Development of an Integrated System for Education and Administration

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Abstract—*A web-based integrated education system has been developed for teachers, students and administrators. One of the most important features of the system is seamless usability of educational and administrative systems. Moreover, teachers and students can access seamlessly the system and securely even from outside of our Intranet using SSL. We assert simple usability for the portal site as an entrance of the integrated education system. To achieve short period development, our development concentrated the user interfaces on the portal site because of familiarity to students and teachers. The other parts of the system; servers, databases, networks were developed within usual technique and commercial package software. In addition, because the existing administrative system was not revised, the integrated education system has been developed within 5 months. After working the integrated education system, students tried doing preparations and reviews of their lessons. Teachers were able to decide the final results of the lectures from outside of the university. In addition, we discuss the system's accidents that were caused by administrators, and low performance's problems.*

Index Terms—*Web-based system, portal site, e-learning, large scale network*

1. INTRODUCTION

A feature of typical university's computer systems is existence of two computer system categories; a basic administrative system, an education support system. The both systems are equal-valuable, each system is indispensable and a kernel computer system for universities. Different points between the administrative system and the education support system are target people and aims of the systems. In the administrative system, the target people is clerical staffs, the aims is to execute smoothly the administrative processes. In the educational support system, the targets are students and teachers, the aim is education. In almost universities, these different categories' systems are managed independently. The two systems'

budgets are independently, sections of universities for operational management are different. The administrative computer system includes a basic student information system, a management system of lecture registration, a result management system and a job hunting management system. Some administrative sections share the databases for the management. In contrast, the education support system means computer facilities of classrooms and their peripherals, software for education such as automatic attendance software. Moreover, the e-learning contents which have developed by teachers are included to the education computer system.

However, campus life of students means not only education in lectures but also receiving the administrative services such as job hunting and student's loan. For example, after lectures, a student joins a guidance of job hunting, after that, he/she enjoys a student party sponsored by a dean of students. After that, he/she submits his/her report to a teacher through an education support computer system. Students are not interested in which computer system includes the activity such as the student party. Both computer systems which are divided for convenience are equal-valuable to the students.

Therefore, we have developed a web-based integrated education system that merges the two computer systems; the administrative system and the education support system. We call it as HInT (Hannan Internet community Tool for e-education). An aim of HInT is an integrated support to students on both educational service and administrative service. An entrance of HInT is an individual portal site that has been customized to each student and each teacher. There are 300 or more portal sites for teachers who are full-time teachers, part-time teachers, and special teachers for extension programs. HInT prepares 6000 or more portal sites for all kinds of students who are undergraduate school students, graduate school students, and occasional students. The portal sites are generated in real-time based on administrative information that was accumulated in the databases of the administrative system. For example, an individual weekly timetable for lectures is generated automatically to a portal site using information of lecture registration in the

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administrative system. Moreover, information such as cancellation of lectures and change of classrooms indicates automatically to the individual portal site through the administrative system. Events such as job hunting guidance sponsored by administrative departments are inserted automatically to the individual portal site.

In addition, if you click a subject name of the weekly timetable of lectures on the individual portal site, you can go on e-learning sites according to the clicked subject. That is, parts of education computer system such as e-learning contests, original teaching materials, submission of reports, and lecture results' management can be executed through the individual portal site. Students and teachers who use the portal sites of HInT can enjoy university's life without awareness of division between the administrative computer system and the education computer system. Because HInT is web-based, students and teachers can access HInT from outside of our university. For people who do not have a computer at home, HInT has functions that can provide parts of information on HInT through mobile phones.

This paper shows the detail of HInT, and development process within only 5 months. Techniques of merging the existing administrative computer systems with the educational computer systems are described. Under the constraint of only 5 months' development period, a success process of putting students' needs and teachers' needs into HInT is explained. Section 2 shows the related works. In section 3, features of HInT and development process are described. Section 4 explains technical essences of HInT, section 5 discusses the usefulness of HInT after starting HInT from April of 2004. In section 6 we point out problems that occurred under working HInT, and section 7 shows summary and future works.

2. RELATED WORKS

There are many useful web-based education systems. A virtual collaboration space: EVE (Educational Virtual Environment) has been developed including synchronous and asynchronous e-learning services [1]. A laboratory has been built around a web-based digital model railroad platform controlled by a client-server system for education of computer science[2]. Also, a web-based system has been developed for control engineering education[3]. To put communication skills into engineering curriculum, a web-based system to integrate workplace has been developed. The purpose of these web-based systems is to establish efficient education, and to communicate sufficiently among teachers and students. In various education areas, various education problems are solved using the web-based systems. The HInT system is also one of such web-based education

systems. The most important feature of HInT is an integrated education system that consists of portal sites and e-learning sites, and connection to administrative computer system. The scoop of HInT is beyond the usual education systems' scoop. HInT is more useful to achieve total education in universities.

Next, e-learning environments are discussed. There are many e-learning tools. For example, software engineering education supported by simulation in computers is popular. Drappa[4], Blake[5], and Oh, E[6]have educated software engineering with simulation methods. In addition, many information literacy education tools have been developed such as electric notice boards[7]. The electric notice boards are useful to share the knowledge of students' questions, and know how to operate. According to specific subjects, many tools and system have been proposed. An organization system for software engineering through group e-learning[8] has been developed. Using the system, the strategies of students have been clarified in some groups. The students' strategy was that leadership and analysis ability are most important in group working. A tool of English writing environment has been developed[9]. The system can access from all over the world through Internet. Students who stay in world wide can communicate with teachers on the system. Although these systems are useful to support students' learning, these systems are limited to only the specified subjects such as software engineering, English writing. HInT has a different view point from these systems' concepts. HInT has supported not only the specific education but also total campus life in the university including the administrative services.

In addition, there are many virtual universities such as California Virtual University and Stanford University[10]. The virtual universities can give full-online educational services and administrative services. Students of the virtual universities are not required to go to the school. The concept of virtual universities is different from the concept of HInT because the concept of HInT is "total support of campus life for students and teachers through the integrated systems". Therefore, we can not compare simply the systems of virtual universities and HInT. A more similar system than the virtual universities is an educational system of Durhan University in England[11]. BlackBoad[12] that is No.1 share of e-learning package software has been implemented to a total e-learning system of Durhan University. Although the total e-learning system has already been working from July of 2000, many requests that the system supported not only e-learning but also total campus life occurred. Therefore, a new package software BlackBoad/Portal introduced to the university, the integrated services between

Figure 1 An out line of HInT

Figure 2 A portal site of HInT

education and administration provided to students, teachers, graduates, candidates for admission. Problems of Durhan University are an improvement of user interfaces, and additional functions to execute the original procedures of the university. The functions and user interfaces of BlackBoad/Portal are not familiar with people of Durhan University, because package software such as BlackBoad and WebCT has been created for general use of general universities. In contrast, an important policy of HInT is "familiar portal sites" on the design phase. HInT is familiar to students and teachers because HInT did not use just original package software such as BlackBoad/Portal.

3. FEATURES AND DEVELOPMENT PROCESS

3.1 A basic concept: Seamless

A basic concept of HInT is "seamless". The seamless means two kinds. One is seamless data between the administrative computer system and the educational computer system. Another is a seamless environment between inside of the university and outside of the university. In the seamless environment, users can access HInT in the same operations on both Intranet and Internet with keeping security. The basis of the concept is disadvantage that occurs by the divided computer systems and environments. For example, although students' information such as mobile phone numbers and e-mail addresses was accumulated in the administrative database, teachers have to ask students e-mail addresses and mobile phone numbers in seminars. After that, the teachers have to make original mailing-lists. Of course, the maintenance of the mailing-lists is responsibility of the teachers. Moreover, a function of automatic record of student attendance in classrooms was prepared even in the conventional education system. However, the teachers have to transfer manually the record of student attendance to paper-based student lists that were provided from the educational affairs section. The teachers' manual maintenance of the mailing-lists and manual transfer of the record of the student attendance lead to mistakes. Indeed, important messages have not been able to send to any students because of invalid e-mail addresses.

In addition, users were able to access the conventional educational system in only Intranet environment. Of course, usage of the share folders on network drives was limited on only Intranet environment. Therefore, when students would like to do home work, the students have to copy the electric files to portable media such as CD. The students have to go to school in order to submit the home work to the share folders. Moreover, because open-time of the computer rooms of the university is limited, the students can not make their reports until midnight. Therefore, we have an aim of solving the disadvantage that causes by the divided computer systems and the divided environments; Intranet and Internet.

3.2 Requests of developing HInT

In the university, significant problems may occur in revising the educational computer systems and the administrative computer systems on the way of the year. Hence, timing of the chance of the large revision of computer systems is only April in Japan. April is start month of a new educational year. Because HInT should be started working at April, the development period has be set to only 5 months. Our important requests of developing HInT are as follows; (1) development period is 5 months, (2) no-revise the existing administrative computer system, (3) because the portal sites is an important linchpin of integrated systems HInT, the functions and user interfaces should be satisfied to teachers and students needs, (4) users can access various data without awareness of distinction between the administrative system and the educational system, (5) basically, users can access various functions in same operations in both Intranet and Internet, (6) a moment access by 200 students should be executable without delayed executions.

4. TECHNICAL FEATURES OF HINT

4.1 An outline of HInT

HInT consists of four parts; the existing administrative computer systems, portal sites,

educational computer systems, and Web-mail (See Figure 1). A feature of HInT is that an educational cycle can be constructed in HInT(See bold arrows of Figure 1). Starting point is the existing administrative system(Part 1). Next, on the portal sites users can refer interactively both the administrative data and the educational data(Part 2). After that, users can proceed to e-learning sites(Part 3) through the portal sites. On the e-learning sites, teachers can communicate sufficiently with students. The e-learning sites are useful in various educational scenes such as lectures, reports, questions and answers, examinations, and home works. After education, the teachers make final results with referring to various records such as reports' results, attendance records, short-tests' results, and final examination results. After the final decision of the results, the teachers renew the data of administrative computer systems(Part 1). The educational cycle can have been achieved by seamless between administrative data and educational data.

4.2 Combination of package software for short development period

To meet our request (1) (See 3.2) "development period is 5 months", it is difficult to develop newly all parts of HInT. Therefore, we planned to concentrate on the development of a specified part of HInT. We thought that the other parts would be achieved by combination of the commercial package software. We targeted the portal sites as the specific part because of our request(3)(See 3.2). Especially, we thought that the satisfaction of users about the user interface is important. By the concentration on the portal sites in the development, HInT has been able to achieve high familiarity with teachers and students. On the portal sites(See Figure 2), there are an individual timetable of lectures, notice boards, administrative news, individual messages, material distribution, submission of reports, ToDo lists, university's event calendar, and forums. The functions of the portal sites can support not only education but also overall campus life.

The commercial package software has been applied to backend parts such as database engines and servers. An engine of the portal functions is Campusmate/Portal, an engine of educational system is Internet Navigware provided by Fujitsu corporation. UBPoint! is a package software for accumulating lecture movies and delivery services. WebCollaboration is for access the share folders on the network drives from Internet. ThroughPass is for single sign-on to multi-package software.

Especially, we had to devise the e-learning sites. There were some not web-based functions in the engine of e-learning system; Internet Navigware. If users access the e-learning sites,
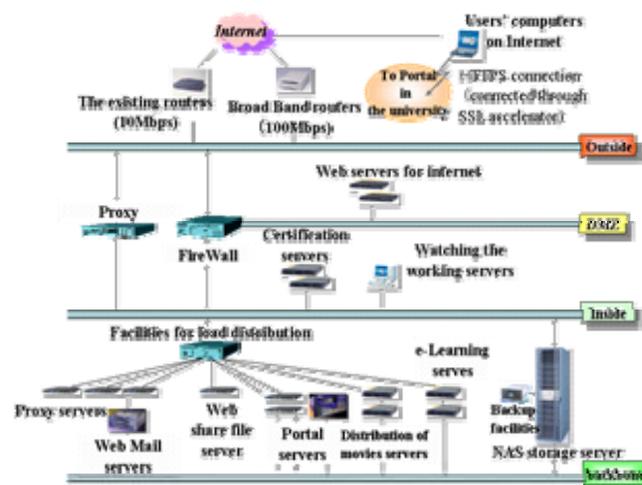
Figure 3 A system design for a large-scale network

the users will have a feeling of wrongness because of the non web-based functions. Our request(4) and request (5) (See 3.2) was not able to be satisfied. Therefore, new package software named "Campusmate/CourseNavig" provided from Fujitsu Corporation at April of 2004 was applied to the e-learning sites. Because the package software was not yet designed and was not yet implemented when HInT was being designed, our design process of HInT was very hard. HInT had to be designed based on the expected design of the new package software. However, we made close meetings with the staffs of the new package design, the e-learning sites of HInT has been achieved well.

4.3 Combination with administrative data

In the administrative computer system, students' basic information, lectures' information, and lecture registration information are accumulated using the package software named as "Campusmate-J". As our request(2) (non revision of the administrative systems), a new database in HInT has been constructed using data that has been extracted from the database of the administrative system. We have understood sufficiently the harmful effects of the dual databases. However, unique information that does not exist in the administrative system is required in HInT. For example, the unique information means occasional students who do not need lectures' results, collaborative researchers of partnership corporations, business men who attend open seminars. Therefore, we dare to have taken the dual databases because of high flexibility of HInT. In addition, we have established a function of real-time change of the data in HInT when the data of the administrative system was revised.

4.4 Large-scale network corresponding to LAN and Internet and load distribution

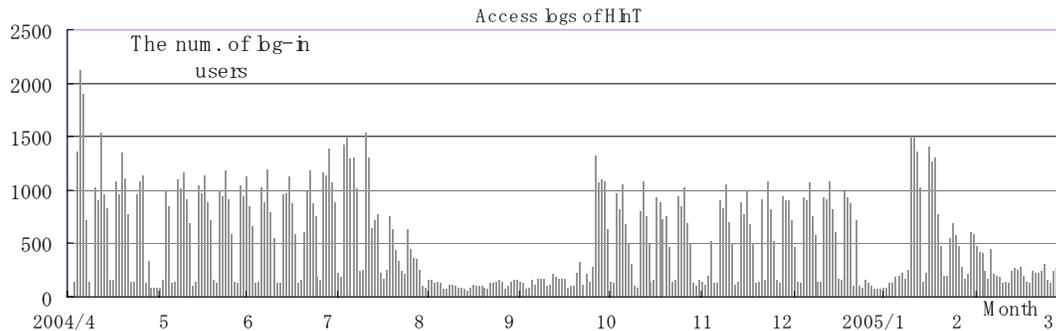Figure 3 shows an outline of network

Figure 4 Access logs of HInT for 12 months

architecture of HInT. We have set up a line of 100Mbps/s as an internet gateway from ISP(Internet service provider). Network inside of the university has been constructed as star-type network. A nucleus center switching has been prepared enterprise-version equipments of Giga port. The nucleus center switching has been connected to seven important bases in the university and all servers under lines of 1Gbit/s. We have established 100Mbps/s transmission speed between the floor switching hubs on the seven bases and all 900 client personal computers. In addition, because of accumulating all data of HInT to one place, we have established a storage system. To achieve the requested performance of the storage system, we have prepared the dedicated segments of 1 Gbit/s for only traffics between the storage system and all servers of HInT. Therefore, we were able to have provided real Giga network for users because the backend processes used the dedicated segments.

In addition, facilities of HInT have been defined as not only inside computers of the university but also outside computers of the university such as internet cafes' computers and homes' computers. Hence, to achieve security of HInT, we have decided four policies; (1) enciphering in using SSL(Secure Socket Layer) on web-based, (2) enciphering of communication paths of wireless LAN, (3) using single user ID and single password for multiple package software and HInT, (4) introducing VPN(Virtual Private Network) system. Therefore, we have established high security environments of HInT without hurting convenience of users.

Because all functions of HInT should be web-based, the load of the web servers of HInT became large. We have prepared two load distribution facilities that equip respectively two CPUs in order to process the moment of simultaneous access. At the system test phase for performance of HInT, HInT has been passed the test of the simultaneous access of 200 users' log-in processes, sending and receiving of 960 e-mails. The security request(5) and performance request(6) have been satisfied.

4.5 Access from Internet of attendant functions

Our conventional education system also had share folders on the network drives for distributing materials and reports. Although the share folders were an important communication tool between teachers and students, the access of the share folders was only Intranet in the university. As the share folders have also been revised to web-based, the teachers and the students can access the share folders from both Intranet and Internet. When users access the share folders, HInT judges automatically which the access is from Intranet or Internet. If the access is from Internet, the access information will be enciphered automatically. The operations of the access to the share folders through both Intranet and Internet are almost same. Moreover, by revising e-mail system to web-based, HInT has been achieved to a unified web-based system.

5 EFFECTIVENESS OF HInT

5.1 Working results from April of 2004

HInT has been started working from April of 2004. The number of users is about 6300. In average, about 1000 users use HInT on a weekday, about 200 users use HInT on a weekend(See Figure 4). People who access HInT on one or more per a week are about 60% of all users. Until March of 2005, the number of lectures' notice is 1,829. The number of subjects that use the lecture's notice is 154 per all 1,690 lectures. The message function from teachers to students was executed on 18,734 times, the message from administrative departments to students was repeated on 89 times.

5.2 Achievement of the seamless concept

In this section, we evaluate the achievement of the basic concept(3.1) and our requests(3.2). At first, the seamless achievement is evaluated. HInT can generate automatically the individual portal site using the administrative data in the educational affairs section. Because teachers can refer easily to a list of members of a class on the portal sites, the teachers are free from carrying always paper-based students' lists.
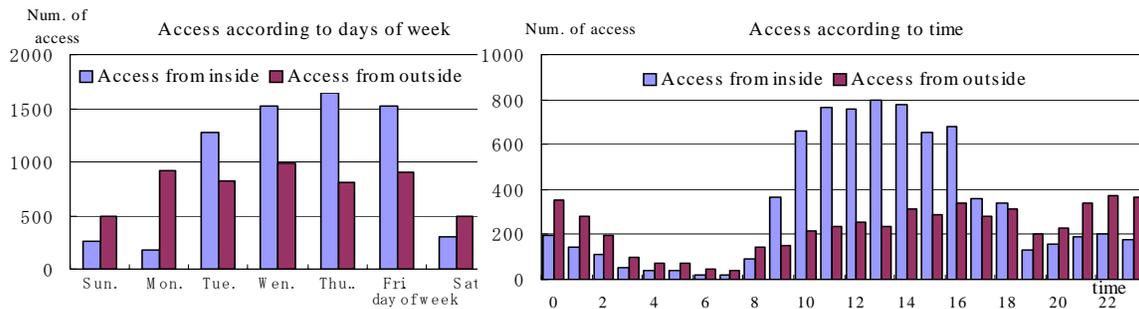
Figure 5 The number of access for the shared folders on January of 2005

Because original materials that have been produced by teachers are inserted automatically into the students' lists of classes, the teachers can refer easily to various reports such as preparation progresses, results of automatic marking short tests, results of reports' evaluation, final results' lists. Moreover, private news such as delay of books' return to a library from the administrative departments are listed to the individual portal site, virtual groups which are performed in forums sites are useful to discuss among students.

In addition, all functions of HInT are web-based. Users can access all functions from outside of the university with the unified operations of HInT. Figure 5 shows the number of access from Intranet and Internet to the share folders, and the number of access to the share folders from Internet are shown. 47% access is through Internet. Access through Internet from outside of the university does not decrease in even nights and on even weekends. Therefore, because all functions of HInT are web-based, we have provided a new campus life environment that students can study in anytime and anywhere.

However, there are some compromises according to the concept of the seamless environment. The compromises are caused by the trade-off between functionalities and data security. Two cases of the compromises are shown below.

First, HInT has been restricted to only reading the data of the administrative databases without writing. Especially, the data of the educational affairs section is important nucleus data in education of the university. Errors of revising the data and the system down are never forgiven. As the educational cycle in Figure 1, we supposed that HInT revised automatically the data of the administrative databases. However, when we thought the danger of the errors of revision of the important data, we have decided that the data should be sent through CSV files to the administrative sections in manually. The staffs of the administrative sections revise the data after the watching confirmation of the errors of the revised data in the CSV files. To protect the important information of the university, parts of

the data have not been achieved on the seamless environment.

Next, we show a problem of seamless access between Intranet and Internet. We had different operations between Internet access and Internet access. When users click one file on the share folders through Internet, if the file requires the related files such as Visual Basic.net files, the files with the related files can not open. The error message is "The files are not found". The error is caused by the way of download from the servers of HInT. When the file is clicked, the file is downloaded to a local computer from the file server. However, the related files to the clicked file are not downloaded. The related files are different in various applications. It is difficult to specify the related files in all applications. Moreover, novices can not understand why the related files are in the local computer although the novices do not click the related files. The novices will be falling into confusion because the novices can not judge the latest file on between the server and the local computer. Therefore, we have decided that the related files do not be downloaded automatically to the local computer. We have instructed students "if you access a file of VisualBasic.net trough Internet, you should copy the folder including the file." We judge it is better to separate the operation between Intranet and Internet in considering novices' confusion.

In this way, it is very difficult to cope with both the achievement of the basic concept of HInT and data security in HInT. When the basic concept conflicts with the security, we have arrived at the solutions from the novices' actions. If the novices were falling into confusion, if the novices leaked the important data in HInT, we have judged that the solution is not well. Although a part of functions of HInT conflicts with the seamless concept, we think that our judgment is right in consideration of working of HInT as a whole.

5.3 Examples in lectures

A subject "software engineering" consists of preparation, distributions of electronic materials, regular lectures, electronic short-tests during the lectures, electronic reports' submissions, and a final examination. The materials for the lectures

Figure 6 A report list with evaluations

Figure 7 Final judgment on a result page

have uploaded to HInT. Especially, the feature of the materials of the lectures is the simulator for the preparation of the lectures. Students consumed maximum 8 hours to the preparation of the lectures. Such sufficient preparation in the simulator that was uploaded to HInT was available because the students were able to execute the simulation at home through HInT.

Moreover, reports for the exercises were evaluated on HInT. Figure 6 shows a list of the reports' submission and the results. On the web page of the reports, teachers can input the results of the report in the column "Evaluation". Also, teachers can give students comments about the reports on the web page in real-time. The students can re-submit the revised reports after the students refer to the comments from the teachers. Figure 7 shows a web-page for all results that include various results of the preparation's progress, the short-tests, the reports, and the final test. The teachers can judge the final result of the subjects while the teachers refer the individual result because the various results condense into a page. In addition, the teachers can judge the final results at home without carrying a large volume papers such as answer papers, reports, and short-tests' answer papers. After deciding the final results, the teachers save the final results to a CSV file that is provided as a template from HInT. The CSV file is sent to the educational affairs section. In future, because the personal history of individual student can be shown to teachers on HInT, the teachers will be able to make a personalized curriculum corresponding to individual ability.

6 PROBLEMS AFTER WORKING

6.1 Local rules of administrative sections

After working of HInT from April of 2004, we had to change the tables' architecture of HInT database. The change of tables' architecture influenced significantly to practical working in the education of the university. The significant change of the tables' architecture was caused by the data of the educational affairs section. Now, the current curriculum of the education runs in parallel with the former curriculum in the university. One subject between the second-years students and the third-years students has two different names in spite of one lecture because of the two curriculums. The second-years students take the lecture as "Information design" in the current curriculum, the third-years students take the lecture as "System design" in the former curriculum. In real, a teacher instructs a way of design of software in one classroom. There are two subjects' names in the administrative databases. It is not a rare case in universities to run on multi- curriculums because of the renewal of curriculums. In order to run the multi-curriculums, we had prepared two items in the administrative database of the educational affairs section. One is named as "subject", another is named as "lesson". The "subject" means the correct subject's name on each curriculum such as "Information design" and "System design", the "lesson" means the real lecture which a teacher instructs students in a classroom. Although the "subject" names are different between the second-years students and the third-years students, the "lesson" name is only one for the teacher and the students. Therefore, if we had picked up the students based on the "lesson", we were expected to make a list of all students under even multi-curriculums.

However, a local rule of the educational affairs section obstructed the creation of the list of all students in multi-curriculums. The local rule was that staffs of the section dealt with the two items("subject" and "lesson") as one item ("subject"). In short, the staffs were not able to understand the difference between "subject" and "lesson". Therefore, although HInT used the item "lesson"

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in making the students' lists, the students' lists were not able to include all students who took the "lesson". Only a part of students was listed to the students' lists. It is wrong to education on HInT in the university. Although HInT was connected to the data of the administrative databases, teachers were not able to see even lists of all students who take the teachers' lectures. So, we have to redesign the tables' architecture of the database of HInT. We decided not to use the item "lesson" to make the students' lists. We have prepared a new function that generates a new unit. The unit is generated by combining the multi-subjects that a teacher takes lessons in a classroom. Using the new unit, the architecture of tables has been changed in May of 2004 at one month later from the start working. According to the change of the architecture, all data of HInT had to have been reset in May.

The local rules should be discovered at the design phase of HInT. We had frequent meetings with administrative staffs. In the meetings with administrative staffs, they did not mention to the local rules because of normal routine tasks under the local rule. In contrast, the design documents of the administrative system had clarified the difference between the two items of "subject" and "lesson". Of course, the designers of HInT had referred to the design documents of the administrative systems. The designers took it for granted that they adopt the item "lesson" in making students' lists. This problem is not a rare case in developing an integrated system including the existing systems. Engineers require investigating sufficiently the existing systems on both design documents and staffs' working. However, the sufficient investigation is difficult in the development of the short period such as HInT. After a new system has started, problems caused by inherent local rules have usually come to the surface. Considering the problems and constraints of the short development period, we think that it was better to phase-in HInT instead of starting HInT all at once. On development of phasing-in, the engineers can develop HInT while the engineers and staffs confirm the correction of each function. If we adopted the evolutional development process such as phasing-in, we will be able to avoid resetting all data of the database of HInT, even if all functions of HInT were not able to start at April of 2004.

6.2 Problems of performance

Performance problems occurred by too heavy load in the moment of simultaneous access. HInT has been passed tests of simultaneous access of 200 users' login processes. However, the performance problem occurred in lectures of Information-literacy for first-year students. The subject of the Information-literacy was designed beforehand in parallel on 6 classrooms for 330 students. The second lecture of the subject has

an instruction of HInT operation. In the lecture, at a moment that teachers say "click a button on HInT", maximum 330 users have clicked the button of HInT in simultaneous access. Therefore, the web servers of HInT had the unexpected heavy load. The request of the load distribution exceeded the performance limitation of the load distribution equipments of HInT. As a result, the extreme performance degradation of HInT occurred in the lectures. To take measures of such performance, we thought that the facilities of load distribution should be strengthened, or extra web servers should be added to HInT. However, such simultaneous accesses occur during only a few minutes of the specified lecture per a year. We decided no-change of the system structure; no-additional facility and no-reinforcement of the facilities, because the situation was a rare case. We tuned up the two web servers in which 400 users' requests can be accepted to the web servers. The database strengthening and the additional facilities were not performed. That is, when HInT had heavy load, users' requests can be accepted to the web servers although the responses of the requests are late.

Next, we had another performance problem because of extreme increments of the number of session of database of HInT. A session connected to the database of HInT is established on each log-in by a user. After the log-in, if the user does not operate HInT during 15 minutes, the session is cut automatically because of avoiding leaking information. We have prepared 400 sessions on HInT, HInT had been working in the 400 sessions without sessions' problems. However, students said "our session is cut frequently during listening to teacher's speech". Usually, the teacher's explanation requires frequently more 15minutes. Therefore the session time-out had been extended to 30 minutes. This extension of the automatic session time-out caused the extreme performance degradation. We had experienced a strange situation. The number of the session of the database was short although the number of user was less than 400. After investigating, we had recognized that the users' operation of finishing HInT was wrong. The way of finishing HInT is to click a "log-out" button on HInT. However, almost students had finished by clicking the button "X" that was set on the upper right of the web-browser. When the users click the button "X" on the web-browser, HInT can not recognize the finish of HInT by itself. Therefore, the sessions can not be cut because of non-recognized finish of HInT. 30 minutes later, the session that had remained by the clicking the button "X" is cut automatically by the session time-out. The remained sessions caused the shortage of the number of sessions in spite that the number of users was less than 400. We had taken the

emergency measures to extend the memory area of the database of HInT. Although we had discussed the increment of the session of the database, we have judged that the increment of the memory area and the education of the way of finishing HInT are better than the increment of the sessions.

These performance problems can be solved by additional cost, and by strengthening facilities' hardware and software. Although HInT is an important system for education, HInT is not a most critical system such as a system of the educational affairs section in the university. We need to discuss carefully the trade-off between the additional cost and the educational effects. However, it is very difficult to measure the educational effects on spending the additional cost for strengthening hardware and software. The establishment of the condition of the trade-off between the additional cost and the educational effect is also difficult. Therefore, if we can take some measures without additional cost such as the instruction to users, and the redesign of the system, in this year, we should take the measures without the additional cost. Next year, we will discuss the strengthening the facilities of HInT.

6. CONCLUSION

We have achieved a web-based education system HInT which is integrated a educational system with the existing administrative system. HInT has been established within only 5 months because the existing package software are embedded to HInT. In addition, the usefulness of HInT is presented by the records of the access logs. In future, to use efficiently the educational cycle (See Figure1), functions of automatic generating personal education programs including preparation of lessons, reviewing their lessons. In addition, we will achieve all-around education system including various shared contents while we improve the operation of HInT.

7. ACKNOWLEDGMENT

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