

Construction and Practice of a Smart Laboratory Based on “6+1”S Management Model

Gang LIU^{1,a} and Min-hong PENG^{2,b,*}

¹Electronic Information School, Wuhan University, Wuhan, Hubei, China

²Centre for Materials Research and Analysis, Wuhan University of Technology,
Wuhan, Hubei, China

^alg@whu.edu.cn, ^bpengmh@whut.edu.cn

*Corresponding author

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Abstract. University laboratory plays a distinctive role in education and research, meanwhile, how to improve its management level is becoming more and more important. This paper focuses on construction and practice of a smart laboratory using advanced technologies. It puts forward a new method based on “6+1”S management model to manage laboratories and serve for the university and society. The result supports the usefulness and efficiency of this approach. It is concluded that the new model not only upgrades the practicability and effectiveness of management, but also promotes cultivation of talents.

1. Introduction

With the increasing significance of the university laboratories in education and research, how to develop the management level is becoming a hot issue. A lot of researchers or managers focus on applying advanced management modes in laboratory management, since these modes have been successfully adopted in other fields. As is known to all, on one hand, a laboratory's environment is usually strict, special and sophisticated, even dangerous. It directly determines whether or not the experimental work can be carried out smoothly. On the other hand, there have been good and mediocre and bad laboratory technicians together. To adjust to requirement of innovative education and scientific research, the laboratory technicians ought to improve their own qualities.

Ordinarily, a perfect laboratory should have the following advantages: excellent environment, safety production, well-ordered work, efficient service and outstanding technicians. The mentioned above would be the direction of our work.

2. Analysis of the Demand for University Laboratory Management in the New Era

It is an urgent requirement for development of higher education to cultivate and bring up a large number of high quality creative talents with solid foundation, practical ability and innovative spirit, and it is also an important direction for the reformation of talent cultivation mode in colleges and universities [1]. Practical teaching is an indispensable factor for improving the comprehensive quality of students and cultivating the innovative spirit and practical ability. The experimental center is an essential base for scientific and technological innovation, personnel training and social service, and it is a common platform for interdisciplinary and innovative practice [2]. Therefore, in the new era, the university laboratory should meet these needs as followings.

(1) The sharing system of large-scale instruments should be established so as to boost resource sharing, improve the utilization rate of equipments and optimize the configuration of resources [3]. The sharing large-scale instruments have great significance and necessity in practical teaching and innovative talents cultivating.

(2) In order to effectively upgrade management level and ensure that the experimental data are reliable and accurate, we should construct a laboratory management platform with process-standard and informationization. We need to establish a unified laboratory management procedures using computer network platform.

(3) As a major place to cultivate students' comprehensive abilities, a laboratory's construction of standard, environment and culture, directly impacts its effect and benefit. Behavioral regulation results in promoting working attitude and makes it a habit. Finally we can achieve the purpose of creating excellent management team [4,5].

(4) The thoughts of meticulous management should be implemented in laboratory. The field management must have clear guidance [6]. The hidden dangers should be eliminated so that the security could be guaranteed.

3. Construction and Practice of a Smart Laboratory

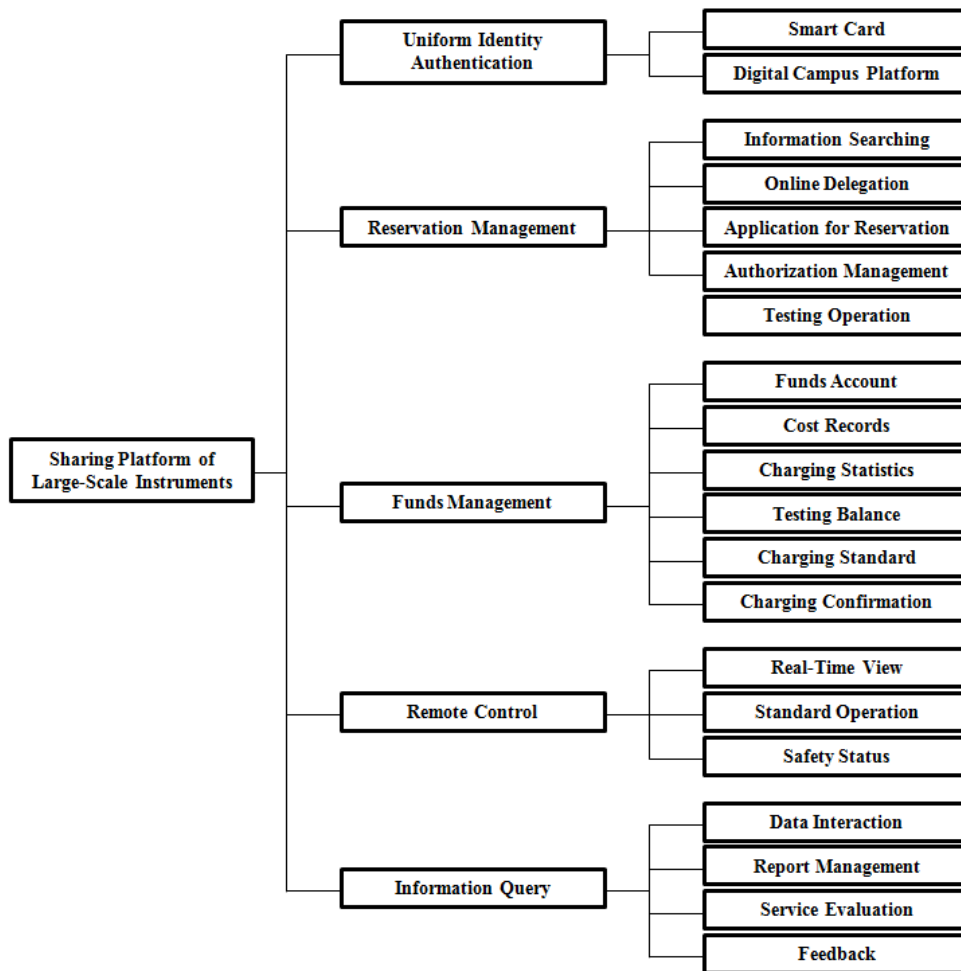


Figure 1. Functionalities of the Large-scale's Sharing Platform.

According to the actual situation, an opening and sharing platform of large-scale instruments has been set up within our university. Its working modules are upgraded after two years of operation. The management system of laboratory information has been further developed. Through the link management, the advanced idea of metrology accreditation in quality system is realized in its second level platform. It leads to streamline management of metrology accreditation and high standard control system of quality activity.

At the same time of information construction, the cultural brand construction is strengthened. The 6S management model is applied in laboratory management, furthermore, we propose a new idea of smart laboratory, which is taken the advantage of ICT (Information and Communication Technology). This second level model is placed in the 6S system. The “6+1”S model includes *Seiri*, *Seiton*, *Seiso*, *Seiketsu*, *Shitsuke*, *Safety* and *Smart*.

3.1 The sharing platform of large-scale instruments

The large-scale instruments scattered over the colleges and departments are reconstructed and optimized, and they are open and shared in and out the university. Thus the service efficiency is increased and the waste of repeat purchase could be avoided. We could serve more teachers and researchers with limited funds and resources [7].

Figure 1 shows the basic functionalities of the sharing platform. In practice, more functionalities could be tacked as it is needed.

3.2 Informatization laboratory management platform with standard process

The information laboratory management platform with standard process can help us strengthen the management of personnel and processing control of inspecting and testing. Gradually, a variety of risk prevention systems are built, ensuring the truth and accuracy of the reported datas and results.

Figure 2 shows the detailed contents of the informatization laboratory management platform.

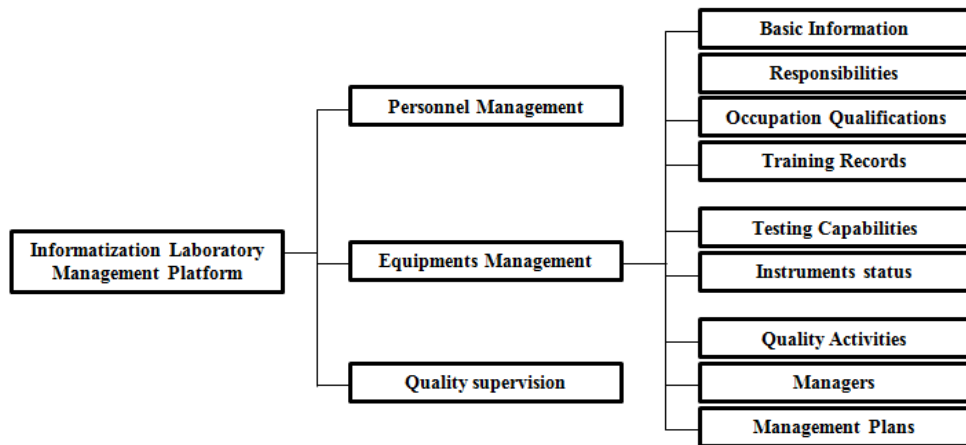


Figure 2. Detailed Contents of the Informatization Laboratory Management Platform.

3.3 Implementation of “6+1”S management

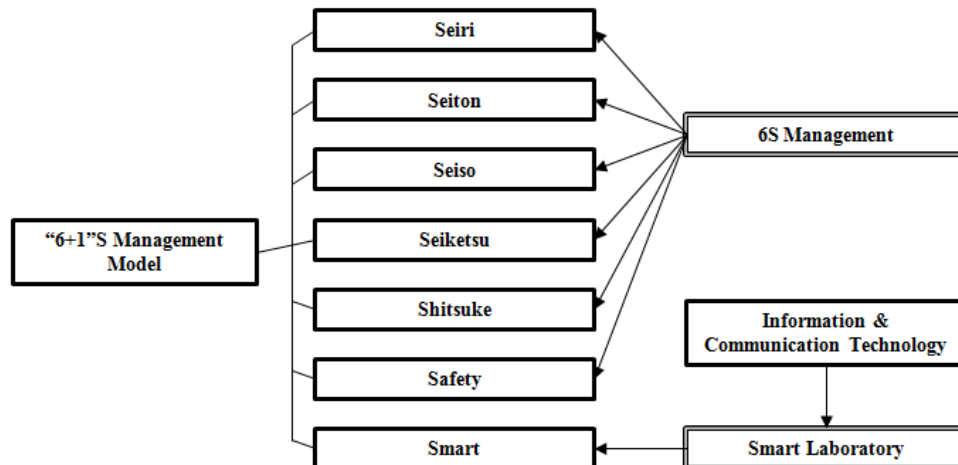


Figure 3. “6+1”S Management Model.

The laboratory management is not only a modern management system of information, but also includes the construction of laboratory cultural environment and the comprehensive quality of laboratory technicians. In the “6+1”S model, the management of internal affairs is combined with the informatization platform, and then the constant improvement of the system will make it possible to gradually realize the standardization of management, so as to obtain a clean working environment, overall concepts of safety, high working efficiency. It also develops positive and enterprising features of spirit and civilized habits.

As shown in figure 3, “6+1”S management model is based on 6S model. ICT is applied in the model to realize smart management. In implementation of “6+1”S management, the specific procedure is divided into two aspects: formulating a plan, establishing relevant standards and regulations of management, examination and evaluation.

4. Summary

We believe the details determine success or failure. The status of site management in laboratory indirectly reflects the internal management level and staff quality. The large-scale instrument platform can basically meet the needs of opening and sharing. Nevertheless, it lacks the function of quality supervision and control, so it can not be combined with the quality management system. By establishing an open management mechanism and constructing an intelligent management system in laboratory, we persist in collation and consolidation as a method of work, and implement cleaning and clearing in all operations. Under the guidance of “safety first”, the omnibearing and smart management could be embodied in the idea and strategy of laboratory management. It is concluded that the smart laboratory based on “6+1”S management model not only upgrades the level of management but also promotes cultivation of talents.

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