality Science
PTZ 3, Pascalstr. 8-9, 10587 Berlin
+49 (30) 314-25930
robert.mies@tu-berlin.de
arancio@campus.tu-berlin.de
www.qw.tu-berlin.de | www.openmake.de | www.opennext.eu

Thank you for your attention!