

# The Space Design of Hackerspace in the “Internet Plus” Era

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**Abstract.** China’s “Internet +” era has come, and the Hackerspace, as an emerging business service platform which meets the public demand innovative undertaking under the new era and has a strong professional service ability, has a long-term and important meaning for stimulating the innovation ability of ordinary people and creating new economic growth point. Under this background, the harmony, efficient and orderly office space design shall play a significant role for the makers to improve work efficiency and working attitude, so as to achieve the more convenient and comfortable communication among people. This paper explored the area environment design of the Hackerspace under the background of China’s co-make era. Based on the analysis and comparison on the space construction of Shanghai New Workshop, Shenzhen Firewood Hackerspace and Tsinghua i.center, analyze the space division and design elements of the future Hackerspace starting from their features. The research of this paper is based on the exploration of the design key of Hackerspace office environment, so as to promote the ecological construction of the Hackerspace, and create a shared platform to communicate, cooperate, and relax for the entrepreneurs.

**Keywords:** Hackerspace · Space design · Area construction

## 1 Introduction

Hackerspace is a new sharing platform, which is a kind of learning and production space for the makers who have the same interests and the ability of doing-by-oneself to exchange and share knowledge, as well as work together to create a new thing. A typical Hackerspace shall be usually equipped with the laser cutting machine, CNC machine, 3D printers, open-source hardware platform and a series of tools, as well as the services space arrangement such as the learning exhibition area, discussion area, and the production area.

In 2015, China’s general office of the state council issued the guidance on the development of the Hackerspace and the promotion of the innovation in the public business, whose purpose was to deepen the Internet reform of the traditional enterprise, serve the innovation and entrepreneurial zeal of the general public, actively contribute to the establishment of the Hackerspace and incubator in the campus and society, which marked that China has gradually entered the co-make era of “public entrepreneurship

innovation”. At present, the ministry of science and technology announced two batches of the Hackerspace list, which showed that there are 498 Hackerspaces being concluded into the national management service system.

This paper’s research is based on the case study of the engineering training center of Shanghai Now Workshop, Shenzhen Firewood Hackerspace and Tsinghua i.center. Analyze the three Hackerspaces’ function orientation and operation mode, based on which to explore its theory, practice and experience of the space construction art, which can provide reference for the physical space planning and design of the domestic Hackerspace by comparing with each other and integrating their function areas.

## 2 Literature Review

The literature for the Hackerspace at home and abroad was concentrated in the analysis on its operation mode, policy support and academic research, while the related literature about space design relatively lacks. Tao (2013) analyzed the Hackerspace of the library of DelaMare science and engineering and public libraries in Allen County, in which she divided the future libraries into a multifunctional space composition such as learning, discussion, creativity, and implementation. After the research and analysis on university laboratory and social space in the USA, Yang Jianxin and Sun Hongbing found that the open physical space and extensible information space are important to the Hackerspace. Liu (2015) argued that the ratio of the function areas in the Hackerspace should dynamically adjust to the elasticity of the function, which may make the space functional flexibility and expansibility. Ma (2015) pointed out that the color performance of the Hackerspace shall be more emotional than itself on the basis of studying on the Hackerspace of the USA library.

## 3 Method

One is the literature research method. This paper studied and compiled the literature and books on the space design and function layout of the Hackerspace, on which designed and analyzed the status of Hackerspace in the campus and society; At the same time, through the comparison and analysis on the space color, space utilization, lighting, and decoration material in the literature material, this paper initially sorted the space design strategy taking maker as the design center.

The other one is the method of case analysis. The author takes the engineering training center of Shanghai New Workshop, Shenzhen Firewood Hackerspace and Tsinghua i.center as examples, compare them on their division and interior design, so as to conclude the highlights of the above Hackerspace, thus to screen and summarize the design mode that can give reference to the internal structure of the Hackerspace.

## 4 The Study on the Area Construction and Space Design of Hackerspace

In China, Hackerspace is mainly divided into social Hackerspace led by individuals and groups and campus Hackerspace led by government and universities.

Social Hackerspace such as Shanghai new workshop and Shenzhen firewood Hackerspace are both non-profit organizations, supported mainly by the membership fee and corporate sponsorship to pay for daily consumption, and open for social workers and students who share this same interest hobby. Usually such a Hackerspace covers a small area, the utility rate of space is relatively high, for space layout and structure are restricted by site and funds, it's usually a kind of compact Composite space.

Campus maker room like Tsinghua "I. Center" is a student collaborative innovation area whose original model is "students' basic engineering training Center" in Tsinghua university. It's mainly used to provide services for university students, and it's where they have innovation training, the popular science lectures and daily game. Compared to social Hackerspace, it's more spacious and multivariate, laser cutting machine, fixed 3 d printer and other heavy machinery equipments are also more abundant.

Through our inspect into social Hackerspace and campus Hackerspace, as well as our functional study and integration of its interior zone, the primary region of maker room is divided as follows:

**The Entrance Area.** Entrance area is the comprehensive service area of the whole Hackerspace, decorated with service counter, passageway, storage room or storage shelves, and so on. Its essential functions include consulting service, membership service, storing and picking parcels, the staff here will provide basic services to guests. Interior design is in line with the internal, at the joint between workplace and entrance area partition can be installed. On the one hand, it can improve the area layering, on the other hand, it can reduce the mutual influence between different area, while enough space shall be left for undertake transfer of personnel (Fig. 1).

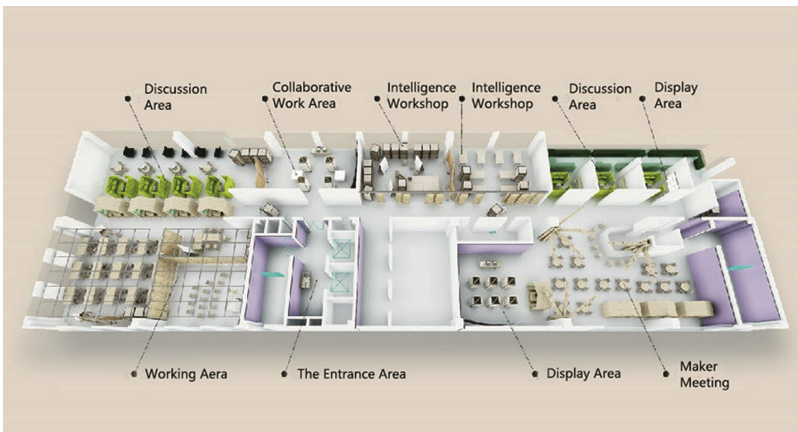


Fig. 1. Tsinghua I. Center, the model of maker room prototype

**Collaborative Work Area.** Collaborative work area is the main part of Hackerspace. Facility is equipped with small tools and materials (In the center workspace area in Shanghai new workshop, they place a part of small tools and equipments in the toolkit, then hang the toolkit on the wall, and the other part just goes to the nearby shelves), the main workbench and chairs and tables that go along with. On the choice of indoor color, we generally choose low purity and high lightness pastel color as metope color, it can help you from having the feelings of fatigue. Floor color has the function of foiling environment and matching metope color at the same time, low chroma or gray tone color (Ma 2015) shall be adopted. About the lighting issue in the main working area, the ceiling can use more scattering light source of light fusion to meet the needs of providing overall lighting for working area. On the other hand, the droplight design of concentrated light can be stalled right above the workbench (as shown in Fig. 2), so it can make up for the shortage of the scattering light from the ceiling when people are operating tools in the need of strong light.



**Fig. 2.** The droplight design in firewood Hackerspace



**Fig. 3.** The display and study area in Tsinghua university Hackerspace

**The Display and Study Area.** The display and study area is the area to provide learning and results display for makers. Infrastructure has the support of computer and network, there is projection screen on metope or interactive whiteboard and combined type desks and chairs (as shown in Fig. 3). At the same time there are liquid display stands for

makers to show their ideas and results. Hackerspace is also a learning space, people can DIY various entities device here and learn a lot of skills related to computer, campus maker room is equipped with their own computer center, compared to the social Hackerspace, its hardware facility is better. As for social Hackerspace, more consideration should be put into the diversity and compound type of its spatial layout, and so it can be convenient for conducting different practice in learning area. For example, removable light source and the layout of the outlet are worth considering.

**Workshop.** Work-shop is specially equipped with heavy machinery or professional workshop, it's a closed enclosed space. The Artisan's Asylum Hackerspace in Boston is equipped with carpentry workshop, welding workshop, painting workshop, precision metal processing workshop, electronic products production studio, computer aided design studio, sewing studio, robots studio and many other stuff. When designing the space, Sound insulation and safety problems should be paid attention to, think twice about the use of sound absorption and insulation fireproof materials when constructing the wall and floor. Pay attention to natural ventilation, keep indoor air flow freely, at the same time, the atelier area shall be connected to the fire fighting escape.

**Social and Recreational Area.** Social and recreational area is a platform of offline activities and gathering together for makers, here everyone can freely exchange ideas and share originality. The garage coffee maker room in Beijing is a Hackerspace whose prototype is a coffee shop, makers can work here for one whole day after ordering a cup of coffee, there is more casual and open space design atmosphere here, which can give makers the freer and more casual communication experience.

## 5 Conclusion

From the perspective of practicability and function, Hackerspace's spatial construction should take the use of economic and durable, safe and stable materials and equipments into consideration when decorating. And about the dimensional layout, diversity of space activities should be considered, so the flexible compound type space can be created. On the choice of furniture, better choose economic and durable furniture with moving tables and chairs that are easily cleaned and maintained. The interior design of Hackerspace is never invariable, it changes constantly according to makers' activities, but always with the ultimate goal to create an indoor environment that is comfortable and beautiful, convenient and flexible, and with rational layout.

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