Final Report: FOSH Literature Review

ALI RAEISDANAEI, University of Toronto, Canada
JINGYUE ZHANG, University of Toronto, Canada
TIANTIAN LIN, University of Toronto, Canada
ZIQIAN QIU, University of Toronto, Canada

Our project was a systematic literature review of Free and Open Source Hardware (FOSH). Since starting to look at the literature on this subject, we have learned many things.

Firstly, the field is relatively new, yet somewhat vast at the same time. The types of hardware we are considering were very limited. There have been two journals that have been started since 2017, and our project will base most of its review. This is good news for our project since it means our review is a systematic review of almost *all* the literature on this subject.

Given the new information, we have refactored and refined some of our research questions. Some questions from the proposal may be beyond the scope of a single paper to be answered, so some may be omitted altogether.

You can see a repository of our project along with a working document **??** that goes over the details here (Not finished).

Additional Key Words and Phrases: Open source design, Open source hardware

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1 INTRODUCTION

1.1 Background and Motivation

The free and open source movement is defined by the following four principles:

> A program is a free software if the program's users have the four essential freedoms:
> - The freedom to run the program as you wish, for any purpose (freedom 0).
> - The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
> - The freedom to redistribute copies to help your neighbour (freedom 2).
> - The freedom to distribute copies of your modified versions to others (freedom 3). Doing this gives the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.
>
> A program is a free software if it gives users adequately all of these freedoms. Otherwise, it is non-free. While we can distinguish various non-free distribution schemes in terms of how far they fall short of being free, we consider them all equally unethical.

[Stallman 2015].

These four principles have started a movement that has revolutionised intellectual property and specifically technology. We have seen the vast social and technical benefits of this movement. The free and open source movement has democratised access to information and technology: any person has access to the basic principles of [Stallman 2015] on the best software. The movement's technical benefit has been the increase of innovation and collaboration. It is no wonder when neighbours help each other build, we have software like the Linux Kernel, Mozzila Firefox, and many others.

These four principles have been applied to other fields than software. Similar to the free and open source software (FOSS), free and open source hardware (FOSH) is any piece of information that is needed to exercise the four principles as it applies to hardware. These include anything such as design files, blueprints, specifications, documentation, and even software for the building, designing, modifying, distributing, and using hardware. A common example of FOSH is Arduino used for single board microcontrollers in a variety of applications.

FOSH has been growing in interest over the years. This is evident in terms of the increasing number of projects, associations, literature. The Open Hardware Association tracks 2057 FOSH projects to date [OSH 2021]. It also lists multiple journals that have started since 2017. These include,

- Journal of Open Hardware
- HardwareX
- The Journal of Open Engineering
- Computers, Design and Technologies from MDPI
  - https://www.mdpi.com/journal/computers
  - https://www.mdpi.com/journal/designs
  - https://www.mdpi.com/journal/technologies

1.2 Research question

1.3 Scope and limitations

1.4 Organization of the paper

Then, we also need to explain why a literature review is needed. What exactly does our work add?

Authors' addresses: Ali Raeisdanaei, University of Toronto, Canada; Jingyue Zhang, University of Toronto, Canada; Tiantian Lin, University of Toronto, Canada; Ziqian Qiu, University of Toronto, Canada.

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2 BACKGROUND LITERATURE

We will include some of the analyses that previous researchers have done on this topic. The major references are: TODO

2.1 Where is the Freedom?

We will follow the definition of Stallman[Stallman 2015], as well as expanding our research to define the "open source" in hardware

2.2 Where is the Hardware?

An overview of hardware and its difficulties is needed as good background information.

3 METHODOLOGY

The main methodology of the systematic literature review is backward propagation. We started with a seed of papers on this subject, and we checked the citations used in the seeds recursively.

Part of the methodology would also be to read through all the literature in the two FOSH journals and to record summaries, benchmarks, and the licences of the hardware they proposed. These two journals are the

(1) Journal of Open Hardware
(2) HardwareX

3.1 Search strategy and selection criteria

3.2 Data extraction and analysis

3.3 Quality assessment

4 RESULTS

5 DISCUSSION

Discuss the potential future developments, opportunities, and challenges that FOSH is facing as well as identify the fields where we could focus more attention on FOSH

6 CRITIQUE AND SOLUTIONS

7 CONCLUSION

Conclude the result we found and answer the research questions.

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to be finished

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