# CERN OSHW Survey - Perusraportti (edited)

## 1. Which of the following most closely matches your job title?

Number of respondents: 100
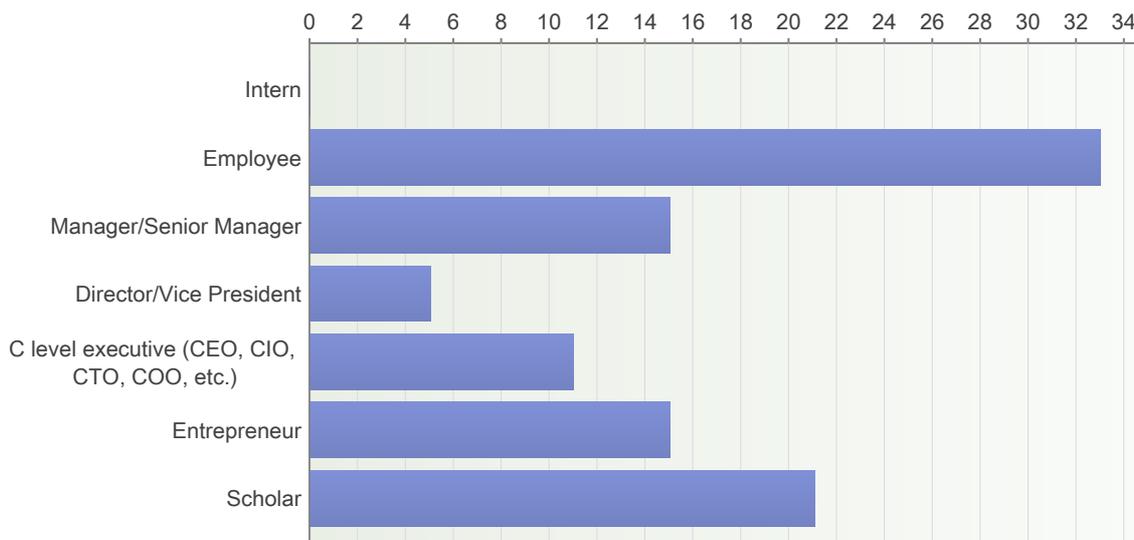
## 2. In which function do you work?

Number of respondents: 101
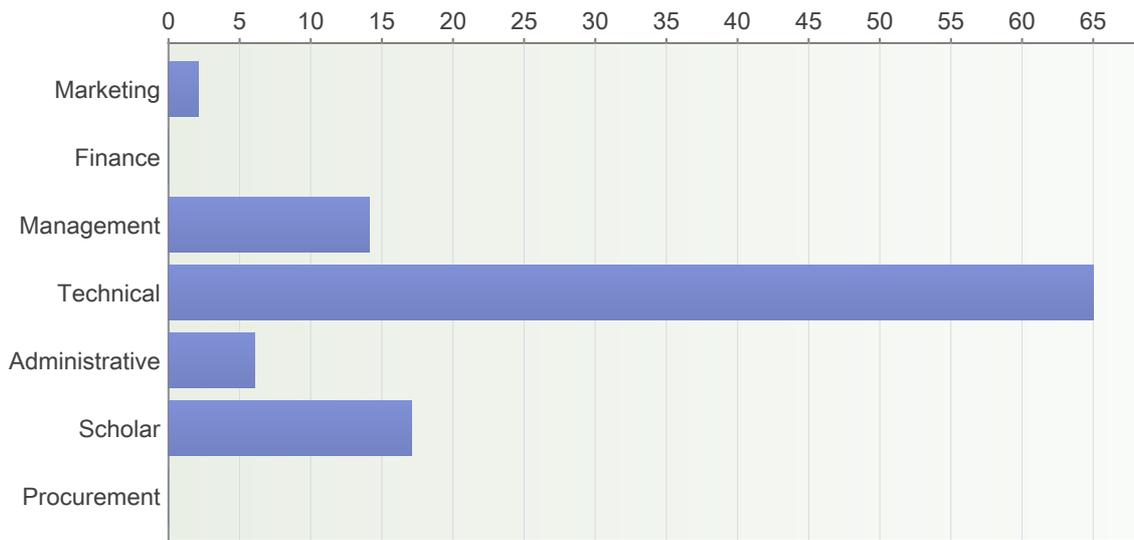
## 3. What is the organisation you work for?

- A hardware company, specializes in biological lab equipment
- Seven Solutions S.L.
- 7S
- Memorial University of Newfoundland
- Creotech Instruments
- self-employed
- Institute IRNAS Race http://irnas.eu
- M-Labs.hk
- Opentrons Labworks
- A sme company with focus on the industry of science
- CERN
- Arduino.cc
- Igalia
- Novaetech SRL
- Trend in Africa
  university of Tuebingen
  open neuroscience
- Uct
- CERN
- GL Research
- JIVE (Joint Institute for VLBI - ERIC)
- Nikhef
- CNRS
- Particle physics research institute
- Fermilab
- Warsaw university of Technology
- Public Lab
- CNRS
- Brazilian Synchrotron Light Laboratory (LNLS)
  Brazilian Center for Research in Energy and Materials (CNPEM)
- University
- Varmora Infotech Pvt ltd
- Kumasi Hive; an innovation and entrepreneurship hub providing  comprehensive supporting services to facilitate and grow local innovation and support entrepreneurs to grow their business.

  Its student community, Creativity Group providing the supporting platform to train as makers, hackers, entrepreneurs among others and provide needed resources for university undergraduate to use technology and innovations to solve problems in our society.
- ALBA Synchrotron
- infn
- id quantique
- Paris Observatory
- CNPEM (Centro Nacional de Pesquisa em Energia e Materiais)
- LNLS - Brazilian Synchrotron Light Source
- Brazilian Synchrotron Light Source (LNLS/CNPEM)
- INCAA Computers
- MagentaSys
- Cosylab.

- Creotech Instruments
- Brazilian University
- IGALIA
- Backyard Brains
- Private Company
- Janz Tec AG
- cern
- GaudiLabs
- Cern
- University Zuerich
- VTT Technical Research Centre of Finland Ltd
- Creotech, Warsaw University of Technology
- Biotech Company
- Novaetech Srl - openQCM project
- University of Toronto
- ITAS-KIT
- Teaching, University
- university of cambridge
- Public Lab
- Public Laboratory for Open Technology and Science (Public Lab)
- Sustainable Construction
- Nikhef
- Nikhef
- oshw
- scientific instrument manufacturer
- independent consultant
- not applicable
- University; Civil society organisation
- acquisition data and detector front-end electronic boards
- university of Geneva
- Open Science
- University
- Eudaemonic Systems & it is my start-up.
- Fhoado Torg LLC
- Institute of Physics, Academia Sinica, Taiwan
- Informatic Research Center
- Elphel
- Private
- University of Virginia in the US
- SparkFun Electronics
- Illuminati - Cyborg Society division
- An electric vehicle company
- IoT Partners
  http://www.iot-partners.com
- LBNL
- Libre Objet
- RepRap DIY
- University of Cambridge
- European Spallation Source
- Softbank Robotics Europe

- GSI
- 3D Central, full service 3D Print shop
- CERN
- Technolution B.V. and Delft University of Technology
- ESRF - The European Synchrotron
- Free Knowledge Institute
  (above job roles and functions are hard to choose from ;-)

## 4. In which sector does your organisation operate?

Number of respondents: 101
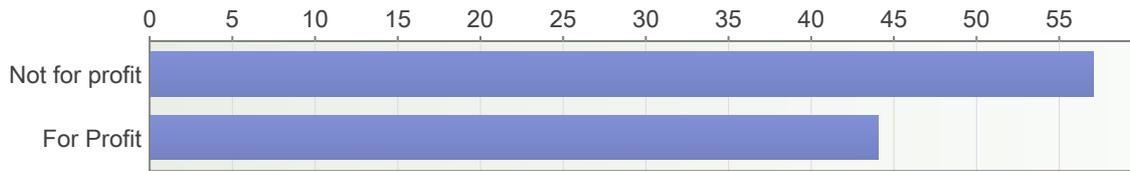
## 5. What is your age?

Number of respondents: 99

| Age group | Count |
|---|---|
| Under 18 years | 0 |
| 18 to 24 years | 3 |
| 25 to 34 years | 34 |
| 35 to 44 years | 37 |
| 45 to 54 years | 19 |
| 55 to 64 years | 5 |
| 65 years or older | 1 |
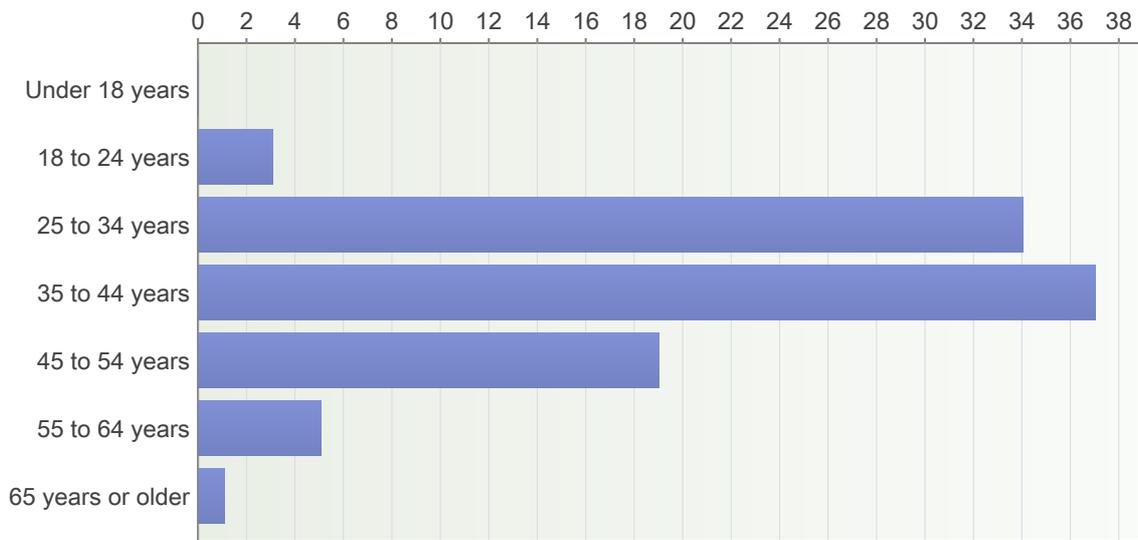
## 6. What is your education level?

Number of respondents: 100
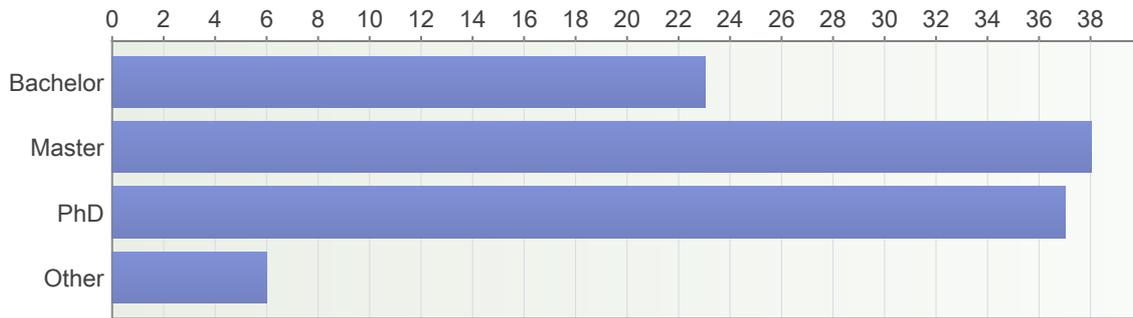
## 7. Gender

Number of respondents: 97
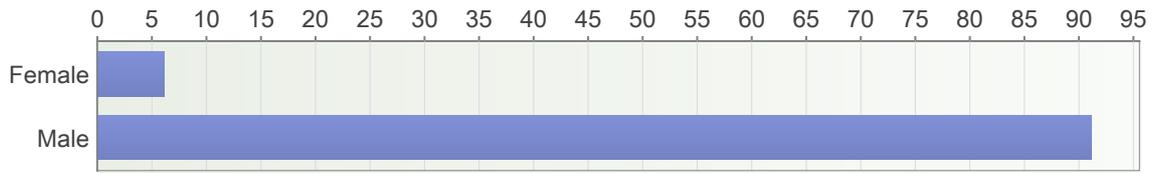
## 8. How would you describe your role(s) related to OSHW?

*Please tick all that applies*

Number of respondents: 100

| Role | Value |
|------|-------|
| Student | 11 |
| Hobbyist | 28 |
| Entrepreneur | 37 |
| Technician | 22 |
| Educator | 28 |
| Scientist | 37 |
| Fabricator | 17 |
| Engineer | 64 |
| Programmer | 44 |
| Maker | 35 |
| Hacker | 31 |
| Designer | 41 |
| Inventor | 25 |
| Researcher | 40 |
| Administrator | 12 |
| Lawyer | 3 |
| Buyer | 18 |
| Other | 3 |
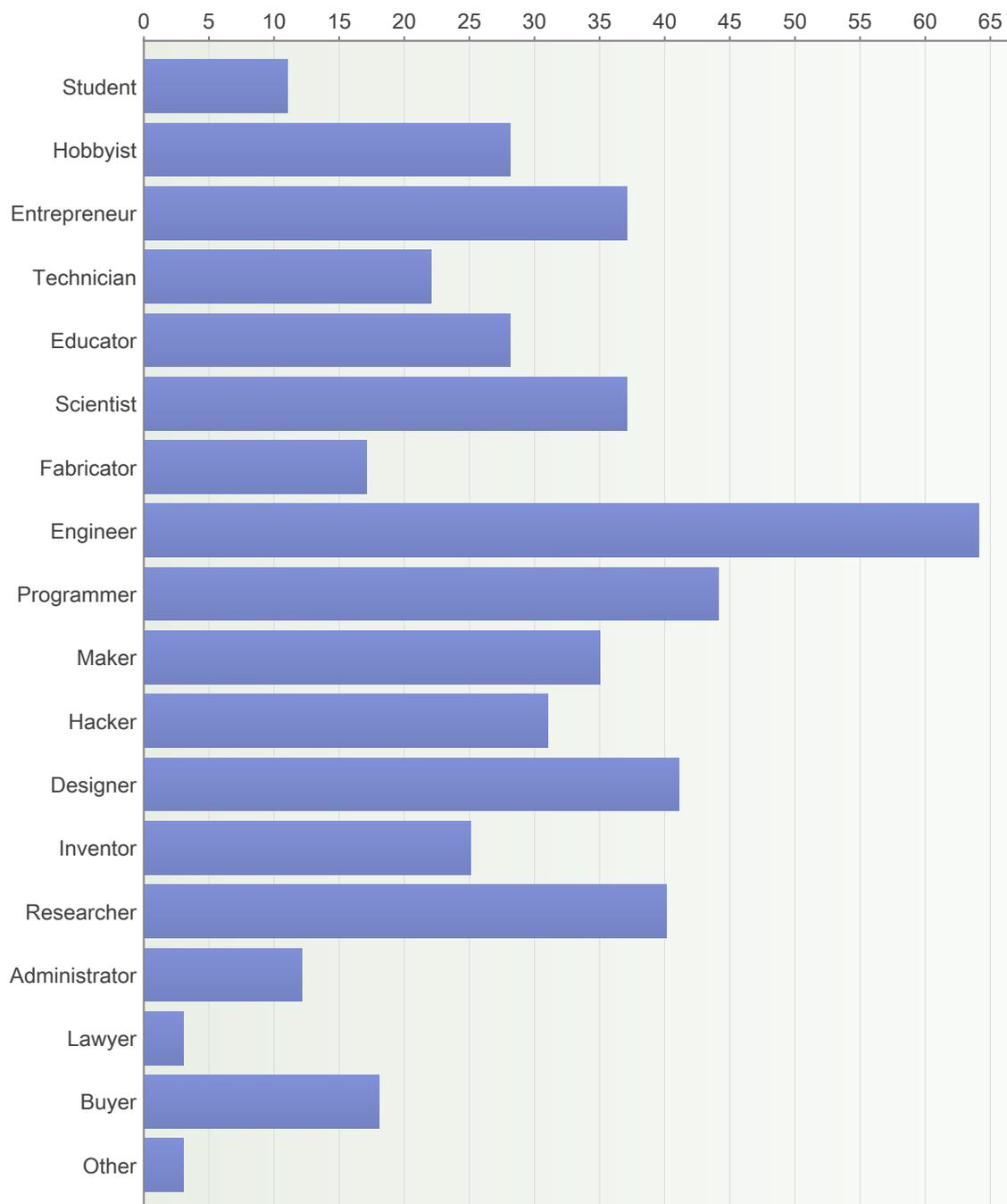
## 9. Using OSHW speeds up the technology development process

Number of respondents: 99

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 1 | 4 | 10 | 21 | 33 | 30 | 7=strongly agree | 99 | 5.73 |

## 10. Using OSHW decreases manufacturing costs

Number of respondents: 97

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 1 | 5 | 10 | 20 | 27 | 17 | 17 | 7=strongly agree | 97 | 4.92 |

## 11. OSHW enables highly customisable products

Number of respondents: 100

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 0 | 1 | 14 | 13 | 33 | 39 | 7=strongly agree | 100 | 5.95 |

## 12. In OSHW, technology development efforts are shared among various organisations

Number of respondents: 98

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 2 | 5 | 5 | 25 | 30 | 31 | 7=strongly agree | 98 | 5.72 |

## 13. Few organisations use OSHW

Number of respondents: 96

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 3 | 6 | 17 | 19 | 32 | 19 | 7=strongly agree | 96 | 5.33 |

## 14. OSHW markets are easy to enter

Number of respondents: 92

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 1 | 11 | 16 | 27 | 15 | 15 | 7 | 7=strongly agree | 92 | 4.27 |

## 15. OSHW revenues come from providing after sales support

Number of respondents: 92

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 7 | 6 | 9 | 27 | 16 | 19 | 8 | 7=strongly agree | 92 | 4.39 |

## 16. OSHW licenses are difficult to enforce

Number of respondents: 93

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 2 | 7 | 7 | 25 | 15 | 27 | 10 | 7=strongly agree | 93 | 4.77 |

## 17. OSHW best suits projects where technical complexity is low

Number of respondents: 98

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 18 | 30 | 16 | 20 | 6 | 5 | 3 | 7=strongly agree | 98 | 2.93 |

## 18. OSHW reduces the overall research and technology development costs

Number of respondents: 100

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 2 | 2 | 16 | 28 | 27 | 25 | 7=strongly agree | 100 | 5.51 |

## 19. OSHW production batches are small

Number of respondents: 96

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 2 | 7 | 5 | 30 | 18 | 24 | 10 | 7=strongly agree | 96 | 4.74 |

## 20. Using OSHW advances knowledge transfer

Number of respondents: 99

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 0 | 0 | 3 | 12 | 36 | 48 | 7=strongly agree | 99 | 6.3 |

## 21. OSHW requires companies to innovate fast in order to stay competitive

Number of respondents: 96

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 5 | 4 | 19 | 24 | 20 | 24 | 7=strongly agree | 96 | 5.27 |

## 22. Peer-review works efficiently in OSHW projects

Number of respondents: 97

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 1 | 4 | 6 | 25 | 27 | 24 | 10 | 7=strongly agree | 97 | 4.91 |

## 23. How do you monitor OSHW projects?

Number of respondents: 59

- Through websites, recommendations from colleagues
- RSS Feeds in wiki page of ohwr.org (not the best)
- Why would I do that?
- RSS feed

  e-mail notifications

  GitHub
- Twitter
- I use http://ohwr.org and look at the Status table.

  Also registered to mailing lists of the projects and may contact responsibles directly.
- online searches, hopefully now as well with the arrival of the journal HardwareX, and also by participating in Sketching in Hardware on a yearly basis
- Twitter, social networks, talking with colleagues.
- Internet
- I keep regular contact with the people involved.
- News, conferences, social media...
- internet ohwr.org website
- Using ohwr.org and using mailing lists
- github and OHWR tools
- - Mailing lists

  - Visiting Open Hardware Repository (www.ohwr.org) regularly

  - Notifications of github repositories

  - Web search

  - Direct contact with developers
- via the OHWR website and the email list.

  The annual news letter, and the published papers.
- Website, mailinglists
- Shared knowledge about best practices and community support provides the platform for monitoring OSHW.
- don't understand the question...
- Mailing list (1 project).
- GitHub, CrowdSupply, The Amp Hour podcast, Hack-A-Day.
- Using CERN's Open Hardware Repository
- I'm visiting the website from time to time.
- Checking how the project docunentation is organized. How acessible and inclisive are the tools user for development and communication. Finally, checking version control/repository activity ler me understand how active is the project, how many developers are actively making contributions.
- web, code repository and public resources
- Periodic checks, email lists, personal contacts
- We are the only one that commits to the projects.
- talk to people.
- mailing list
- CERN ohwr-site news.

  technology sites like hack-a-day, slashdot, etc.

  technology bloggers or youtubers (EEVblog and others)

  trade magazines
- ohwr, github, hackaday
- Using github platform mostly. In electronics, I used to visit Adafruit Sparkfun and Arduino website almost everyday.

  Stay connected with people involved in the development of OSHW using social network, mostly twitter.

- Mailing lists, wikis
- personal connections in the scene of oshw engineers
- Conference, website,..
- I do a poor job of monitoring OSHW projects, but I mostly periodically check websites and blogs of OSHW organizations I'm familiar with, and see what's new in the GOSH forum or Public Lab community.
- I go to real-world meetups for developers, discuss things, and follow people on twitter. I also engage in several hobby and professional interest online communities that somewhat overlap-- the Water and Sanitation sector (professional) and kite and balloon makers/fliers (hobby but also professional).

- github
  forums
- based on mailing lists and bug trackers, it can be a tough reading though on high-volume lists...
- simple
- the question is blurred

  if monitor the development : communities

  if monitor the use: trademark + working on blockchain
- I am involved in some. As for procurement, I always look for solutions that I'm free to modify/maintain or w/ little lock-in
- I'm not sure I fully understand what is meant with 'monitor'. My view is that OSHW projects develop organically rather than by design, as a variety of different stakeholders/ contributors gets involved in the process. As such, one cannot determine in prior specific milestones and indicators to measure success or define a critical path to follow. From this standpoint, perhaps the best approach is the development of a minimum viable solution, as well as a challenge-based hypotheses, which would then be measured to the the degree and the quality that they are met in the process.
- web
- don't know.
- Not much of monitoring in my start-up.
- Currently do not perform any monitoring. I have one design published to FHOA.org and do not anticipate any other market entrants in this field soon.
- Search the Internet
- Web
  mailing-list
- I subscribe to and read Make magazine. I also check out projects of interest mentioned in distributor emails and trade magazine emails.
- We use a combination of GitHub/GitHub issues, Bugzilla tracking software, proprietary in-house inventory tracking software, and Google Docs as a feedback and collection mechanism to track builds, issues, and sales of OSHW projects.
- https://en.wikipedia.org/wiki/List_of_open_source_hardware_projects
- Mailing lists, instagram, internet search engines.
- Mailing lists and Git logs
- Participating/observing on-topic communities like RepRap forums, Hackaday, CERN OSHW mailing list, etc.
- ohwr.org, git hub
- Follow mailing lists.
- Through social media and industry leaders (eg Adafruit, Sparkfun)
- OSHWA, social networks, local and international community groups and networks

## 24. OSHW increases my organisation's designers' workload

Number of respondents: 95

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 12 | 14 | 17 | 26 | 17 | 8 | 1 | 7=strongly agree | 95 | 3.53 |

## 25. OSHW product markets are small

Number of respondents: 96

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 7 | 19 | 6 | 22 | 20 | 14 | 8 | 7=strongly agree | 96 | 4.07 |

## 26. OSHW revenues come from supplying the products

Number of respondents: 90

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 4 | 7 | 7 | 22 | 22 | 17 | 11 | 7=strongly agree | 90 | 4.62 |

## 27. My experience with the CERN Open Hardware License

Number of respondents: 97

| | Yes | No | Total | Average |
|---|---|---|---|---|
| I have released hardware files using CERN Open Hardware License | 35 | 61 | 96 | 1.64 |
| I have contributed into design of hardware files released under CERN Open Hardware License | 40 | 55 | 95 | 1.58 |
| I have downloaded hardware design files released under CERN Open Hardware License | 68 | 29 | 97 | 1.3 |
| Total | 143 | 145 | 288 | 1.5 |

## 28. Using OSHW increases the amount of suppliers on the market

Number of respondents: 94

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 1 | 6 | 29 | 27 | 22 | 9 | 7=strongly agree | 94 | 4.96 |

## 29. Using CERN Open Hardware License has marketing value

Number of respondents: 93

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 5 | 9 | 28 | 20 | 23 | 8 | 7=strongly agree | 93 | 4.76 |

## 30. Switching supplier is easy when using OSHW

Number of respondents: 93

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 6 | 6 | 26 | 18 | 31 | 6 | 7=strongly agree | 93 | 4.86 |

## 31. OSHW revenues come from testing the products

Number of respondents: 89

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 6 | 11 | 9 | 35 | 13 | 13 | 2 | 7=strongly agree | 89 | 3.96 |

## 32. OSHW is a personal reputation building channel for designers

Number of respondents: 95

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 1 | 1 | 1 | 14 | 22 | 36 | 20 | 7=strongly agree | 95 | 5.56 |

## 33. I find OSHW design documentation to be in general accurate

Number of respondents: 94

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 3 | 10 | 12 | 22 | 21 | 22 | 4 | 7=strongly agree | 94 | 4.38 |

## 34. OSHW reduces legal costs

Number of respondents: 91

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 4 | 10 | 9 | 28 | 14 | 19 | 7 | 7=strongly agree | 91 | 4.35 |

## 35. OSHW decreases market prices

Number of respondents: 94

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 1 | 7 | 8 | 20 | 22 | 23 | 13 | 7=strongly agree | 94 | 4.87 |

## 36. Please provide the amount of collaborating people in your OSHW projects

Number of respondents: 82

Minimum amount of collaborators I have had

- 1
- 1
- 3
- 0
- 5
- 0
- 5
- 3
- 1
- 0
- 1
- 2
- 0
- 2
- 3
- 1
- 3
- 3
- 3
- 1
- 2
- 2
- 4
- 0
- 4
- 0
- 2
- 1
- 0
- 2
- 1
- 1
- 2
- 0
- 0
- 8
- 1
- 10
- 1
- 2
- 2
- 1
- 3
- 1
- 0

- 1
- 2
- 2
- 2
- 0
- 2
- 1
- 1
- 0
- 2
- 0
- 3
- 2
- 0
- 1
- 1
- 1
- 1
- 1
- 1
- 0
- 0
- 0
- 1
- 0
- 0
- 0
- 0
- 1
- 1
- 2
- 2
- 0
- 1
- 1

Maximum amount of collaborators I have had

- 2
- 3
- 15
- 16
- 5
- 8
- 25
- 20
- 20
- 350
- 3
- 6
- 4
- 4

- 5
- 5
- 25
- 100
- 10
- 5
- 10
- 5
- 6
- 3
- 30
- 0
- 5
- 2
- 1
- 7
- 5
- 3
- 6
- 12
- 3
- 18
- 4
- 15
- 100
- 20
- 5
- 8
- 4
- 3
- 10
- 3
- 7
- 6
- 5
- 30
- 60
- 6
- 3
- 1
- 3
- 0
- 10
- 0
- 30
- 19
- 0
- 3
- 1
- 1

- 4
- 6
- 2
- 0
- 16
- 0
- 1
- 0
- 0
- 4
- 10
- 7
- 4
- 20
- 7
- 0
- 2
- 10

## 37. OSHW is essentially a marketing channel for companies

Number of respondents: 92

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 |  | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 7 | 13 | 17 | 25 | 16 | 11 | 3 | 7=strongly agree | 92 | 3.82 |

## 38. It is hard to detect infringements of OSHW licenses

Number of respondents: 91

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 1 | 4 | 7 | 17 | 18 | 35 | 9 | 7=strongly agree | 91 | 5.07 |

## 39. Openness is a competitive advantage

Number of respondents: 91

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|---|
| 1=strongly disagree | 0 | 3 | 4 | 7 | 23 | 27 | 27 | 7=strongly agree | 91 | 5.63 |

## 40. How would you improve OSHW collaborations?

Number of respondents: 42

- Having more conferences where people meet, so that we know what is going on in the network
- Being clear about goals and outputs at the start.
- All of these questions are premised on the idea that OSHW products are dev tools, like an arduino or R-pi. At Opentrons, we sell open-source robots directly to life-scientists. The openness means that the 10% of our users that want to write new software can push it to the community, but 90% of our customers just use the robot and dont care at all that it is open-source. I think that you'll start seeing more companies like us that move up the 'value chain' and closer to the end consumer.
- Start projects in an early phase to be open (before the design has started even to allow for early discussions).

    Make it easier to search on ohwr.org to search for projects.

    Have someone who verifies quality of the projects (presence of all and of the latest design files).
    Have someone who insists of having project documentation up to date.
    Who catalyses the projects by actively describing users, keeping documentation up-to-date, getting companies involved etc.


- creating an umbrella organization ready to provide people with help in the process of linking projects with test-sites, helping universties understand that not only patents are relevant for the progess of science and technology, bringing this up as a viable business model at high education instances, lobbying to make sure publicly funded R&D produces OSHW licensed creations ...
- I'd like to see an easy to use platform for work group, sharing and modifying:
    - software
    - hardware
    - design
    - electronics

    Something like GitHub for all the aspects of OSHW development
- Keep doing what you're doing you beautiful bastards
- Collaborators need to be convinced of the advantage of OWHW.
- education, education, education
- 1) More professional tools for project management. Redmine-based tools in OHWR are fine, but they are amateur even when compared to github issue tracker. Transparent management of reference projects (for instance White Rabbit and all associated data acquisition of CERN BE-CO-HT) in an open source management tool could serve as example for many to follow.

    2) Unified libraries of components:
       - 100% unified for schematic symbols
       - variants for footprints, depending on fabrication specs

    3) Make sure companies disclose information on critical issues for hardware production. Keeping secret the non-trivial issues of a the manufacturing process of a given hardware design will still be a barrier despite the access to schematics and layouts before open hardware. Although I recognize this need, I cannot propose an effective mechanism to doing so by now.

    4) Use open source tools for the whole hardware design chain
- Build a OHWR internal channel among the companies that follow the OHWR license, to share the business changes, including product purchase, customized produce design and service.

- Providing more discussions on the benefits of OSHW collaborations
- adhering to (and/or developing) clear and open standards is the way to go, particularly - but not limited to - for what regards documentation.
- We are trying to build a standard OSHW modular instrumentation platform (Easy-phi) on which both OSHW and proprietary modules may be implemented. This should both promote openness and allow businesses to make money, therefore stimulating OSHW.
- 1. Improve KiCad
  2. Improve version control of hardware projects (e.g., Git integration with KiCad with for example visual diffs)
- Mostly by having a good documentation on all projects.
- Better documentation is always on order.
- Even I like the OSHW idea, I still have problems about the business model that goes with it.
  As a Swiss company, we are not really well placed to get NRE for the development of equipment @CERN (well balanced country, Swiss salaries).
  Placing a design under OSHW is then our own investment into a risky business model.

  A solution to make it: find a Swiss co-funded lab, ESSS for example, willing to place a design under the OHWR and funding 100% of the development + industrialization of a product.

  I'm at your disposal for any discussion around the subject. The business model is a key factor for the success of the OSHW.
- With free and open source tool for hardware development. KiCad is getting better, thanks to CERN, but we need more tools.
- More visibility and active communication in the community. Following up with old and recent collaborators. Maybe having a technical person being a clear point of contact and understanding the skills and capabilities of all involved actors (individuals, companies, etc). Identifying the interest of current and old collaborators and converging interests around valuable and visible use cases in the society. Community and brand are weak points in OSHW right now.
- It is required to promote more general design so different players can support new designs.

  It is also required to innovate in the business model that is not realistic. The open of OHWR designs discourage companies to develop their core business based on those products. Sales revenues is very small and the associated design services are discontinuous so it is almost impossible to live from OHWR.
- Find a platform to share hardware files on similar to github but for pcbs 3D etc. GitHub is too text focused.
- frequent phsicial meetings
- try to set common goals between large research organizations.
  provide easy to use services like ohwr.org and/or github.
  provide tools like kicad and others required in the toolchain (design, simulation, manufacture, compilers etc.)
  large non-profit organizations could invite tenders for hardware that they require - and require produced products to be released under OHL.
  OHL-organizations could support universities with information or programs that make it easy for advisors/professors to join a program where student thesis work contributes to open hardware projects.
  google summer of code - like activities.
- Through development of easy-to-use web platforms for sharing and improving OSHW project in all its feature: hardware, design, electronic, firmware and software
- make the license stricter, dont let copycats get away with closing down the technology. at least an optional share alike function would be nice.
  there needs to be a clear way to deal with conflicting patents in the domain and how oshw stands in relation to patentability. i dont want to release my designs to see them appear in another guys patent later
- Make open process a more fundamental part of OSHW, not just having open designs and codes at the end.
  Invite people in to see the incremental work, so that more people can contribute, innovating faster, etc.

- The actual design side of OSHW is hard to initiate-- OSHWA tends towards the technical side of development. The product development starts from assumed specifications or individuals' collected specifications, and those specs are rarely published at the outset. More work could be done on OSHWA collaborative product specification development and user research and user testing sides of things. The User/Maker is idolized; people are encouraged to make their own tools. This is convenient, but not scalable. As tools move beyond the uses their designers created them for projects fragment, and the user stories and user experiences that lead to that fragmentation are unarticulated.

  Concepts current in the design world-- users stories, appreciative inquiry, user testing, the creation minimum/maximum target specifications-- still sit outside of OSHWA. Where organizations adopt these activities, the activities are internal processes. Collaborative platforms and documentation on how to specify designs need to be created.
- getting people with similar interests involved
- most problematic for OSHW is the fact that "the market" has established but expensive means in place to protect IP (patents). This is an unfair competition ground for OSHW developers, that usually don't have the money to get access to this system, while established companies could take advantage of ideas made practical in OSHW. Together with the fact that infringement detection can be hard, (there is one practical case, the LEN/ZEN vs. White Rabbit SCB of the switch) and infringement is not legally covered, because patents do not apply and copying of the machine (not via the documentation covered under the license but by looking at the board, knowing the open product and redesigning from scratch) can not be legally prohibited.

  Collaborations are mostly improvable by very good online platforms and the organisation of "get togethers", maybe a symposium about application, but also hacking days to implement or improve a certain part. What I am missing in the online tools are chat spaces... At that point direct communication can speed up development, because one can immediately get answer from the right expert.
- sharing creates sharing. But only public institutions have the resources and incentive to start sharing first. Unfortunately. Greedy world...
- I believe the main problem of the open source community is the state of precarity that the contributors face, as well as a constant threat from enclosure by the proprietary economy. One solution could be provided by the use of a reciprocal type of licences, i.e. licences that would enable openness for stakeholders that intend to contribute to the design, by using the same type of licence in derivatives, while at the same time create added market value from the ones that don't (an enhancement of the 'copyleft' clause, such as copyfair licences). This way openness could be protected within the open source ecosystem, while an alternative source of income could be provided for the contributors. Moreover, new forms of business models should be considered, which empower and support open collaboration, utilising elements from commons-based peer production and cooperative organisation (such as open cooperativism & platform cooperativism). Those have been shown to be particularly competitive, due to the significant reduction of transaction costs and the pluralism of inputs, while at the same time they can reduce precarity for the contributors and enhance cooperation for mutual benefit.
- Linking developers with end product designers.
- Registry?
- * Being paid when it is possible.
  * Be open mind to accept new people.
  * Be patient when a new collaborator enters the projects
- There are too many OHW models, each has different ways of improvement.
  Simple advioce - do not call it OSHW And we do not call our company OSHW. CERN OHL is designed to be like "GPL for hardware" and this is why we adopted it for all our hardware products. Unfortunately "open source" when not paired with "free software" (like in FOSS or FLOSS) has ambiguous meaning for historical reasons and in that contradiction we are definitely on GNU GPL and Richard Stallman side. So OHW is more neutral than OSHW.

- I do not have enough experience to know
- Continue to build general public understanding of what open source hardware actually means and encourage participation/documentation of open source projects. These are the two biggest issues we come up against during our oshw collaborations.
- Improve wokflows
- Allow/accept licenses with non-commercial clause. OS software doesn't need this, OS hardware does, because of manufacturing costs.

  Everything else is pretty well established already.
- Present my work at a conference
- Specifically in development and collaboration tools for 3D Printed OSHW.

  We're also moving to OSHW certification to see if that will help.