A standard E-learning solution supported by the Ring Service Learning Management System

by

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Abstract : At the cutting edge of today's rapidly growing information age, e-Learning is playing a vital role in the reform of global educational systems. Many business organizations and learning institutions continue to rely on the flexible platform of training which e-Learning offers through the internet. In parallel with the growing interest in the development of e-Learning, there has also been an increasing demand for learning management systems bearing the fact that knowledge assets need to be managed and leverage more effectively. This has led to the integration of various learning management systems into e-Learning models to manage the learning process. This paper discusses the architecture of the Ring Service Learning Management System.

Keywords : Learning Management System,
Blended Learning, Revision Classroom, Mobile learning,
Curriculum Book shelf, Sharable Content Object (SCO), Sharable Content Object Reference Model (SCORM), Real Time Contact Session.

1．Introduction :

In the emerging information age, we will have vast amount of information stored in databases and delivered as Web pages via information networks. Opportunities will be created for almost everyone to access this information through the Internet. In other words, easy access to information will create relatively good opportunities for learners to participate in various kinds of learning scenarios. And with the aid of information technologies learners will be able to select and master many fields of study from their own perspective of the learning environment. In such a social circumstance, many educational communities will expand providing favorable conditions for everyone to engage in learning regardless of place, time and situation.

Hence it is believed that the advent of, powerful "e-Learning solutions" will contribute to facilitate learning processes and assist learners in their areas of interest. Our Ring Service Learning Management System (abbreviated Ring Service LMS) mentioned in this paper is designed to satisfy various requirements in e-Learning from learners', teachers', and system administrators' points of views.

Background :

Recent advanced information technologies are very powerfully changing our social system to an information oriented one. Corresponding to this social evolution, our educational system should be reconstructed with new conventional methods. For instance, multimedia technologies that provide high quality teaching materials such as animation, simulation, or movies should be incorporated into the educational system. A number of information and communication technologies designed with educational goals can also assist learners in their learning process from remote Web servers and accessed through the Internet. Owing to these changing technical support systems, learning instruction strategies should be relatively improved in comparison to the present traditional ones. In order to apply these advanced information technologies across the education system, the authors have designed a general model of e-Learning that could be applicable to both present and future education learning generations.

Purpose :

Through the entire learning processes in the e-Learning system, three kinds of persons (learners, teachers, and system managers) collaborate and play individually their proper roles under intimate relationship with each other. The authors are interested in the manner under which such the e-Learning system is controlled by these three players from their individual viewpoints. In order to implement such a standard e-Learning system, we have designed the Ring Service Learning Management System, which is built within the context of managing learning in a loop like form around a number of learning phases. Its tools can be fully incorporated into a standard e-Learning system that is designed to provide with efficient learning environment accessed through the internet. The Ring Service LMS (Ring Service Learning Management System) provides the Interface for a smooth and streamline flow of learning process in which a traditional classroom and new online learning fashions are jointed through a Web based learning environment. In addition, it provides more flexibility to the learner to get individualized training anytime and everywhere.

In order to unify and standardize the learning process, we have designed the Ring Service of e-Learning from two viewpoints of support for learning or teaching methods. These view points are represented by (I) an in-phase support mode and (II) a phase-link support mode. Under an in-phase support mode, learners learn their subjects with the assistance of a teacher or CAI (Computer assisted instruction) through a Web based learning platform. The system provides learners with teaching materials, teaching software, and educational information. A teacher can use these teaching materials in his/her classroom during a contact session. On the phase-link support mode, the learners' information is managed by a common database that is distributed across the learning phases. The database links the information of learners' situation from one phase to another. By the phase-link support, a teacher looks over the whole of the learning situation of his/her classroom. These two forms of supporting modes have helped to standardize the design of our e-Learning model with a global concept.

In this paper, the authors discuss the global concept of the Ring Service LMS in chapter 2. In chapter 3, modules in the Ring Service LMS are discussed and how they assist learners' through their learning processes. We have also illustrated the structure of the modules in the Ring Service LMS with user interfaces; procedures for learning, learning control, etc. Chapter 4 shows the implementation of the Ring Service LMS and how it supports our e-Learning web-based learning platform "TSPLAZA". Through the system "TSPLAZA", we try to implement a global concept of the Ring service LMS.

2．Global Concept of the Ring Service LMS in e-Learning

In general, information technology consist of three kinds of technologies : information processing technologies, information communication technologies, and information management technologies （see figure 1）. By joint of these technologies, we can design various types of information systems built on independent modules. In
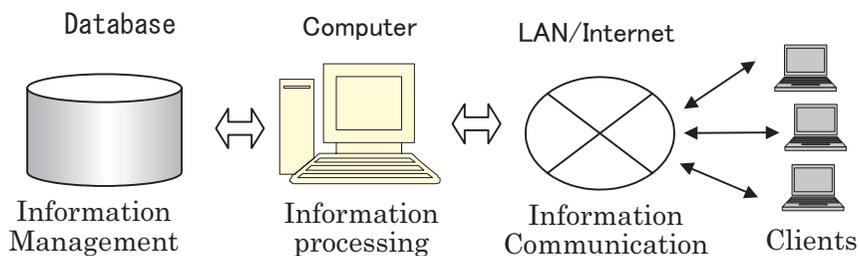

Fig. 1　Three functions of an information system

the case of e-Learning, Database is one typical methodology used to implement information management technologies in managing and administrating teaching materials, teaching strategy, and educational information. Recent multimedia technologies have helped teachers; course and content designers to design rich teaching materials in order to adapt impressive teaching strategies in the learning process. Moreover, owing to the invention of one major information communication technology tool-the Internet, teaching materials and education software are efficiently delivered all over the world and we can now realize the use of computer assisted instruction (CAI) to even very far distance learners.

A very standard e-Learning system comprises of various kinds of educational information and software related to instruction strategies and teaching materials. Teachers, learners, and system administrators are expected to collaborate to fulfill their tasks with the assistance of the e-Learning service provided. Our System allows the teachers to control and manage their own instruction strategy and teaching materials, while the system administrators cooperate to manage learners' learning processes. In order to streamline this collaboration, we have designed the Ring Service Learning Management Systems (RSLMS) inside of which the learning processes are controlled more effectively. Fig.2 shows the global concept of the Ring Service LMS described in this paper.

In the operation of an ideal learning environment, the Ring Service LMS should be the central most vital part for any e-Learning model to survive and integrate well in a rapidly transforming global educational system. Figure 2 illustrates the global design of the learning phases supported by the Ring Service LMS. This system combines circularly phases of learning platforms ranging from the learner's home to classroom based learning environment and real time learning through online services based on the Internet. The Ring Service LMS is complaint to the SCORM version 1.2, thus all Sharable Content Object (SCO) utilizes the SCORM Run-Time Environment to communicate with it. Therefore, the Ring Service
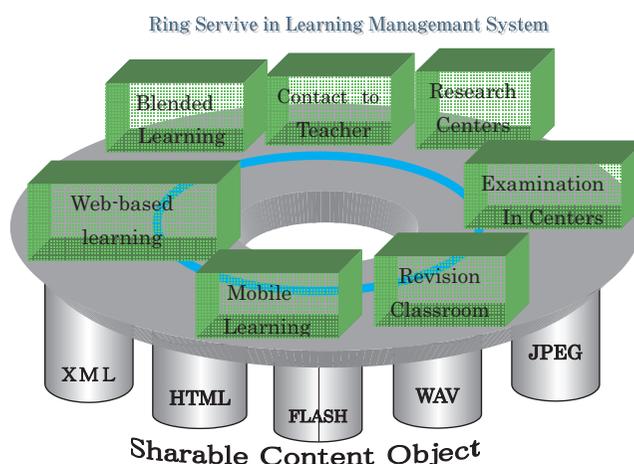

Fig. 2 Components of the Ring Service Learning Management System

LMS is supported by the basic software such as XML, HTML, FLASH, WAV, and JPEG, with which the concept of the Ring Service LMS is implemented as shown in Fig.2. The Ring Service LMS consists of seven learning phases. Each phase in Fig.2 is managed by an "in-phase" and "phase-link software". The in-phase software control the local learning processes, evaluate learner's academic grade, and delivers teaching materials. With the phase- link software, learning phases in the Ring Service LMS share common database information about learners' attributes, learning situation, and academic grades. According to the structure of the Ring Service LMS, these two distinct softwares are distributed across the e-Learning model. A total of seven agents manage the in-phase support with respect to the individual phases in the Ring Service LMS. One of the agents (notably a teacher) supervises and controls the flow of the learning processes over the series of seven learning phases.

The Ring Service LMS consists of seven phases; blended learning, Web based learning, mobile learning, revision classroom, examination in centers, suggestion in research centers, final check by contact to a teacher. The Ring Service LMS incorporates a set of learning platforms that gives both the learner and the tutor the easiest way to achieve their goals. One special learning platform that the Ring service LMS support is blended learning which combines mixed learning modes such as classroom-based learning and individual self-learning assisted by a computer in a classroom or learner's Home. The Ring Service LMS manages the flow of the learning process.

Figure 3 represents the tools consisting of the softwares required to share the information among the seven phases in the Ring Service LMS. It includes a Learning Management Server designated as "RSLMS Server", a Web-based Learning Server (WBL SERVER) and Data-base Server (DB Server). Though these three servers have independent functionalities, they do influence each other's performance by the sharing of relevant information. Through the interdependent relationship existing between the servers, data and information can be transferred from one server to another allowing for proper management of information before it reaches the end-users. Table 1 below illustrates the
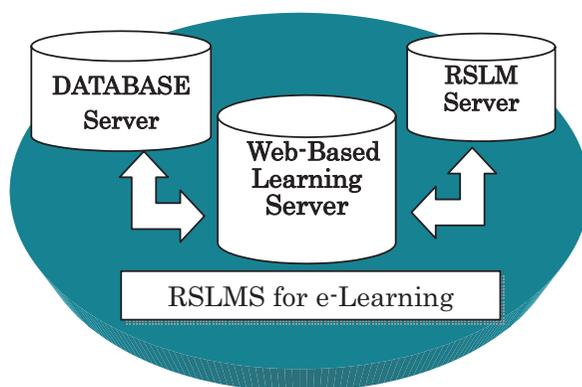

Fig. 3   Servers for the RSLMS

respective functions of these servers to the RSLMS shown in Figure 3.

3 . Functions of Modules in the Ring Service LMS

Table 1 Functions of the Servers in the Ring Service LMS

Servers	Functions
Database Server (DBSERVER)	Embeds data and information on the learning sessions. The database delivers teaching materials and teaching software.
Web-based learning Server (WBL SERVER)	By Communicating with the database server, we create the platform for multiple modes of learning from self paced course work (web-based seminars or classes) to scheduled classes (live instruction in classroom settings or online) to group learning (online forums and chats).
RSLM Server	Manages learning resources of the WBL server and those of the database server. Provides features for the management of learning events. Provide reports of learning sessions, scheduling abilities and calendar, and learner-tutor email services. It creates an assessment engine with built-in testing and evaluation capabilities for monitoring, tracking and rating the e-Learning events.

Our designed e-Learning model that the RSLMS supports is managed by several sub-modules corresponding to the learning process as shown in Fig.2. In this chapter, a number of learning processes are discussed to explain the concrete structure of the Ring Service LMS.

3. 1 Blended learning as supported by the Ring Service LMS.

In an ideal learning situation, before starting to learn a new subject, learners are expected to get used to the course contents and learning methods. In order to strengthen such a perspective of a learning scenario, the Ring Service LMS provides learners with a type of "blended learning" that includes real-time contact classroom, face-to-face contact teaching, and traditional lecture-oriented classroom. Even for the inexperienced learners, blended learning can prepared them with simple and easy learning fashions they can adapt to suit their educational needs. In Figure 4, we illustrate an example of Blended learning with several user interfaces that assist both learners and instructors in a learning environment.
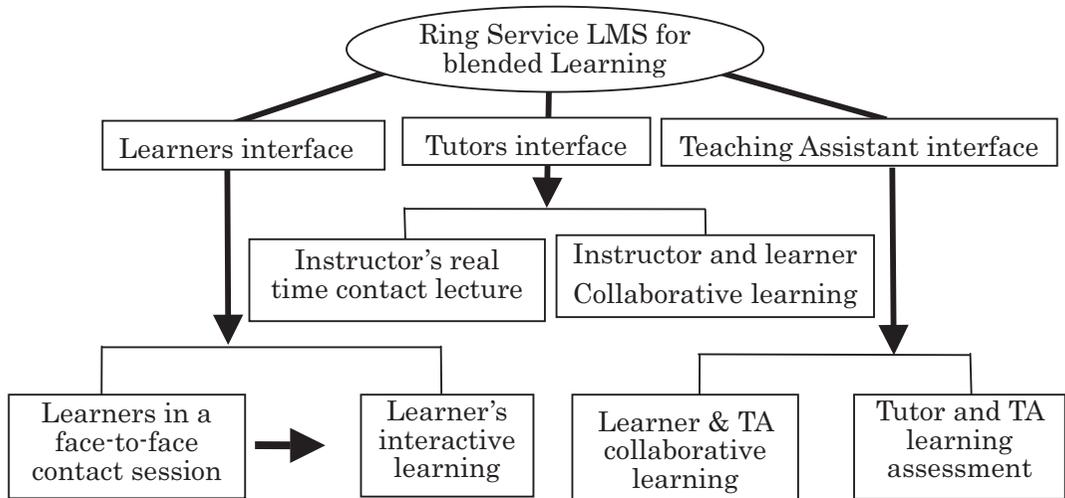
Fig. 4 Tools and Interfaces in RSLMS

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                Ring Service LMS for
                  blended Learning

  Learners interface    Tutors interface    Teaching Assistant interface

                  Instructor's real      Instructor and learner
                  time contact lecture   Collaborative learning

  Learners in a      Learner's       Learner & TA       Tutor and TA
  face-to-face       interactive     collaborative      learning
  contact session    learning        learning           assessment
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Fig. 4 Tools and Interfaces in RSLMS

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                Real Time Contact Session
                (Classroom-based lecture)

  Enter RSLMS with Password        Learner's problem
                                   evaluation

  System checker Checks whether    Instructor &  learner, TA &
  or not the learner is part of the  Learner problem solving
  face-face contact session

  Soft environment                 Instructor & TA feedback
  for learners     Robust environment for learners   during face-face contact
                                   session

        Knowledge
        retention process
        during contact
        session
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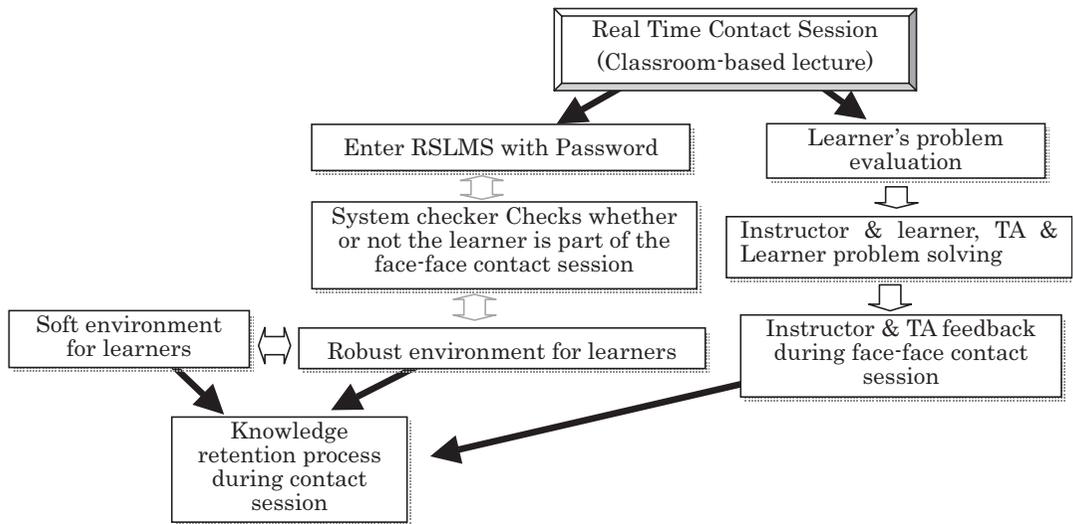
Fig. 5   Learning process and Relationship between sessions

In the blended learning mode, there are three interfaces available for learners to choose (see Fig.4). When learners take a lecture, they are expected to choose the tutors interface and engage in a contact session. When they need some assistance to solve their learning problems, they can choose the teaching assistant interface or tutor interface. Moreover, if they want some discussion or collaboration with their schoolmates, they can choose the learners interface. Therefore, the tools and interfaces are blended as set of options for the learners, tutors and teaching assistants as is illustrated in fig.4. However, it is always possible that learners and a tutor sometimes

will use computers to engage in self-learning, or presentation of their opinion. For instance, in a real-time contact lecture, both learners and a tutor collaborate to realize intensive learning in a classroom-based learning environment, and it is the Ring Service LMS that provide learners and tutors the tools required to upgrade e-Learning over traditional learning methods.

Each user interface presents its proper learning scenario during a particular learning session. Fig.5 illustrates scenarios in the real time contact session of a typical learning schedule (Traditional style learning refered to as one of blended learning methods). Such a learning environment is supported by the tools provided in the Ring Service LMS. In the case of Fig.5, the teacher/instructor and teaching assistant remains as a supervisor to ensure that the learner's task is completed within the schedule period of time. It is very important for both the Instructor and his/her teaching assistant to follow the progress of the learner after the first half of the real time contact session.

To solidify the knowledge absorption or retention of the learner, real time practice drill follows immediately after blended learning (see Fig.6). In real time practice drill, the instructor give short range practice drills questions on the topic of discussion, and require the learner to solve these problems on the basis of the knowledge attained on the
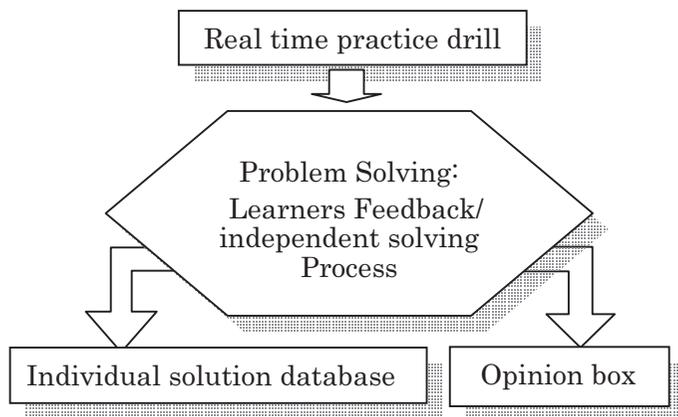

Fig. 6   Real time practice drill

contact session. The learner will also be required to give their suggestion on their level of understanding and their feedback on whether or not the practice-drill questions is of relevance to the topic of discussion. These individual solution and opinions are stored in a database, and followed by practice drill questions conducted later in the other learning modules.

3. 2 Ring Service LMS as applied in an on-line learning Environment

Recent educational polls indicate a tremendous increase in global interest for on-line learning platform as compared to traditional learning classrooms. This is because
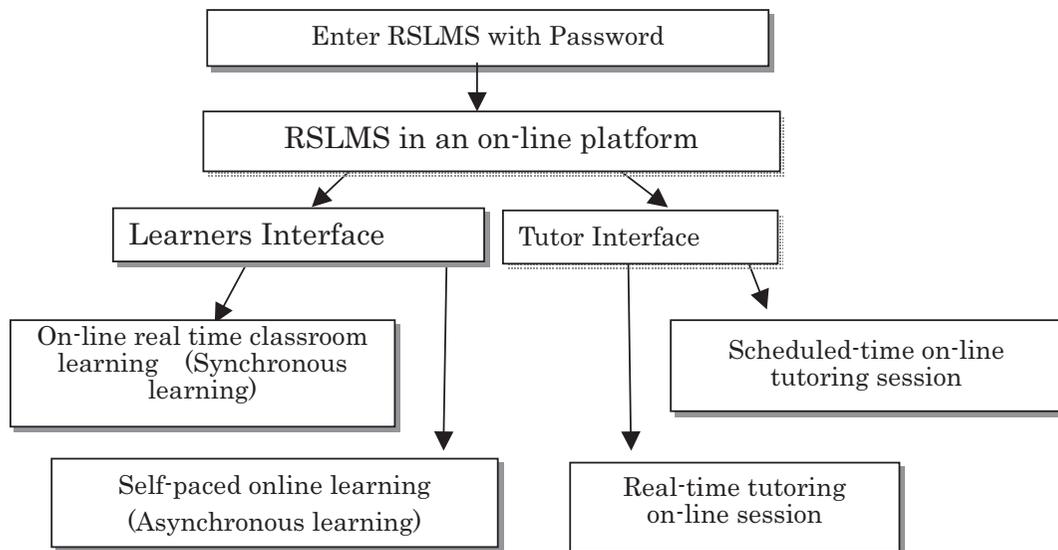
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┌─────────────────────────────────────┐
│     Enter RSLMS with Password        │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│      RSLMS in an on-line platform    │
└─────────────────────────────────────┘
         ↙                    ↘
┌──────────────────┐   ┌──────────────────┐
│ Learners Interface│  │  Tutor Interface  │
└──────────────────┘   └──────────────────┘
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On-line real time classroom learning   (Synchronous learning)

Scheduled-time on-line tutoring session

Self-paced online learning (Asynchronous learning)

Real-time tutoring on-line session

Fig. 7   Individual works of learners and a tutor in RSLMS

on-line learning platforms provide encouraging flexibilities in learning that suits the individual learner's interest. Moreover, on-line learning is cost effective giving it a sound advantage over many other traditional learning methods. Fig.7 illustrates a simple example of learning processes with relative tools and interfaces that the Ring Service LMS provides for the realization of e-Learning via on-line learning platforms.

As shown in Fig.7, a learner and a tutor enter Ring Service LMS with his/her password. Corresponding to the learner's situation, he/she can choose the most suitable course of her interest and engage in it. A tutor goes to a scheduled time for on-line tutoring session, or real time on-line session. In learner's case, he/she may choose on-line real time classroom learning or self-paced online learning. Within the RSLMS, learners and tutors as well are expected to execute their proper roles independently of each other under the management of this system, with the fact that they are different from each other in cyber space. Moreover, as many learners are expected to take part in the learning processes of the Ring Service LSM at the same time. Fig.7 shows only one typical example for partaking in the learning events of the Ring Service LMS.

3. 3 Ring Service LMS as applied to a Web-based learning Environment

Owing to the recent advanced information technologies and growing reliance on e-Learning over traditional classroom, e-Learning can be performed in any environment (for instance, at home or dormitory). The necessary tools for e-Learning

are provided anywhere at anytime through the Internet. The Ring Service LMS creates the platform of e-Learning for learners to continue their learning in their most favored conditions (see Fig.8). The service also provides a number of useful tools that helps learners to make a memo of lecture notes (short descriptive notes and analysis of the learning scenario). And also the Ring Service LMS provides a database reservoir where the learners can input their memo of lecture notes/ design and analysis. This experience will be reviewed by a tutor/instructor who may assess the level of understanding of the
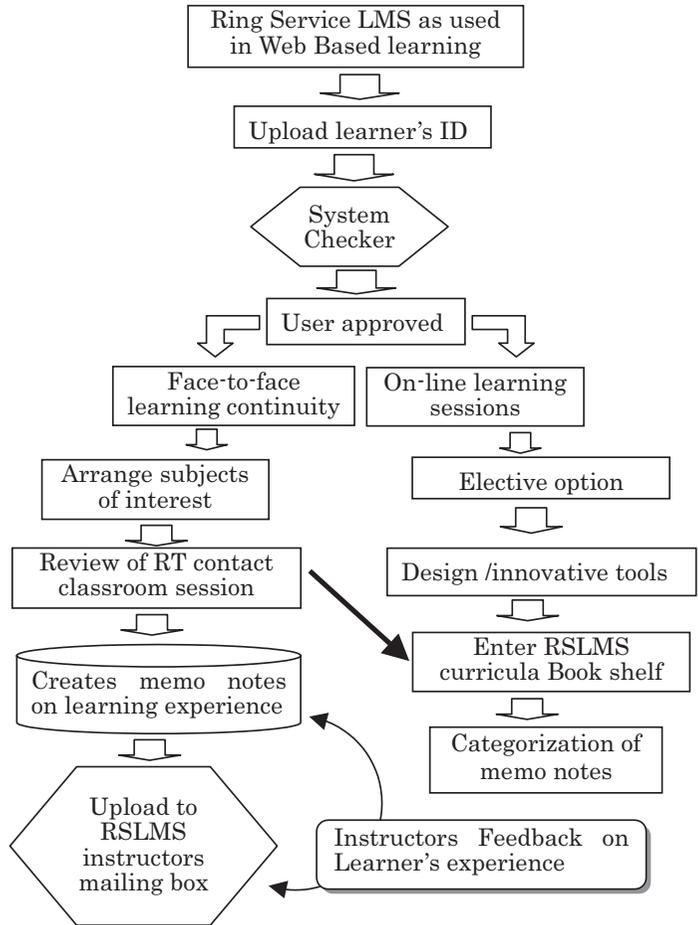
Fig. 8   RSLMS applied to a learner's home/dormitory

learner in that particular area of the learning session. The service will also provide an interface for the instructor to correct and send his feedback to the learner. There is also a rapid mailing response system that will be used by both the learners and instructor to communicate and solve learning problems. The learner will use the RSLMS e-mailing system through a mail server to send their question and learning problems directly from their homes to their instructor of a particular subject, and may request the instructor to send a feedback if the situation permits him. Therefore, a learner can learn his/her interested subjects anywhere and anytime in the Web based learning by using e-mail services. Fig.8 illustrates some processes of a typical Web based learning and its supplements.

In order to assist an active learner, Ring Service LMS provides him/her with a curricula book shelf that assists him/her to categorically fix all learning lecture notes

in a chronological order. It can also provide the interface that the learner will start to arrange subjects by order of interest. In the Ring Service LMS, the learner can directly upload seminar assignments to a specific instructor- learner's mailing list box prior to or after the submission date. These tools make the learning circumstance very active and attractive.

3. 4 Mobile learning in Ring Service LMS

Wireless communication now forms one the most popular means of 21st century communication : it comprise of a number of tools ranging from mobile phones, PDA handheld PCs, wireless computers and so forth. In the near future, wireless communication will become so popular to an extent that it will emerge as any ordinary
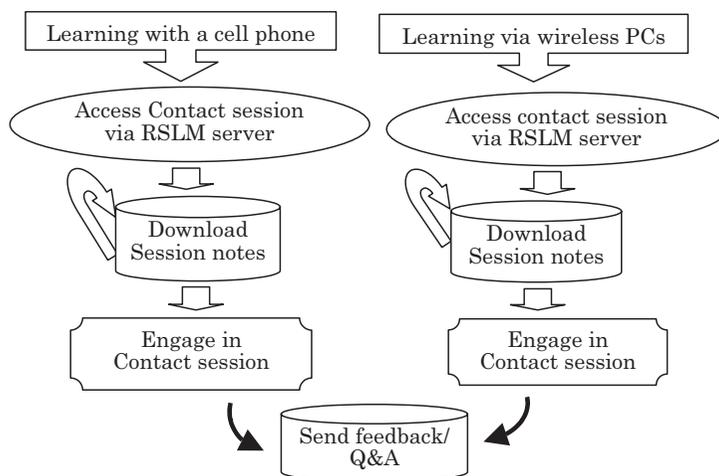

Fig. 9　Mobile learning in RSLMS

communication methods. Fig.9 shows support model of the mobile learning. The Ring Service LMS provides the learning interfaces operable in a cell phone, PDA handheld PCs, wireless computers for CBT and WBL environments. This service creates the environment for the learner to access learning information through CBT/WBL platforms via e-Learning services. However there are limitations to the quantity of data access with regard to mobile phone learning owing to the size of their memory bandwidth. RSLMS uses the I-mode platforms of mobile phones as the environment where a learning session occurs. Every learning client is allocated an ID and password to enter the learning zone via their cell phones. The learner can access the Web-based learning interface through Ring Service LMS server and get involved in the learning session (real time contact classroom based learning) regardless of whether they are in the contact session or outside the contact session. The instructor will upload I-mode content prior to the learning session to give the learner a glimpse of what going to be on the contact session. Hence a learner can still engage in the contact session and will be able to send any related information on the topic of discussion to the tutor via the Ring Service LMS mobile phone mailing system.

With the increase in memory and hard disc space, a computer can now be used for a number of educational purposes. When a learner is not in a contact session, he/she can use a wireless computer to access a contact session as he/she will do with a mobile phone. The only advantage a wireless PC learner will have over a mobile phone learner in the RSLMS is the quantity of service to access. The Wireless PC learner has a greater advantage of disc space, and memory so he will be able to penetrate into more learning details as opposed to using a mobile phone which has limited memory.

3.5 Ring Service LMS in a Revision classroom

The Ring Service LMS revision classroom section is designed to assist both the learner and teacher alike in the process of reviewing previous learning sessions (see Fig.10). The teacher's area is divided into two Portions : Portion (A) is used by the teacher to deliver important pinpoints of previous learning session, relevant tips that will help the learner to understand the learning contents. In Portion (B) the teacher provides a platform for various examination revisions before the learner takes an examination. This may take a number of methods, for example, some learners may prefer the traditional one to one revision at the back ground of e-learning where both the learner and teacher uses a computer for the revision session. Or they use a revision platform through the Ring Service LMS where the learner and teacher meet to discuss a revision session within a schedule period of time either online or just-on-time classroom.
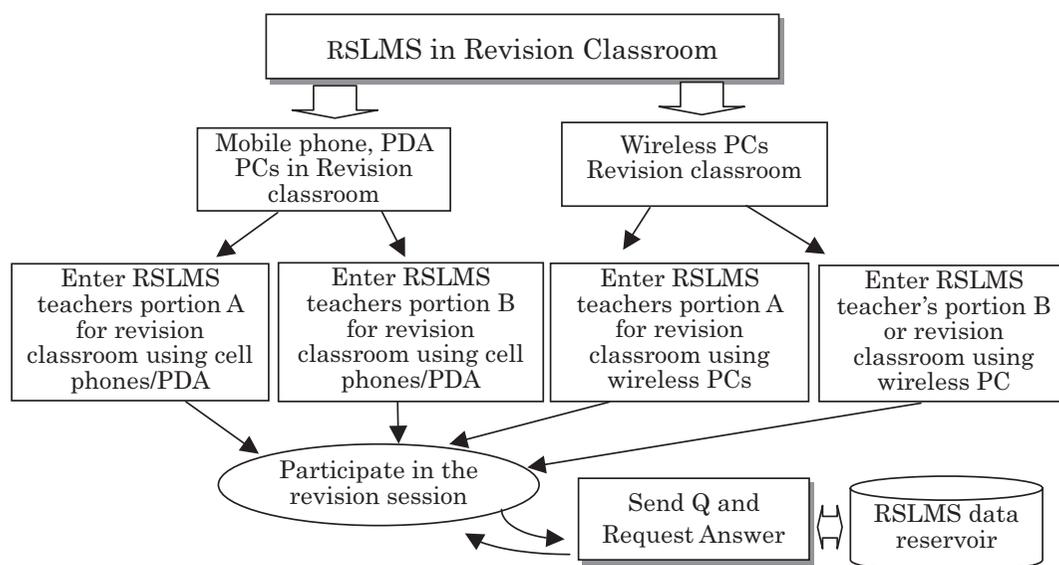

Fig. 10   Ring Service LMS in Revision Classroom

The service also provides a flexible kind of revision in a mobile learning mode. That is the learner can use their mobile phones, PDA handheld PCs to keep in tact with the revision classroom session. They will be able to access minimal data relating to portion (A) and (B) as described above. For the client learner using a wireless PC, they can be able to access the full contents of the revision session having been registered as a member of the RSLMS revision zone. In this session the learner can send questions directly to the instructor and expect a reply so that he/she can follow on the progress of the learning session.

3.6 Ring Service LMS designed for Examination Centers Platform

For a while, examinations still remains the primary methodology, through which a learner's ability and strength in a particular field of study is tested and assessed (see Fig.11). Therefore it is important that a thoroughly defined working platform is designed to allow for a smooth examination process to be conducted either in a
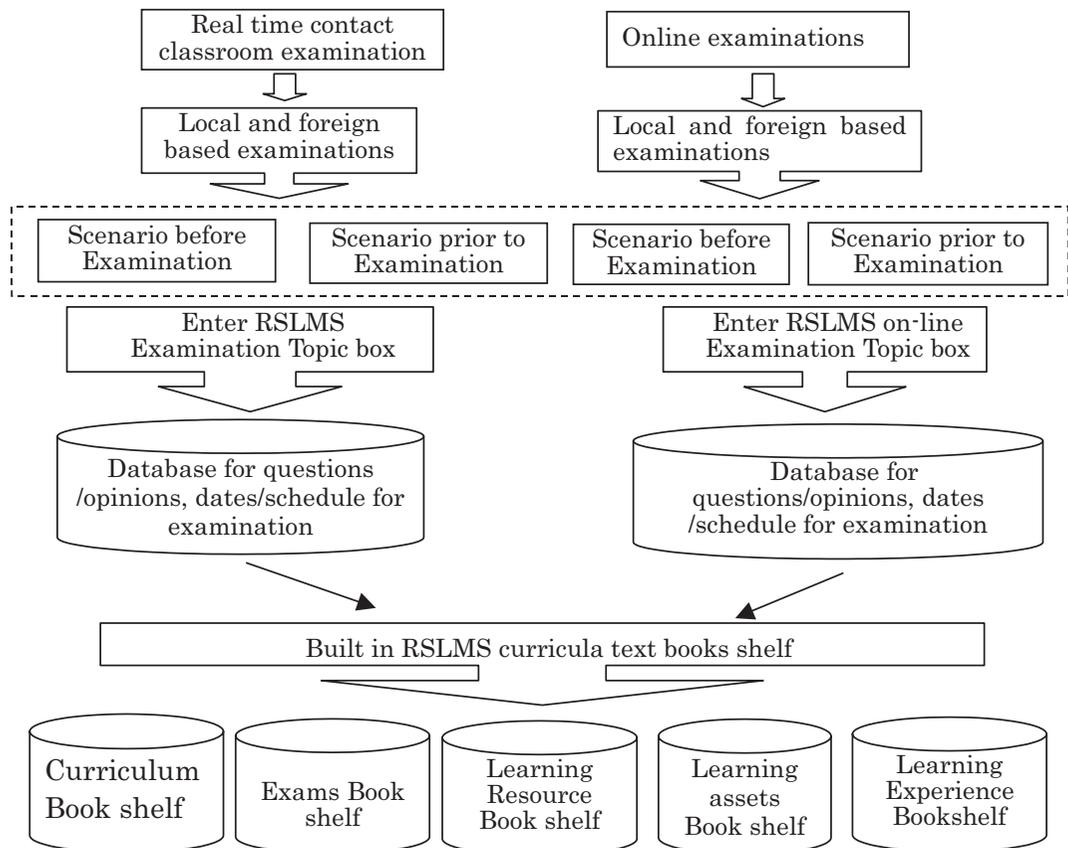
Fig. 11   RSLMS in Examination Center Platform

traditional classroom fashion or computer based testing methods. In both fashions, it is equally convincing that the role of e-Learning is of paramount importance. The Ring Service LMS creates the tools and environment for a variety of information that the learner will require before and prior to the examination period. There is an examination topic box that contains a number of information on curricula examinations within a learning environment. This topic box can also manage the questions and opinions submitted by the learner regarding examinations, schedule dates and so forth. The Ring Service LMS will provide a section for a list of curricula text books, problems and solutions section regarding previous examinations so that the learner will have a thorough outlook on the nature of the examination he/she is to partake in.

The system provide a platform for information exchange to support e-Learning examinations conducted in both online and real time contact classrooms. This system will provide a section responsible for both local and foreign based examinations. Fig.11 illustrates Ring Service LMS interfaces used for examination training programs. Though online examinations are quite different from the real time contact classroom examination from the viewpoints of technological infrastructure, the formats and results are arranged in the similar way. Some teachers may apply both of these quite different examination methods to their teaching strategies as a way of creating options for the learner to choose from. Therefore it is very important that a very efficient database system is developed across the educational system to effectively manage the information of these examinations.

3. 7　Ring Service LMS for Educational Research Center Platforms

Research laboratories create the links between educational enterprises and business organizations. This means that there is a viable process where research results can be transformed from a theoretical perspective to practical objectives. Industries and market producing organizations are continuously transforming their traditional business practices into information market oriented strategies where the information reaches the consumer earlier before the product is produced (see Fig.12). All this has been made possible through the emergence of e-Learning into business practices. Hence a mechanism is highly needed to manage (management of staffs and learning resources) and support training and the flow of this information from the research centers to industries & producing organizations and finally to the end users/ consumer. The Ring Service LMS thus creates the interfaces that will support and provide the information flow required to facilitate such a working relationship. An
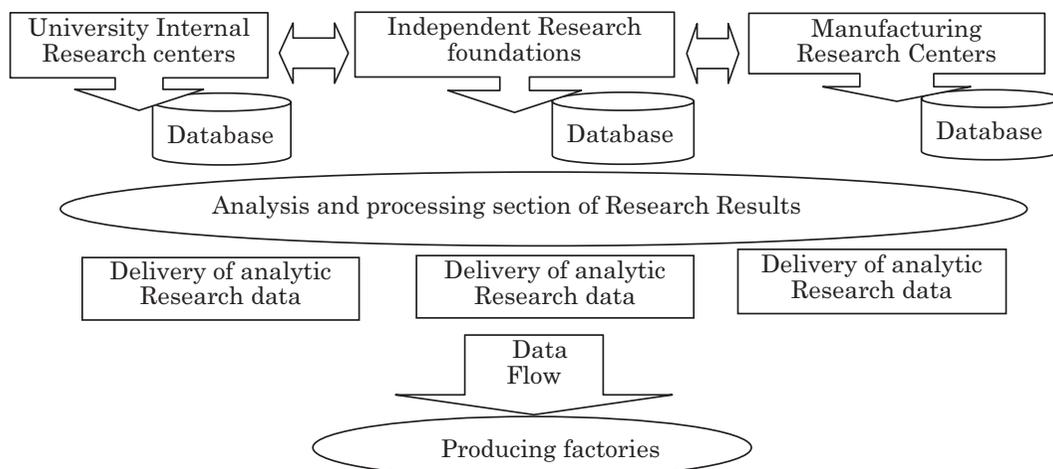
Fig. 12   RSLMS in educational laboratory center

educational system should supply intellectual human power to the producing factories together with knowledge/information assets.

Considering the social circumstances mentioned above, the authors have designed the Ring Service LMS that is also aimed at supporting research centers. In the research center, the learners' academic grades and achievements are analyzed and processed into an information database that is further used to fill in application forms for employment search based on their academic merits and potentials.

4 . Implementation of the Ring Service LMS in Web-based learning environment

The Ring Service LMS is partially implemented in a real educational environment as a supporting system to our web based learning platform called TSPLAZA. In the TSPLAZA, there is a database server, a Web server, and a network server. Teaching materials are delivered to learners and tutors in a classroom or their home via the architecture of TSPLAZA. In this chapter, the authors introduce TSPLAZA to concretely demonstrate the relationship it bears to the Ring Service LMS.

4. 1 TSPLAZA as supported by Ring Service LMS in the Internet world

The Ring Service LMS is a general ideal model of a learning management system for e-Learning. In order to realize the Ring Service LMS in a real educational world, the authors have been trying to build a communication plaza named "TSPLAZA", operated in the internet environment. This plaza will provide flexible learning

opportunities for all levels of students to learn at their own pace at any time and from anywhere. Our present target is to realize a real educational environment according to the ideal design of the Ring Service LMS. In the process of implementing the concepts of the Ring Service LMS, we have developed and installed teaching materials, software for instruction strategies, drills for examinations, and some management software. At present, these educational materials

Fig. 13　Architecture of TSPLAZA

are managed through a Database server, Ring Service LMS server, and Web based Learning server (see Fig.13). And these are provided to learners and teachers through the Unified Resource Locator (URL) as indicated below :

http : //www.tsplaza.jp

The authors have designated the above named URL under the concept of the Ring Service LMS and "TSPLAZA", which is a combined name for "teachers' and students' plaza".

Figure 14 : Top page of TSPLZA

In the authors' educational environment, TSPLAZA is a web-based learning platform that provides information / knowledge in the form of teaching materials for learning training programs and also function as a CAI for learners' self-learning. In real time contact learning such as face-to-face lectures, teachers and learners can access the TSPLAZA to get teaching materials or CAI software from anywhere and anytime in the campus. Fig.14 illustrates an image of the top page in TSPLAZA. Corresponding to the concept of the Ring Service LMS, the top page gives three items that is supported by the learning phases as shown in Fig.2 :

(1) Ring Service Learning Management System :

This command comprises of sub-commands such as (I) Learning Strategy (II) Learning Management software (III) learning Schedule (time table)

(2) Database Service for Education :

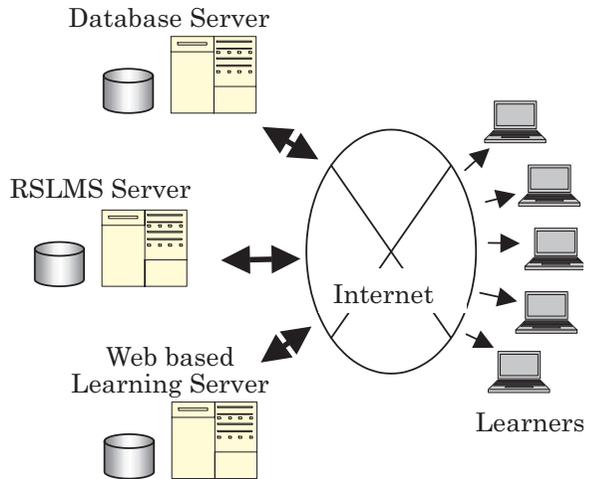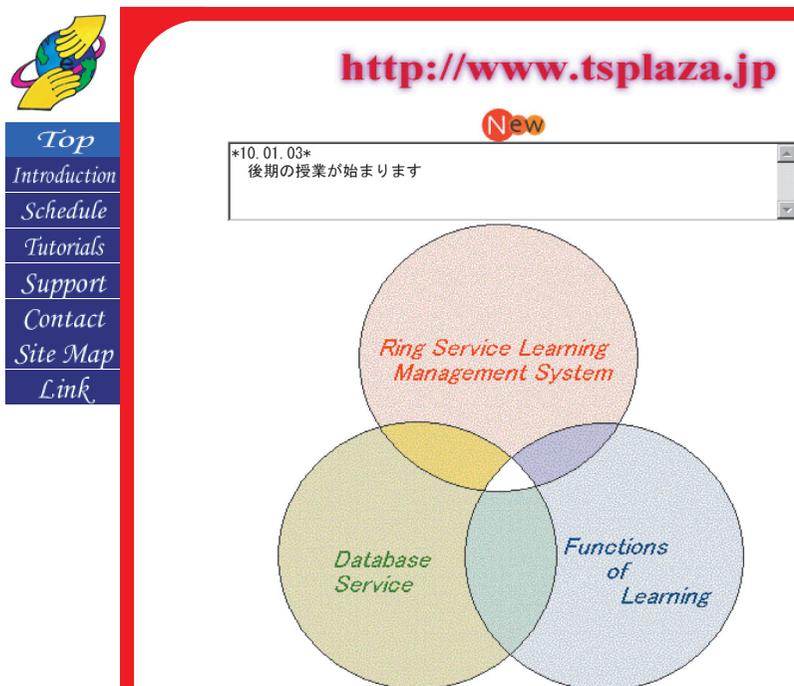Contains sub-commands such as (I) Teaching materials (II) List of teaching staffs

Figure. 14   Top page of TSPLZA

(3) Functions of Learning comprise of sub commands such as (I) Email (II) Chat
(III)Information and News (IV) white board (V) seminars
These commands are designed to fulfill the learning phases in the Ring Service LMS, and through this the learning processes can be controlled under the combination of these commands. As one access the TSPLAZA, a learning scenario is eventually created and manipulation of the TSPLZA is performed at the request of the end user in the learning processes.

4. 2 Application to a real time classroom and learner's self-learning

In the present information age, many social systems are changing into an information oriented one. Information technologies continue to advance at a rapid rate creating tremendous impact on societies. Taking such present social circumstance into account, the authors of this paper have considered the importance of the Ring Service LMS as a growing project with the advancement of information technologies and the impact it has on our changing social systems. Therefore at the expense of providing a formidable e-learning solution, we have started off by preparing several teaching materials (see Table 2) that could be accessed by learners and teachers as well. For instance as shown in Table 2, four kinds of teaching materials are available for

Table 2 Software and Teaching materials in TSPLAZA

	Title	attribute	contents
S	Space Travel	Simulation	Simulation of space travel according to Newtonian Kinematics
	Life game	Simulation	Simulation puzzle of life game
	L system	Simulation	Simulation of L system about growing tree
E	Drill in Excel	Drill	Drill in Excel for beginners of the application software "Excel"
	Multiple Choice Test	Marking	Automatic Sequencing of Multiple choice test
	Free Format Report	Marking	Automatic Grading of Free Format Report
T	"WORD"	Tutoring	Tutoring the manipulation of "WORD" for beginners
	"Excel"	Tutoring	Tutoring the manipulation of "Excel" for beginners
	"Power Point"	Tutoring	Tutorial about manipulation of "Power Point"
	"SPSS"	Tutoring	Tutorial about manipulation of SPSS (Statistical Package for Social Science)
	Information Science	Textbook	Textbook of computer science edited with "WORD"
	Information Science	Lecture Note	Lecture note of computer science edited with "Power Point"
D	Food and Cookery	Database	Database providing the information of food and cooking
	Folk entertainment	Movie and animation	traditional fork entertainment "OWARI MANZAI (Japanese traditional comical celebratory dance)"
	HAIGA	Database	Database providing the information of HAIGA (俳画)

learning : these include simulation software, testing and assessment marking systems, tutoring material, and Database. These teaching materials will be used as learning assets in a classroom or self-learning by CAI. The authors hope these teaching materials will help to promoting the usage of TSPLAZA as a learning platform.

5. Discussion and Conclusion

In the 21st century, it is believed that Global economies will be transformed into a more viable knowledge based economies supported by the Internet and new information technologies. Vast amount of information will continue to flow through the Internet with ease of access to learners. Therefore there will be growing demand that traditional learning methods be replaced by more efficient, fast and conventional intelligent tutoring systems. With the advent of e-Learning over traditional learning methods, this has pioneered the realization of such a transformation. The Ring Service LMS is one of such advanced systems to support more efficient teaching methods. As discussed in this paper, the authors have designed and implemented partially the Ring Service LMS as an infrastructural management system for e-Learning.

Our Ring Service LMS provides learners, teachers, and system administrators with an infrastructural environment where a learner engages his/her interested subject in a self-learning pace. The Ring Service LMS has been defined from two points of views. From learner's viewpoint, the six learning phases (see Fig.2) share common information about learner's academic grade and learning situation. The information is used to manage and control the learning process. From teacher's and system manager's viewpoint, the Ring Service LMS provides an infrastructural environment for e-Learning. Moreover, a teacher can access suitable teaching materials in his/her classroom from anywhere and anytime by means of the Ring Service LMS. A learner is not only given access to texts and teaching materials but also offers opportunities to develop a self-paced learning environment in relation to their field of study. A system manager administrates the collaboration between a teacher and a learner under the software of the Ring Service LMS. As discussed in this paper, information technologies make our ideas the practical system, and encourage us to improve our education to a more advanced technologically based system.

The Ring Service LMS is designed to be a general standard model for several instruction strategies. Its modules are designed to share common information of the learner's situation and teacher's schedule, as well as function independently of each other. Even if some of the modules and information are replaced with new ones, the Ring Service LMS can work well in accordance with the new instruction strategy. Owing to such flexibility of the Ring Service LMS, we can administrate different kinds of curricula under its concept as an e-Learning supported set of learning tools. In chapter 4, the authors showed an example of the implementation method by the Ring Service LMS in an educational environment.

Finally, we would like to summarize that in order to realize truly powerful e-Learning solutions; the Ring Service LMS must play an important role in the reform of both present and future educational systems. This learning management system is expected to grow and develop in the light of forming a strong back bone for all e-learning visions.

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