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An Analysis of Current Scenario Development in Open Source Hardware Community and Its Benefits

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ABSTRACT
Open Source Hardware is a design made publicly available. The open source development consists of some steps in which it is implemented.Open source project are self-motivated units. Companies, universities and even an individual are adopting open source design due to its properties. This paper focuses towards ongoing trends of open source hardware design. This paper also concentrates on OSHW benefits and its further enhancement. OSHW contribute to develop new research area in the field of hardware designing.
Keywords--Open Source, OSHW, Aurdino, closed source, current trends on OSHW

I. INTRODUCTION

Nowadays an individual does not want to design hardware from its scratch-pad because of its extreme complexity and the compactness of modern technology. Thus the methodology of openness is accepted by companies as well as customers.

The originally applied phenomenon for term Open source allows others to modify, improve and compile the software available publically. Currently, this open source process is adopted by hardware communities also. It will include printed circuit board designs, layouts and mechanical assemblies.

The Open Source Hardware is design which is made publicly available. It has freedom of user to study, modify, distribute, make, and sell the design or hardware.

II. PROBLEM STATEMENT

When closed source is in trend, both software and hardware are belongs only to a particular company or person. The owner of design has its license under its legal authorities. All information related to a product has to be purchased by customer by paying a certain amount of money.

As manufacturers are earning profit by developing and selling products, they are more enthused towards closed source.

Not an individual can develop any closed source system alone. Closed source development requires a team of professionals to design and develop such a system. There is no backup of design or software available in closed source expansion. If information of any customer is lost then customer has to purchase the design again. This approach is very expensive. Not only single software or a design, but the whole data related to a design has to be purchased.

In closed source designing when product does not work properly there is service and support system for user. The service or support by designer will also be expensive under some circumstances. If an error or a bug is generated in software or hardware, then user have to compulsorily wait for service provider. If it is a serious problem then user have to modify the respective software or hardware. To modify the system customer must have its newer version or have to wait till newer version release. After new release also, customer have to purchase the software or hardware. The closed source design comes with its license or patent. Any company or an individual is not allowed to use the design until the design is earned. The software or hardware design is copyright or patent under legal situations to earn an amount of money.

The user is only provided with software's binary version file but not the source code. Without source code customer is only using a product but customer is not aware of the design. If customer is not aware of the technical design then modification of source code is not possible.As the source code is not modifiable by the user, there will be no comparisons of design. Only if any two companies had worked on similar projects there comparison is made possible. It may also be imaginable that more than one company is working on a same project. Thus the development of that particular project is very slow.

In closed source systems designer doesn't know about the need of customer. The design is made only according to the group of employees, implementing that system. There is no parallelism of process in closed source system. The designers of product have to take care of testing and maintainability of system. No one can manage closed source system without learning its technical working.

III. NEED AND IMPLIMENTAION

1. ElectingAn Open Source

When any data is searched and modifies ourselves, then it provides better knowledge to user. Open source hardware also has a feature of backup plan for lost data. If any company stops producing design and it left from business, customer does not have to redesign product. In that case, a drop-in replacement may already be existing from a different company, or at least a replacement can be manufactured from the offered design.Open Source Hardware basic project can give a huge head start.

With the help of expert, successful open source hardware can be design. It needs group of people, offering firmware updates, ports to new operating systems, and modifications for new functionality and design, suggestions for substitute parts. Industries prefer open-source equipment because of its, ability to improve community, resources and documentation. Downloading and inspecting existing open source hardware is good for instrument designer.

For the purpose of job open source hardware is more utilize. People dedicated to innovation and sharing will continue to make open source easier for more people to start business and creates jobs. This is succeeding for open hardware community.

2. Design Of Open Source Hardware

The open source development consists of some steps in which it is implemented. As the open source hardware is for customers, the previously implemented design will be easily available. The design is then modified according to the requirement. The freely available open source hardware consists of design schematic, printed circuit board layout, components, source code and software on which these are design. By using all these, new product or design will be made in a more sophisticated mode.

First step to design open source hardware is to generate its schematic. This will consists of number of components used in a particular development. All the components in hardware are connected to each other in a specific way. These connections of hardware components form a schematic.

Next step for designing open source hardware is to design printed circuit board layout. The schematic which is formed is then converted into photo-mask layout. This photo-mask layout is now imparted to printed circuit board for formation of a design.

Final step is placing components on printed circuit board layout. Marking, etching, soldering and finishing of printed circuit board is done at the time of placing of components. But it may also consist of some kind of software embedded into it. The source code used in this process should also be freely available. Thus only modification of source code is needed to use the previous design and develop a new one.

IV. CURRENT TRENDS

Open source hardware has initiated many developments like Aurdino, amber, BeagleBoard etc. Brief discussions on some open source hardware are as follows:

Atmel is promoting Aurdino because of its open platform.It not only provides compiler, IDE, GUI, example code and tutorial. It also has very good collection of application notes and it also promotes the university research group by funding them with free samples of microcontrollers and development board along with necessary software.

The Amber processor core is an open-source ARM-compatible 32-bit RISC processor.The Amber core is fully compatible with the ARMv2 instruction set. This version of ARM instruction set is supported because it is not covered by patents so can be implemented without a license from ARM Holdings. There are two versions of the core provided in the Amber project are, Amber 23 and Amber 25.

Ethernut is an open source hardware and software project for embedded-Ethernet-system. The existing designs of Ethernut are, Ethernut 1, Ethernut 2, and Ethernut 3. Developing Ethernut design is Ethernut 5. Nut/OS is an open Source operating system for Ethernut boards. Nut/Net is its own network stack. The supported architectures of Ethernut are, Atmel AVR, Atmel AVR32, ARM7, ARM 9 and ARM Cortex M3.

The Simputer is a self-contained, open hardware Linux-based handheld computer. It is a low cost device. The Simputer are designed to be used in place of personal computers.The word "Simputer" is an acronym for "simple, inexpensive and multilingual people's computer". The Simputer uses Linux Kernel which is an open source operating system. The device features are, touchscreen, Smart-card, Serial port, and USB connections, and an Infrared Data Association (IrDA) port. It was available in both greyscale and color versions.

The BeagleBoard is a low-power open-source hardware single-board computer produced by Texas Instruments in association with Digi-Key and Newark element14. The BeagleBoard was also designed with open source software development in mind, and as a way of demonstrating the Texas Instrument's OMAP3530 system-on-a-chip. The board was developed to be used in colleges around the world to teach open source hardware and open source software capabilities. It is also sold to the public under the Creative Commons share-alike license.

Company also organizes challenging, competitive and innovative events for students and research scholars to come up with their new idea. Then give the win-win situation to both company as well as participants.

V.   BENEFITS

1.   Available Source Code

Not only an executable file but also the source code which has design technical meaning is also available to users freely. Customer can easily use and modify source code. Distribute design files under open license.

2.   Free software

All software's which are being used in design are freely available. Free software consists of its source code also. Thus user is aware of software design. In open source system, software to implement design is freely available and user can easily utilize software.

3.   Modify code by user

The complete source code is available to customer in open source. Thus customer can easily modify code as per the requirements. This modified code can again compile and forms an executable file

4.   Frequent Release

Whenever an open source design is created, it have to be uploaded somewhere. That will be supportive for other users who are working on that respective project. This process does not take time as in closed source development. It will be helpful for removing bugs and errors in any design.

5.   Openness

Open source are not restricting any design. User only needs to use design. Open sourcehelps to identify the user requirement themselves. Software used for developing hardware, its source code and hardware details are all available freely.

6.   Parallel process

More than one user can work in a single project at a same time. Reviewing, testing and maintainability are performed in parallel. Updating of any design is very fast. The whole world is connected in this process with the means of internet.

7.   Knowledge sharing

When more than one person is updating design openly, it will be available publicly. This open design is used by everyone. With the help of open source user can easily communicate to each other.

8.   Backup plan

Open source design provides a storage area. Whenpartsof any product are discontinued then it is supportive.Many programmers examine it and can detect bugs. Design is also reevaluated more and more times.

VI.   FURTHER ENHANCEMENT

Open source design is developed anywhere around the World. Any of design presented in open source may be influenced by reviewing some other work. No single person or a company has the whole documentation of a product. Therefore this kind of designing is unsystematic. Designs should be implemented in such a way that it should be in anorganized manner. This approach will help in better development of any design. Systematic development will also reduce duplication of any design generated under open source. Lack of communication will also affect design and modification of open source system. To overcome this issue internet connection between users should be very strong. The programmers of open source software or hardware should always ignore any of conflict situations, because this will directly hurt development of system.

In an open source design more than one person can work on similar project. This will lead to different designs, and these designs will again be used by some other. If this rotation of a particular design is repeated ten times in twelve months,then it should not be an ideal design. This will show instability of that particular design. It should be stopped only by awareness of users working on any open source project.

Complete package of an open source design should only be available after sponsoring group venture. Otherwise users may design product themselves instead of purchasing it from market. In this case sponsors will lose an opportunity to gain profit from their own design. This will also produce a problem of motivation towards open source. And most of the users will hesitate to work in a free domain.

The enhancement of open source design is also depends upon companies, universities and individuals. Open source design should be accepted due to its benefits. As more and more companies will start working on open source design, it will be frequently adopted by an individual also.

VII.   RESULT & CONCLUSION

Type Features	Open Source	Closed Source
Openness	✓	✗
Parallelism	✓	✗
Free Source Code	✓	✗
License	✗	✓
Backup	✓	✗
Communication between User	✓	✗
Free Software	✓	✗
Available Schematic	✓	✗
Earning Profit	✗	✓
Copyright/Patent	✗	✓
Retail	✗	✓
Available Layout	✓	✗
Fast Release of new version	✓	✗

OSHW provides very easily and open platform to the new comers in the technology. Even non-technical person can also implement his/her idea in a fruitful end working result. Table given above summarizes the result of this research paper. We conclude that OSHW will expand its impact all over the World and will contribute to develop new research area in the field of hardware designing.

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