Construction Mechanism of Digital Lifelong Learning Platform

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Abstract—**Through researching construction principle, system framework and operation mechanism of digital lifelong learning platform, constructing such a platform needs include the following functions: first, digital lifelong learning platform is able to provide convenient, flexible and personalized learning environment for the learners; second, it achieve the lifelong learning overpass of vertical join and horizontal communication for all types of education; third, it provides learners with learning information stored, credit recognition and conversion, learning credit management, and obtains mutual recognition of learning outcomes convergence "Credit Bank"; it can provide technological support for comprehensively promoting continuing education and lifelong education system and building the learning society.**

Index Terms—**lifelong learning, smart learning environment, mobile learning, situated learning**

I. INTRODUCTION

With the rapid development of science and technology, knowledge update cycle continues to accelerate. The concept of lifelong learning in the society has been recognized by the public. Learning time is gone down to the human life and learning space is expanded to the whole society. Moreover, due to the development of lifelong education and lifelong learning, the value of education is no longer just to train a small amount of elite, but realizes equal learning opportunities and personal development needs for the majority of the members of society. Lifelong learning emphasizes the learner-centered and pays close attention to various needs of learners. To this end, we integrate all kinds of educational resources, which demands information technology as aid. In such a lifelong learning system, learner may learn the interesting resources in the anytime of their life.

People presently understand the connotation of lifelong learning as follows:
(1) from the requirements and characteristics of the era of knowledge economy, Learning should last throughout life, not once and for all;
(2) from the scope of learner, learning is not involved in a few people, but in all members of society;
(3) from the content of learning, learning is used to improve knowledge, quality and skill of learners and foster capability of learners;
(4) from the mode of learning, people learn knowledge in different times and places according to their own arrangement;
(5) from the type of education, lifelong learning includes not only academic education and formal education, but non-academic education and informal education as well.

Thus, lifelong learning is an important way of the all-round development of people, overall social progress, mankind towards a common ambition and consistent pursuit of the new century. For society, lifelong learning is to establish an educational action of modern civilization lifestyle; for individuals, lifelong learning is an effective measure to change life quality of a person, and is an effective means for learners to pursue the value of life. Therefore, countries have attached great importance to lifelong learning system. America formally promulgated the laws of lifelong learning in 1976, which established legal status of lifelong learning. The committee of lifelong learners is built in 1993 to formulate the policy and plan of lifelong learning. Former President Bill Clinton issued a report on the administration to improve the quality of learning and education through remote technology in 1998, which fully utilized modern science and technology to bring about the new learning chance. European Union regarded 1996 as the European Year of lifelong learning and introduced white paper on education "Teaching and Learning: towards a learning society". European Union promulgated "2010 target of European education and training" and presented three strategic targets: improving educational quality and benefit, expanding the educational chance of the whole people and opening EU education to the world. Japanese government proclaimed "Lifelong Learning Promotion Act" in 1990, which defined all levels of government responsibility for the implementation of lifelong learning and made the corresponding law. "Social Education Act" and

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"Libraries Act" revised by Japanese government in 2008 were provided the legal protection for promoting lifelong learning and the condition for jointly attending learning activity. In 1998, British government published the Green Paper entitled "ear of learning" which presented new measures including the construction of the personal learning account, the establishment of the industry university, the improvement of the basic skill, the qualification reform, launching workplace learning and regional cooperation. "Learning and Skill Act" published by British government in 2000 aimed to march toward learning society to boost lifelong learning and enhance national competitiveness.

Our country paid attention to lifelong education in 2000. The 17th Chinese Communist Party Congress stressed the need to develop distance education and continuing education, construct learning society of universal learning and lifelong learning. "National long-term Education Reform and Development Plan (2010-2020)" requires constructing lifelong learning "overpass" to fulfill various learning and development needs of individual so that sets up flexible and open lifelong learning system. The 18th Chinese Communist Party Congress reaffirms that our country actively develops continuing education, perfects lifelong education system and constructs the learning society.

Lifelong learning digitized public service platform (LDPSP) is built through the use of various modern technologies, such as computer technology, network technology, and multimedia technology, etc. It is a digital learning platform for lifelong learning, which integrates learning platforms, learning resources, learning tools and learning support service and orients all social members to provide learning service. To construct the learning society, provinces are building their own lifelong learning platform. For example, Shanghai Municipal Education Commission and Shanghai Distance Education Group jointly developed a common platform of lifelong education system (www.shlll.net). The application of the platform can satisfy the basic right of learning and requirement of lifelong learning of townspeople. Also, such an application plays a very important role in accelerating comprehensive development of people, improving urban civilization and constructing harmonious society [1]. Shanghai common platform portal of lifelong education is shown in figure 1.
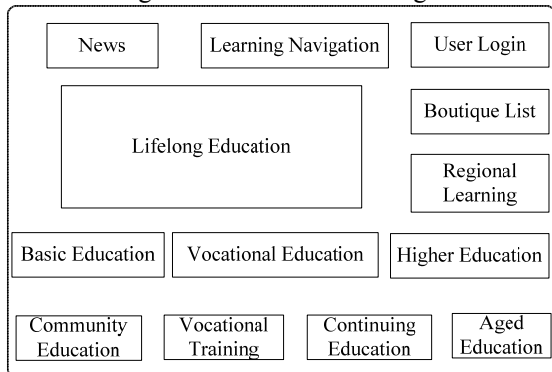

Figure 1. Shanghai common platform portal of lifelong education

Fujian Province is relying on "Fujian lifelong learning online" to build lifelong education system and learning society. This platform portal is shown in figure 2.

Jiangsu Lifelong Learning Online Organized by Jiangsu Provincial Social Education Services Guidance Center and undertaken by Jiangsu Radio and Television University is opened on May 20, 2009. According to learning concept of independent learning and joyful learning, Jiangsu Radio and Television University constructs the all-open, integrated, quasi-public service learning platform. The platform is used to provide various learning resources, which boosts universal learning and lifelong learning and promotes all-round development of human being. It also meets the needs of all kind of social group work, life and leisure. The sketch of Jiangsu lifelong learning online is shown in Figure 3.
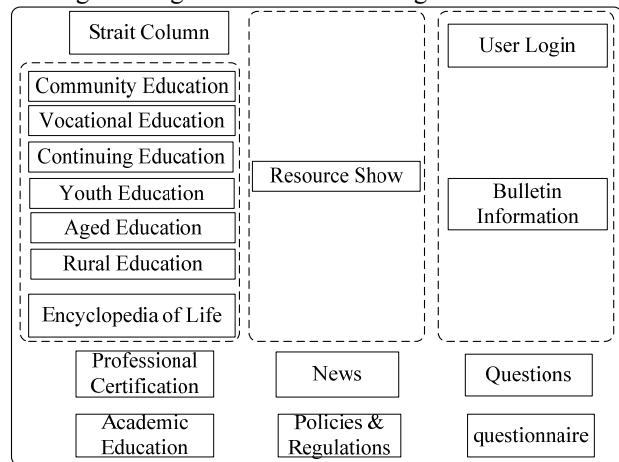

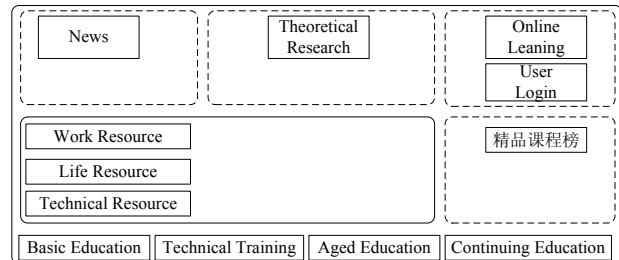Figure 2. The sketch of Fujian lifelong learning online

Figure 3. The sketch of Jiangsu lifelong learning online

In practice, lifelong learning platforms provinces construct respectively are used to display all kinds of resources and exist in the following outstanding problems.
(1) Educational institutions, universities and social organizations lack collaborative innovation mechanism of building lifelong learning platform;
(2) High-quality resources in lifelong learning platform in line with the needs of learners are few so that it is difficult to attract learners;
(3) In the learning process, learners get lost easily faced with abundant network resources and feel lonely and helpless so that learning efficiency is not high and learning motivation is inadequate;
(4) Existing lifelong learning platforms lack track, analysis and mining of behavior of learners, need to improve learning support service, boost personalized knowledge service and further conform to

personalized requirements of users.

According to the above shortcoming of learning platform, the paper constructs a new LDPSP from the top-level design, which provides technical support and theoretical guidance for constructing a learning society in which everyone can learn in anywhere or anytime. Moreover, the platform may provide ample learning resources, well learning environment, convenient alternative learning pathways and chances so as to afford each learner the opportunity to learn, satisfy each learner desire to learn. In a word, productive capability and life quality of everyone can be increased through such education or learning.

II. CONSTRUCTION PRINCIPLE OF LDPSP

A. Construction Purpose

LDPSP is gradually established a software and hardware platform which integrates advanced information technology, accords development of lifelong education and adapts school education according to the guidance of scientific outlook on development and the requirement of entrepreneurship and innovation. The platform can furnish effective technological support for accelerating the development of Zhejiang Open University, comprehensively promoting the construction of lifelong education system and building the society of ubiquitous learning.

LDPSP can promote the development of both academic education and non-academic education. According to the requirements of the job training, community education, rural adult education and old-age education, LDPSP is built community education network which covers both urban and rural areas and abuts the crowd. Moreover, it can offer convenient, flexible and personalized learning environment for learners [2,3]; it can provide learners with learning information stored, credit recognition and conversion and credit management, which achieves mutual recognition of learning outcomes. Scope of business of LDPSP includes community education, academic education, non-academic education, mutual recognition of learning achievements and public service of education for high schools.

The overall design thought of LDPSP is that the platform is centralized deployment of the provincial center, offers the whole support function of learning process, realizes cross-system authentication, concentrates resource storage, unifies data exchange mechanism and provides the service of mobile learning and complete rights management and teaching management. LDPSP affords education service as followed: on one hand, it orients community members to supply free educational resources and teaching management function; on the other hand, it orients various education institutions to provide learning environment of non-academic training and corresponding software and hardware support. Education institutions may apply for using the platform to generate learning websites which uploads their own resources and customizes kinds of educational services. Since learning resources, user information and statistical data of learning behavior are stored in the provincial center, we can obtain real-time data about projects of community education and non-academic training.

B. Construction Principle

LDPSP is a very important link in the system of lifelong education. It can provide the necessary technical support for which Zhejiang Open University is to carry out lifelong education. Moreover, LDPSP is detailed demonstration that a new university unfolds concept innovation, model innovation, means innovation and service innovation. Thus, construction principle of LDPSP is as follows:

(1) Emphasis on forward-looking. When building LDPSP, we innovate to educational idea, cultivating mode and operation mechanism and fuse a variety of state-of-the-art information technology.

(2) Emphasis on integrity. LDPSP is designed to achieve full sharing of data and effective monitoring of learning process, especially on scientific design focused on the integration and coordination of data exchange, after existing systems are synthetically analyzed and various needs are developed in detail.

(3) Emphasis on openness. We pay attention to basic standards and the overall architecture design of the platform and fully consider Openness and scalability. Urgent needs to function on the platform are first developed.

(4) Emphasis on interoperability. We pay special attention to scientific and standardized processes of the platform, while realizing the function of the platform. Thus, in construction, multiple departments mutually cooperate. In the use of the process, we need to work together.

(5) Emphasis on normalization. We strengthen the system construction and establish a set of scientific processes and operating mechanisms to guarantee the construction, management and application of the platform from the demand for research, project approval, project implementation, and management application.

(6) Emphasis on individuation. The platform can provide personalized learning service, including personalized resource push and personalized learning support service. We fully consider emotional experience of learners on this platform, which includes the usability, usefulness, expandability and reliability of resources and satisfaction of learners.

III. THE SYSTEM ARCHITECTURE OF LDPSP

A. Systematic Architecture Design of LDPSP

LDPSP is required to actively serve social development and local economic construction. The construction aim of the platform is to develop lifelong education, promote the quality of learner and insist social and international direction. Popular lifelong learning platforms based on web to launch online learning and support service, such as Shanghai Learning Net and

Jiangsu Learning Net [4]. Due to mobile technology, virtual reality technology and the popularity of intelligent terminals, a few educational organizations closely track mobile learning technology and actively explore mobile learning, but mobile technology is slowly applied to mobile learning. Existing mobile learning websites based on short messaging service and simple browse of resource in form. Such websites on system deployment are frequently set up alone and those on function are used to provide information consultant [5]. They do not integrate available resource and do not realize situated learning and immersion learning. Thus, mobile learning websites are not easy to be penetrated into the whole process of learning support and services [6].

According to the actual demand of LDPSP and the guidance of knowledge service concept, service-oriented architecture (SOA) is applied to design the platform, since it has the characteristics of flexibility and universality. Thus, LDPSP can unify the data standard to fuse resources and applications and to realize the service of sub-systems.

LDPSP is built by the relative mature application software, such as Microsoft .net architecture. It uses Oracle or Microsoft SQL Server of database to support data application. When data is stored, structured and unstructured forms are combined to store data so that the flexibility of data is expanded.

In fact, LDPSP can integrate information resource to provide online learning. It may complete credit certification so as to build the smart learning platform of universal learning and lifelong education through situated learning, mobile learning, immersion learning and assisted learning realized by network. Thus, such a platform can renew specialized knowledge and vocational skill and provide timely, effective, flexible and multiple ubiquitous learning services.
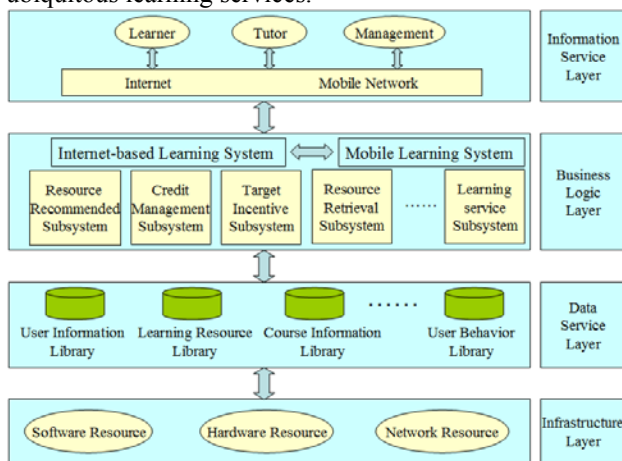

Figure 4. System architecture of lifelong Learning platform

Since lifelong learning has with extensiveness, continuity, instantaneity and autonomy, the design of LDPSP needs to satisfy the above requirement. Moreover, Owing to the diversity of user's learning needs, the platform is developed to upgrade quality and efficiency of service. Thus, we want to apply the latest information technology and analyze learning demands of users to design systematic architecture of the platform so that

personalized style of learning support system in learning goal orientation, learning process guidance, learning management, learning activity participation and learning outcome reward is established to serve self-directed learning of learners. From meeting learners' needs of mobile learning, situational learning and immersion learning, the well learning platform bases on web and depends on 3G communication network to expand mobile learning management system. The framework of the new and flexible learning platform for smart learning support service is shown in Figure 4.

(1) Information service layer

The layer provides operation interface to users and takes charge the session between users and the platform. Through loading the system, the platform can automatically distinguish the user access to Internet-based learning system or into mobile learning system. The platform provides the single access portal, for users, personalized information service and assigns the appropriate permission for users. Also, page design, navigation and operation of the platform are terse. The use of multi-channel in the platform can provide multiple resources transport mode and learning support service mode for meeting multiple learning needs of learners. Thus, learners are not limited to single learning mode, but choose learning service according to their learning need so that learning is become more autonomous and convenient.

(2) Business logical layer

Business logical layer is used to accept used needs from information service layer, which transforms needs to initiate requests to data service layer and then turn results into information service layer. To meeting needs of different businesses, the layer is set up the interface of public application or dedicated service component. Meanwhile, the platform naturally integrates Internet-based learning system and mobile learning system so as to provide technical support for multiple learning forms, various resource transfer mode and learning service mode, which meeting diverse learning requirements of learners applying multiple learning terminals.

(3) Data service layer

Data service layer provides the above layer with various data, such as user information, learning resources, leaning records, interactive information and learning fruits. The data is well stored, processed and managed to easily apply those data to the above Internet-based learning system and mobile learning system so that the data are shared. Moreover, application systems can finish data mining to provide learners with personalized resource push and resource retrieval. Then, systems can afford various statistical forms for managers. In data service layer, we build storage standard, access standard, exchange standard and management standard of the data to realize interoperability between heterogeneous application systems.

(4) Infrastructure layer

Infrastructure layer sustains the entire operation of LDPSP. The layer consists of hardware resource, software resource and network resource. Software

resource includes operation system, database and so on. In order to hold out cloud service of LDPSP, the layer needs to set up a large number of hardware devices, storage virtualization and corresponding software.

B. Main Function of LDPSP

(1) Learning resource push

LDPSP can offer a series of courses for learners and recommend learning contents and aid resources according to the learner's own situation so that learners can rapidly find learning objectives and learning resources. Thus, learners are not adrift in massive data. To be specific, when a learner first enters into LDPSP, he is required to fill in personal career information, hobbies and professional information if he wants to become registered member of the platform. The platform collects information above to recommend corresponding learning contents for him [7,8]. If the learner has his own learning circle, the platform can recommend learning resource of his learning friends to him, which helps the learner quickly locate resources he needs.

(2) Learning management and incentive

LDPSP can track each learning process of learners, record learning schedule and vividly scribe the learning process of learners in figure. Learners may adjust learning progress and reasonably distribute learning time according to their own requirements. Through management and quantification of learning process, learners can avoid online aloneness and do not lose learning motivation and goal.

In order to encourage learning interest of learners, the platform sets up the learning incentive system of score and certificate. The platform can open a few high quality resources for the learner when his score meets the requirement of the platform. If the credit of the learner is attained to appraisal standard, we issue a certificate to him. Thus, the system can afford incentive for learners and assess the learning results of learners.

(3) Smart learning environment

In addition to relying on a wired network and a relatively fixed place of learning outside, learners may apply mobile technology, ubiquitous technology and seamless access technology to learn. Therefore, learners can learning in anywhere or anytime and obtain more learning chances. In the other hand, the platform can totally record learning situational information (environmental information, equipment information and user information) and obtain new data so that learning ability, cognitive style and learning preference of learners are distinguished through data mining and scientific analysis on learning process data of learner. Hence, the platform can produce relatively suitable learning tasks and activities for learners and guide them correct decision. A new learning environment that effectively promotes intelligence development and boosts smart behavior is thus built.

III. OPERATING MECHANISM OF LDPSP

(1) Management mechanism for collaborative innovation

Levels of departments collaboratively manage LDPSP to ensure smooth operation of the platform and obtain tangible results. This requires not only schools and technical departments, but also the higher administrative departments and research institutions. With interactive cooperation of these sectors, we establish the project management team and implementation of the relevant group to construct LDPSP. Firstly, LDPSP is a system which abuts the masses and covers urban and rural areas; secondly, it can provide convenient, flexible, personalized learning environment for learners; thirdly, it achieve the lifelong learning overpass of vertical convergence and horizontal communication for all types of education; fourthly, it can realize "credit bank" which affords learners with learning information storage, credit recognition and conversion, learning credit management, mutual recognition of learning outcomes.
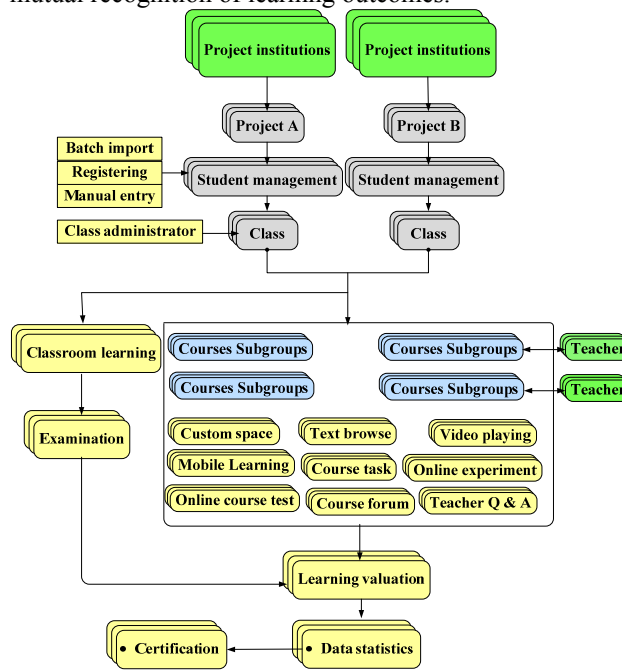

Figure 5. The training flowchart of LDPSP

(2) Flexible resource building mechanism

High quality learning resources is not only an important part of LDPSP, but also an important factor to attract learners to study. Thus, we focus on building learning resources, especially high-quality resources and resources interested by learners. The mode of building resources consists of three parts. The first mode is that learning resources are built by the school; the second is that cooperation between school and other units is used to build resources; the third is that learning resources is purchased. Besides, good resource learner produces is also introduced to the platform. Through extensive build mode of learning resources, all kinds of e-books, journals, videos and courses are stored to LDPSP and are transformed to the popular playing formats, such as wmv、mp4 and avi for various terminals easily accessing. Moreover, we explore value-added services on the platform. For example, we provide paid service with high-quality resources to realize the maximal value of

educational resources. The platform can achieve good cost-effective and make sustainable development.

(3) Society oriented service mechanism

The construction goal of LDPSP is to provide technical support for building a learning community and make everyone who wants to learn have learning space. The platform can offer human support for local social and economic development and let everyone who wants to improve his or her quality learning resources. Thus, it can serve social institution and social members. Often, a part of people can be trained in terms of the platform, master a skill and obtain the corresponding certificate. The training process on the platform is shown in Figure 5. The platform can provide a large of learning resources for the people in the community. Through learning those resources, citizens can grasp knowledge in happy learning, such as health knowledge, financial knowledge. In a word, people who are willing to learn can log on to the platform to find appropriate resources for their own learning

V. CONCLUSIONS

With the development of Internet of Things, cloud technology and mobile technology, the construction of LDPSP is put forward new demand, i.e., building smart learning environment. Thus, in the process of building such learning environment, we consider the following three questions. First, advanced information technology is applied to perceive learning situation and learning information of learners is obtained. Learning ability and preference of learners are distinguished so that the most appropriate learning task or activity is produced. Second, we discuss information technology to bring the change of learning model and investigate the requirements of mobile learning and corresponding resources. Likewise, we research learning process, counseling form, evaluation methodology and collaboration pattern of mobile learning and pay attention to seamless connection of different learning systems. Finally, we deliberate the Standardization of learning resources and strengthen the construction of a variety of resources to suit the needs of various systems presented.

Nowadays, with the rapid development of information technology, the construction of lifelong learning digitized public service platform (LDPSP) aims at affording mobile learning, fun learning, situated learning and immersion learning for learners. We can create a satisfying ubiquitous learning environment to meet the needs of learners with the help of LDPSP. Further, lifelong education is promoted.

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