WorkSense: An Interactive Space Design for Future Workplace

Hsuan-Cheng Lin and Taysheng Jeng

Department of Architecture, National Cheng Kung University, Tainan, Taiwan
shiuanlin@gmail.com, tsjeng@mail.ncku.edu.tw

Abstract. Technological advances have initiated obvious changes in types of work so that the traditional cube office layout cannot meet current users' needs. This paper aims to develop an experimental platform for the workplace which is centered on satisfying users' demands. Living lab studies are examined in order to evaluate the uses of the place, with different interactive installations of furniture in the space, and a back-end BIM platform, to present a humane smart workplace of the future.

Keywords: interactive design, living space, smart space, future workplace.

1   Introduction

The development of technological devices and applications, such as laptops, handheld devices, tablet PCs, cloud computing, and wireless network systems, have all become more advanced during the last few years. With the evolution of office tools and the popularity of various technological products, people can handle official business anytime and anywhere; some people even proposed that we should abandon the office space altogether.

However, in order to maintain personal growth and organizational skills, face-to-face communication is absolutely indispensable. The source of creativity in the workplace is still human-based, so that the human-centered design of the future workplace should not be denied. The workplace should contain business resources, which means human beings and their creativity. Office space converted into the workplace not only can handle office requirements, but also serve as a social place that can stimulate creativity. Because of the importance of sensibility and creativity, the office should focus more on the human component to create a workplace which is full of activity, yet charming so that everyone wants to stay inside.

2   A Shift towards a New Age of Workplace Design

The studies on future workspace mostly follow two directions, one is from the perspective of the hardware in determining the design of the space, with the focus on multifunctional furniture and the use of flexible space [1][4]; the other direction is

from the software perspective, with the focus on the system that can support seamless tasks, team work communication and coordination [2][3][5].

Due to space limitations and changing requirements of the workplace, the office desks' layout no longer dominates the office space. The workplace is gradually being transformed into a social activities platform. Because people can hand official business everywhere thanks to the technological support, the main purpose of the future office will be to serve as a social place for, meetings and discussions with people face to face.

This paper proposes two hypotheses regarding the future workplace:

1. Efficient work will no longer constitute the main purpose of the office space; it will be replaced by the need to enhance creativity and human perception.
2. Smart space should be sustainable and humane, which means space should enhance energy efficiency, the 3Rs (Reduce, Reuse and Recycle), and augment human capabilities, such as health, mobility and memory.

3   The Design of Future Workplace

We converted a stairwell space into a design studio space, as a platform for future workplace experiments, as shown in Figure 1 (floor plan) and Figure 2 (actual space). The users are the design graduate students who will carry out the living lab experiments to evaluate the space potential. We designed the space according to the constraints of the existing space and restrictions into different types of work space:
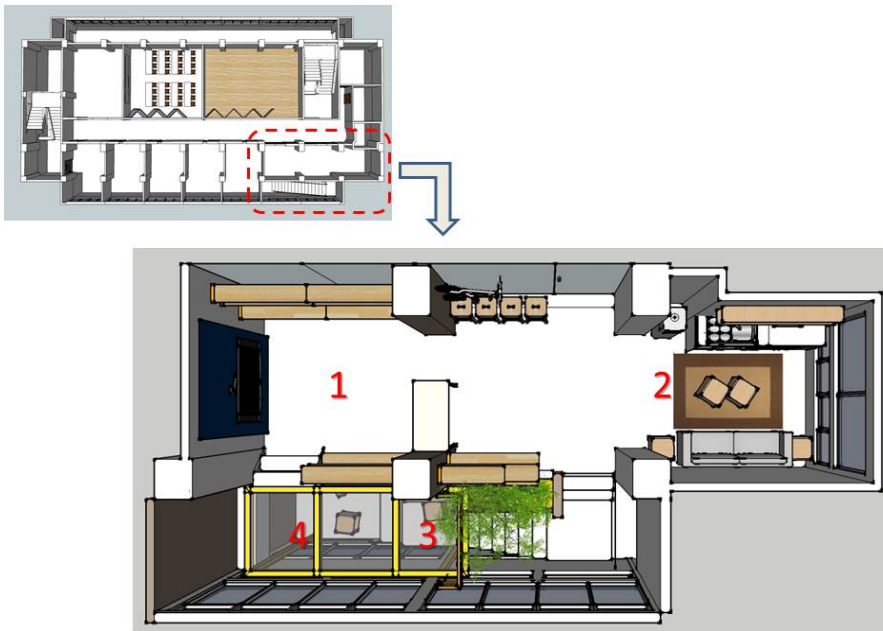

Fig. 1. Workspace floor plan

1. Standing office area with high tables and large display equipment for public use, which can easily accommodate discussions with other people.
2. Lounge space for casual discussions.
3. Public work station area with seats for long time use.
4. Experimental interactive space with sensors and actuators where permit meditation and rest, with the layout of the workplace shown in Figure 3.

Fig. 2. The reconstruction of the workplace experimental platform

We tried to use the different gaps in space to create space diversity; we derived a steel and glass platform, staircase landing for work station, and a small ladder classroom space for group lectures. We also used the ladder drain place to create an indoor large-scale planting space to improve indoor air quality and relax users' stress in the workplace.

Fig. 3. Different types of workspace: the upper row is the office work area; lower row from left to right are: Lounge space, Work station area, and Experimental interactive space

4   Interaction Design in the Future Workplace

4.1   Interactive Devices

We are going to install several interactive devices in different areas in the workplace, such as the bicycles with sensors on them; the sensors can monitor the use of the bikes and send the data to cloud. People who are using this system can do more exercises with this social interactive design, and compete with colleagues; the moving interactive units with LEDs and speakers can change the indoor microclimate. With each interactive device, sensor and the equipment, it is as if you installed an APP in

the smart phone, the hardware and its software in the physical space and also in the back-end system. For example, if you need to install an air quality sensor, it would provide not only the sensor, but also the "drivers" for the workplace, by which you can monitor the air quality data and access the data on the system platform.

4.2   Sensing Technologies

We also put different kind of sensors into the workplace, such as air quality sensor, electric power meter, light sensor and infrared sensor to monitor the equipment and users' activities in the workplace. The collected data are sent to a real-time Autodesk Revit model via a Revit API program, which can provide back-end management of workplace and users' workplace usage pattern analysis; the system architecture is shown as Figure 4.
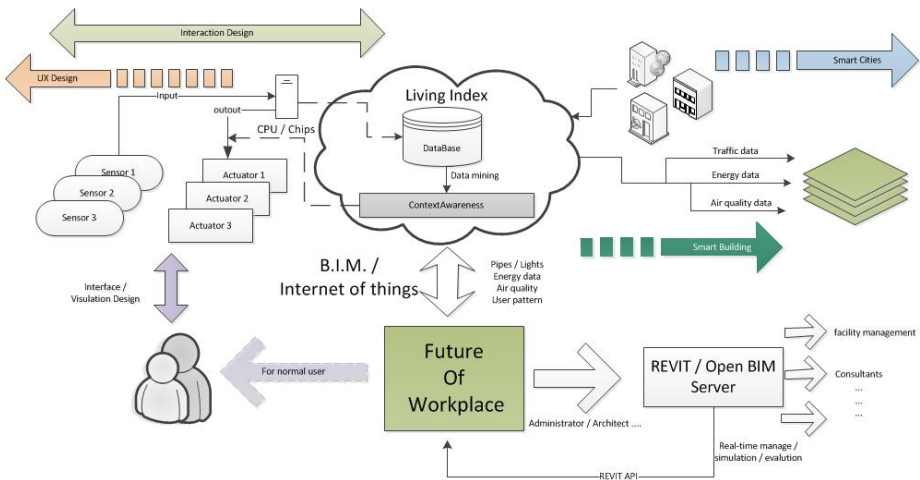

Fig. 4. The sensing system architecture of the future workplace

We call this integration of interactive devices and space usage patterns "WorkSense", and look forward to proposing social innovation designs of future workplaces. We collect all the data and upload to the cloud; then the normal users can access their own data from designed interface. The administrators can use REVIT as a BIM (Building Information Modeling) platform to manage the equipment and other facilities. The BIM information can also be provided to consultants, such as building structural consultant, property management, and other technicians to maintain the workplace.

5   Conclusions

A future workplace should not only focus on a place which is "Green" and "Humane" with interactive technologies, but also a space which can monitor the physical data

and the usage pattern in the BIM platform for more advanced applications in a humane smart workplace of the future. With the workplace BIM platform, users can install their own devices in both the physical and virtual systems. The future workplace can augment human capabilities and provide an efficient, sociable, and creative platform. Then all the user activities and environment data can be collected in a data base for different analyses.

The "WorkSense" is a long term ongoing project that includes the user experience workplace design, the interior design, the interactive device design, and the BIM platform which can provide useful data, from a signal smart space which can be extended to a smart campus and even to a smart city [7][8].

References

1. Probst, K., Perteneder, F., Leitner, J., Haller, M., Schrempf, A., Glöckl, J.: Active office: towards an activity-promoting office workplace design. In: Proceedings of the 2012 ACM Annual Conference Extended Abstracts on Human Factors in Computing Systems Extended Abstracts, pp. 2165–2170 (2012)
2. Tennis, J.: Designing the Future of Collaborative Workplace Systems: Lessons Learned from a Comparison with Alternate Reality Games, pp. 1–7 (2011)
3. Sun, T., Doubleday, N., Smith, A.: Designing experiential prototypes for the future workplace. In: Proceedings of the 2012 ACM Annual Conference Extended Abstracts on Human Factors in Computing Systems Extended Abstracts, pp. 331–334 (2012)
4. Raskar, R., Welch, G., Cutts, M., Lake, A., Stesin, L., Fuchs, H.: The office of the future: A unified approach to image-based modeling and spatially immersive displays. In: Proceedings of the 25th Annual Conference on Computer Graphics and Interactive Techniques, pp. 179–188 (1998)
5. Russell, D.M.: Ubiquitous search for smart workspaces. Universal Access in the Information Society 11(3), 337–344 (2011)
6. Jeng, T., Ma, Y.-P., Shen, Y.-T.: iAWN: Designing Smart Artifacts for Sustainable A wareness. In: Stephanidis, C. (ed.) Universal Access in HCI, Part III, HCII 2011. LNCS, vol. 6767, pp. 193–202. Springer, Heidelberg (2011)
7. Lee, J., Baik, S., Lee, C.: Building an integrated service management platform for ubiquitous cities. Computer 44(6), 56–63 (2011)
8. Gil-Castineira, F., Costa-Montenegro, E., Gonzalez-Castano, F.J., Lopez-Bravo, C., Ojala, T., Bose, R.: Experiences inside the ubiquitous oulu smart city. Computer 44(6), 48–55 (2011)