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The implementation of the RFID System for improving customized service: the case of the National Library of Korea

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Summary

The National Library of Korea (NLK) has introduced and operated the RFID (Radio Frequency Identification) system linked with the library card registration policy since July 2005. Most of all, we aim to set up the basis of the Ubiquitous Library and to provide a high-end patron service by utilizing the RFID. The NLK has utilized the RFID in an effort to enhance library patron rights and to upgrade patron services, while in November 2004, introducing a new subject specialist services system. This paper introduces the process of building an RFID operational system and a case study for service improvement. The NLK has built a new feature called "My Library" which is linked with a library card system and an RFID system to enhance library patron rights. The Library Card system is employed for patron online registration, and it provides better quality services through the Subject Specialist Librarian Support System. The Subject Specialist Librarian Support System is a management system that librarians use to manage the patron's special interests to improve one-to-one customization services.

When a patron registers online and selects his/her special interests in the system, a subject specialist librarian will then manage the patron's special interests. A patron management system by subject interests is a creative system and will become the basis of the U-Library in the near future.

1. Background of System Introduction

The RFID System was introduced by the Korean government and the Korean local self-government bodies. Originally, the Ministry of Culture and Tourism started a business

initiative called “2002 Business Establishment of the Digital Information Center for Public Libraries.” The Ministry selected four libraries¹ and built the RFID system in the libraries as a business model to start the initiative. Eun-Pyoung District Library introduced the RFID system for the first time in Korea in May 2003. The NLK set up 30,000 RFID tags in June 2003 and has operated the building plan for the RFID Application Management Information System starting from September 2004 to August 2006. With this plan, the NLK has operated the RFID system, which is connected with the registration system of library patrons since July 2005.

2. IT Environment in Korea

It is known that Korea’s infrastructure for information and telecommunication is the best in the world according to the fact that Korea is ranked number one for the high-speed Internet distribution and is also ranked number six² for internet use in the world. The Korean government regulates the RFID services and the USN (Ubiquitous Sensor Network) as key services to be a leader in the global IT market and to create a ubiquitous society with its infrastructure. Accordingly, the government set up IT 839 strategy [see figure 1] in 2004.³ In the meantime, the ‘Preliminary Plan for Building u-Sensor Network’ was established, and the RFID was tested in 12 areas such as the Ministry of National Defense, the Supply Administration, the Ministry of Environment, etc.⁴ Korea started the RFID business later than other countries, but the government has been actively supporting the RFID-related technology. As a result, the RFID-related technology has been improved very rapidly. The RFID has developed into a new technology and service called a mobile RFID (mRFID), which is a hybrid product with the mobile telecommunications in Korea. In 2006, the government is planning to proceed with a mRFID terminal development and to undertake it as a business model. In the library community, they are planning to set up a “ubiquitous library service for blind people” to provide library services for visually impaired and blind people.

3. The NLK’s Challenges

The objective of introducing the RFID system is to create a ubiquitous society, an integration of U-KOREA and U-LIBRARY, and to let it continue to develop. As the RFID system is introduced in the NLK, librarians carefully considered as to how they could operate the RFID system, set up the framework of U-LIBRARY, and provide the quality services to patrons while keeping the NLK’s own functions for the library community. In an effort to solve these challenges, the NLK formed a task force team and started a blueprint for the RFID operation system.

¹ The National Library of Korea, Daegu Metropolitan City Library, Daejeon Hanbat Library, Busan Metropolitan City Library

² International Electric Telecommunication (ITU) Internet Report 2005

³ IT839 strategy was revised and added as u-IT839 strategy in order to aim at a policy for creating a ubiquitous society in February 2006.

⁴ Korea Computing Department, “RFID Model Industry and Policies” 2005.9

As for the first step, the task force team analyzed the process of library materials being used by patrons and its environment through a simulation. Then, they looked into gathering information for the library's service improvements and its applicable services.

Comparison of IT839 Policy and u-IT8939 Policy

	IT 839	u-IT839
Eight New Services	Wibro Service	Wibro Service
	DMB Service	HSDPA/W-CDMA
	Home Network Service	u-Home Service
	Telematics Service	Telematics/Local Based Service
	RFID Service	RFID/USN Application Service
	W-CDMA Service	Broadband Merger Service
	Ground Wave DTV Service	DMB/DTV Service
	Internet Telephone	IT Service
Three High-Technology Infrastructure	Broadband Convergence Network (BcN)	Broadband Convergence Network (BcN)
	u-Sensor Network (USN)	u-Sensor Network (USN)
	Next Generation Internet Protocol	Software Intraware
Nine New Power of Growth	Next Generation Mobile Telecommunication Equipment	Mobile Telecommunication/Telematics Equipment
	Digital TV/Broadcasting Equipment	Digital TV/Broadcasting Equipment
	Home Network Equipment	Broadband/Home Network Equipment
	IT SoC	IT SoC/Merger/Parts
	Next Generation PC	Next Generation Computing/Peripheral Device
	Embedded Software	Embedded Software
	Digital Contents & Software Solution	Digital Contents/Software Solution
	Telematics Equipment	RFID/USN Equipment
	Intelligent Service Robot	Intelligent Robot

[Figure 1] IT 839 Policy and U-IT839 Policy

Source: Digital Daily 2/28/2006

1) The NLK does not allow patrons to check out the library materials outside of the library.

Most libraries with the RFID system built in have attempted to shorten the time for processing returned items at the circulation desk. This efficiency would result in saving the patrons' time as well as reducing the amount of work for the staff at the circulation desk. However, the NLK didn't reduce the time to process returned items, because the library does not allow patrons to check out items outside of the library, but only allows to check out for certain items in stacks inside of the building. The NLK is an institution that preserves the national intellectual resources. Patrons can freely use the library materials that are openly

shelved in both subject rooms and closed stacks or digitized materials on the PC inside of the building only. There is a concern that the RFID system may not provide much freedom to patrons who are familiar with using the library in the opened stack system. In addition, the library materials shelved in closed-stacks are not attached with the RFID tags.

2) The NLK needs to establish a scientific management information system for the growth of the library.

The NLK celebrated the 60th anniversary for its foundation in 2005 and founded the vision 2010 for making “a strong country with knowledge power”. With the library's vision set, the NLK has endeavored to grow to be the center of a knowledge and information society. Therefore, it was required to set up a library with a scientific library management information system that would play a significant role in revitalizing the library. The NLK recognized to respond to the changes of library environment more quickly by obtaining statistical data in real time for the library management. In the past, a patron used to fill out a checkout request form and submit it to a librarian when they intended to use material located in closed stacks or opened stacks while the patron was in other floor of the library building.⁵ This environment wasn't easy for the NLK to analyze patrons' files for the usage analysis and the statistical data in real time for the library usage. However, the NLK can monitor the usage of library materials and patrons in real time after introducing a RFID system that is connected with the Library Card system, and the ILS (KOLIS: Korean Library Information system). As a result, the NLK can operate its own management information system (MIS).

3) The NLK provides high-quality information services to respond increased requests from patrons.

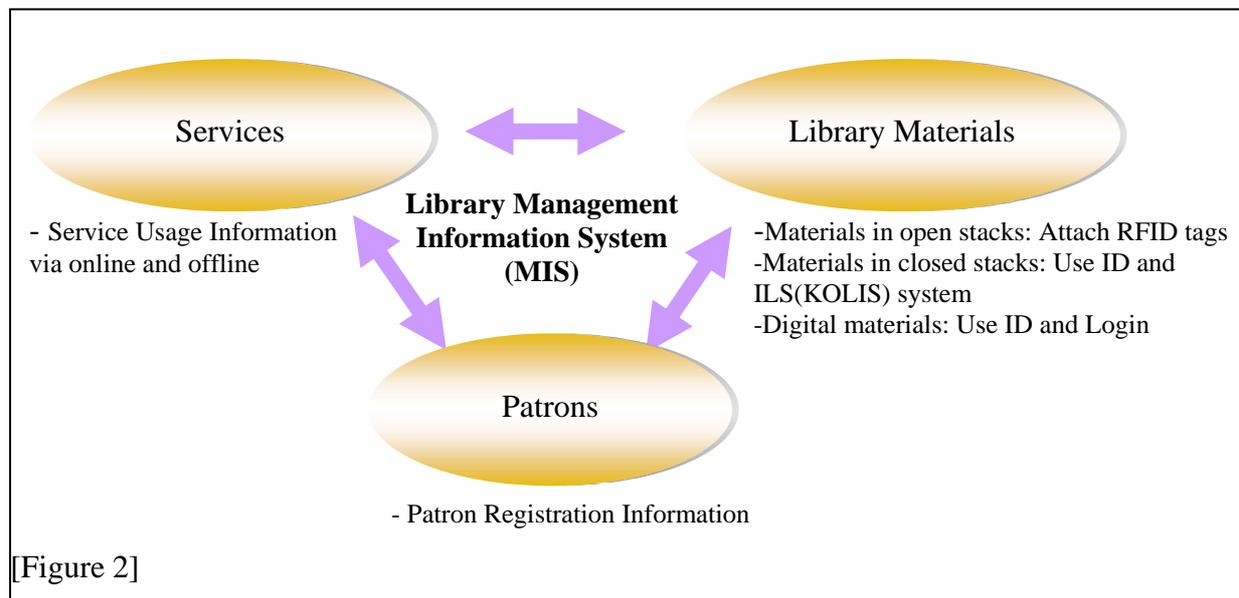
Lately, the library information services have adopted an aggressive marketing strategy. Traditionally, the library services were passively limited to patrons who physically came into the library, but today's library services are actively looking for patrons and reaching out to them. The Internet patrons in Korea are relatively sophisticated groups because Korea has one of the most developed information infrastructures. Therefore, Korean Internet patrons are very savvy ones who can find most preferable information for themselves very quickly. In this environment, the library communities recognized that they have to provide the library patrons with more attractive services in both online and offline. It is inevitable that we live in a time when libraries may need to compete with commercial websites and have to work with them under the circumstances. Libraries need to provide diverse services to patrons in an effort to form strong and supportive library patron groups.

The diverse services should be provided based on the analysis of patron profiles and patron preferences or patterns in using information. With this background, in November 2004, the NLK restructured the organization of the library from the traditional reference service department providing physical library materials to the subject information department providing more concentrated information services. Followed by the structural change, the development of information services and patron development became the hub of the NLK's affairs. Therefore, the NLK discovered that it would be required to obtain patron files for the analysis of library usage. Then the NLK was able to set up an environment that would respond to the needs of establishing the RFID system.

⁵ A patron filled in name, telephone number, resident's number, call number, title, etc. in the checkout form and submitted it to a librarian.

4. The NLK established the RFID operation system that improved patron services

The NLK's ultimate goal of introducing the RFID system is to establish a U-Library in a ubiquitous society. More specifically, the library provides knowledge information resources to citizens, makes the resources usable for them anytime and anywhere, and assists them to grow and live more prosperously. We have already reached the stage of execution with an ability to provide information services whenever and wherever patrons want. WiBro (Wireless Broadband) mobile internet services have been commercialized in Korea in 2006. These services allow patrons to access the Internet while the patrons are on the move, and it is estimated to have a higher demand of information services on the Internet. It is already known that there are various ways to provide services for scholarly electronic databases, digitized materials, and digital teleconference through the Internet. An RFID tag is attached onto a library item, provides the location of the item and its availability in real time, and further plays a role in connecting patrons and services on the web. The RFID enables to sense the flow of library materials offline and provides the basis of one to one service with a capability of analyzing the usage pattern, which is integrated with patron information.



Namely, the library creates a patron database through managing the library cards and attaches RFID tags onto library materials. Then it is possible to check on the usage of library materials in real time in coordination with the RFID system and the ILS (KOLIS). Finally, it allows the library to have a total analysis of usage that is integrated with patron information and usage information of the materials. The RFID system is linked with services, library materials, and patrons in real time. The NLK has set up two goals in detail for the RFID system. First, the NLK is to improve the quality of library services and to provide the convenience of using the library. Second, the NLK is determined to establish the NLK's Management Information System to operate the library more effectively and start to make its operation system.

1) Improve the quality of library services and provide the convenience of using the library

The primary goal of service quality improvement is to create an environment where it provides a one to one customized service for upgrading the library patron services. We set up the MIS to provide comprehensive statistical information. The system is linked with the

Library Card system, the ILS (KOLIS), and the RFID system to understand patrons' preferences, to conduct usage analysis, and to create customized services. We also established a supporting system assisting subject specialist librarians who manage patrons and patron services through utilizing the data from the MIS. As mentioned earlier, the NLK planned for a three-year MIS project starting in September 2004 and was in the process of executing the preliminary work such as installing equipment. In early 2005, the NLK established statistical items for the MIS in order to provide the flows of patrons, library materials, and services both online and offline. Then the librarians were granted the ability to analyze the pattern of library materials for each patron in each subject room using the subject specialist library support system while utilizing the data from the MIS.

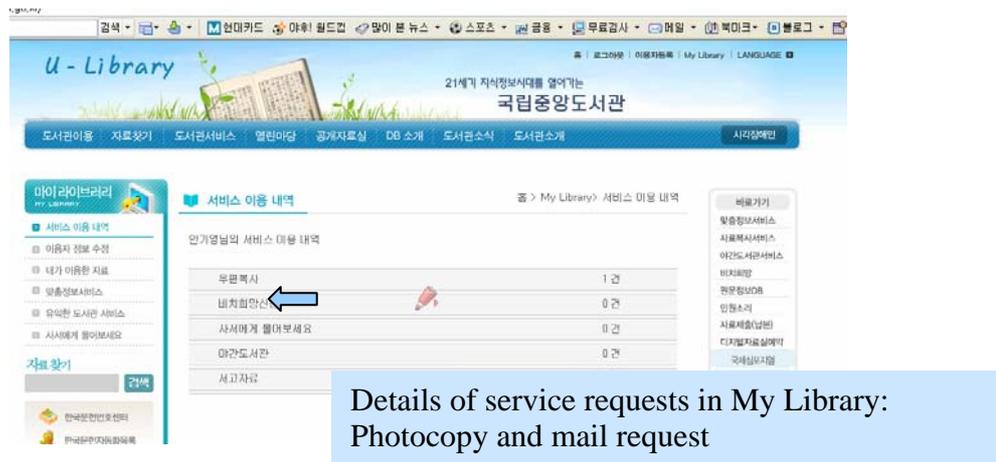
With the application of the RFID system, the NLK set up two types of service facilities to provide patrons more a convenient environment. One facility is designed for patrons who physically visited the library, and the other facility is for patrons who accessed through the Internet remotely.



Figure 3: Self-Checkin Equipment and the self-check kiosk

-- For on-site patrons: We decided to discard the checkout form, which was used for requesting library materials to be checked out of the library. Instead, a library patron can use his library card and place the wished item, which has a RFID tag attached, on the Reader to check out of the library. This new equipment allowed both librarians and patrons to save time. Additionally it set up a new system that let patrons check out on their own using the self-check kiosk. For the closed-stack items without attached RFID tags, we designed a new system feature that patrons can request items to check out from the search result screen in the ILS (KOLIS). This is an efficient way to save patron's time during the circulation process.

-- For patrons who accessed the library through the Internet remotely: Earlier remote patrons had to input the same information whenever they logged onto the NLK's homepage and tried to use the service offered on its homepage with the registered ID. We omitted this step and offered the 'My Library' feature to patrons. 'My Library' feature allows patrons to see their search history conducted in both online and offline. The NLK can utilize 'My Library' feature to control patrons' potential information inquiries that may be redundant and help them use the source of information more effectively. In addition, we offered patrons to see the progress of their service requests through the 'My Library' feature, and this is another way to use the library services more conveniently.



[Figure 4 Service Usage in My Library]

2) Establish the NLK's Management Information System to operate the library more effectively.

The NLK's MIS is a statistical information system to set up an effective library management system that produces data on the flow of library material usage, the usage of information services, and the flow of patrons in real time. By utilizing the MIS, librarians can offer a one to one service through the patron analysis while the management team of the library can use the system as a decision making tool for the library's resource distribution. For library patrons, the MIS is deemed an additional service system that helps them find out the use of their subject interests and its related information.

The major advantage of the RFID system is in the aspect of managing the collection holdings. However, as for the management of collection inventory or item location information, it was technically ineffective to handle a collection of 560,000 volumes, which were not attached with the RFID tags. Accordingly, as one of the NLK's earlier goals, the RFID system is established to identify and meet the essential needs which are the flow of library patrons, collections, and services while employing the developed technology. The NLK's MIS provides the real-time data on the number of visited patrons in both online and offline, the usage status by subject categories, and patron information. Recently, it also supplements to provide data on online service usage status.



[Figure 3] MIS real-time usage status by subject categories

5. Setting up Operation System

To establish the improvement of patron services and the MIS, the key point of the RFID system operation was based on a question, “How do we connect the RFID system and Library Card Operation System more effectively?” It is also significant to connect the existing ILS (KOLIS) and the NLK’s homepage. The NLK formed a task force team mainly with the Subject Information Department in January 2005 to set up the Library Card Operation System, which will be connected with the RFID system. The Task Force Team started planning on framework for the Library Card Operation System. During the early stage of the RFID system, its unfamiliarity of related equipment and the large scale of the project challenged the NLK. As a result, the NLK happened to overlook the purpose of setting up the system. However, followed by the librarians’ continuous effort, the team started focusing on the improvement of patron services. Especially, we focused on the following question, “How do we go by building a patron database which will be connected with the RFID system?” when we set up the Library Card Operation System which must be linked with the RFID system. Most of all, we need to understand our patrons as the first step and figure out the flow of the library materials and set up an operation system which will provide a distinctive service later. To accomplish these, we had to solve the following three challenges:

Understand patrons.

Make it possible to analyze individual patron’s preference or his/her usage pattern.

Create a basis that enables to provide a distinctive patron service.

Understanding patrons is a basis of a one on one service system, but is also a sensitive area with respect to the issues of privacy. We set up the categories of statistical information, which are necessary information to be gathered by MIS to provide individualized services.

With this basis, we designed a patron registration form and a library card operation system that are linked with the RFID system. As we pondered the system setup of the library card operation, we first considered the way of issuing library cards. The first suggestion from a system developer was as follows: a patron will visit the library and fill out the issue form to get a library card. Then the patron will be given a waiting number from the Library Card Issue Room, submit the number, and finally receive the library card. There were only name and resident's number to be filled out in the library card issue form, so this information was very insufficient to build a patron database. Additionally it has one major weak point; it cannot include the remote patrons who access through the Internet. After setting up the patron database, we separated the steps for patron registration and library card issue in order to cover all of the patrons accessing the library online. Then, we issued library cards using the same IDs to the patrons who registered on the NLK's homepage first and visited the library later.

5.1. Fill in the registration form

We intended to link with a patron management system to better understand patrons and their subject interests that would make a one on one service easier. We attempted to design a system that allows patrons to select their subject interests during the patron registration and have subject specialist librarians manage related-services for patrons.

1) Information to be filled out during the patron registration

Required fields: Purpose of library use, name, date of birth, telephone number, address (including email), occupation, subject interests.

Optional fields: SDI service, library webzine, etc.

2) Subject Interests

The library card operation task force team classified a total of 47 subjects and linked each subject with its corresponding subject room. At the NLK, there are four main subject rooms; humanities, science, social science, language and literature/library and information science. As for the first step of subject information services, each subject room had its own subdivisions of the subject and had provided information services. For example, a patron selects 'Home Management' for his subject interests and will be directed to the screen of "science patron management". Then a subject librarian who is specialized in subdivision of home management will serve the patron. As for a patron who selects 'architecture' for her interest, her information queries will be sent to both science subject room and humanities subject room and served by the corresponding subject librarians. Subject specialists analyze the preferences of their patrons and usage pattern of the subject room. They also perform collection development in their subject areas, manage SDI service, and send information via email or SMS to patrons. SDI service management is a quality checking service system, which librarians manage the number of SDI services being offered to patrons and their contents. The support system for subject specialist librarians was set up in January 2006 and has been improved with features that are more useful.

Example: Subject Specialist Librarians Support System

사회과학실 이용자 관리

0. 자료실 메뉴 관리 1. 자료실 소개 관리 2. 학술DB 관리 3. 추천사이트 관리 4. 주제별 사서추천자료 관리
5. SDI 관리 6. 실별 이용자 관리 7. 접속 이용자 관리 8. 사회과학실 이용자료 30선

번호	이름	아이디	전화번호	이메일	SDI 신청	웹진 신청	관심주제
48542	채 임	CJ 1026	031-4537		Y	N	[보기]
48541	소 오	NIK ACB	032-9489		N	N	[보기]
48540	김 석	GC K	02-90921		N	N	[보기]
48539	이 경	GC JGHT	032-7949		N	N	[보기]
48538	최 수	CJ 522	02-6799		Y	N	[보기]
48537	박 레	RE IX	02-6698		Y	N	[보기]
48536	조 백	CC 706	063-3364		N	N	[보기]
48535	이 경	IAM E	031-9876		Y	N	[보기]
48534	조 영	DU 567	010-5-0127		N	N	[보기]
48533	유 회	WIL OW	011-9-5620		N	N	[보기]

이름 [SEARCH]

[Figure 4] A list of patrons who selected “social science” for their subject interest.

A list of subjects displayed during patron registration.

<input type="checkbox"/> Home management	<input type="checkbox"/> Education	<input type="checkbox"/> Law
<input type="checkbox"/> Architecture	<input type="checkbox"/> Transport	<input type="checkbox"/> Health/Welfare
<input type="checkbox"/> Economics	<input type="checkbox"/> Military	<input type="checkbox"/> Immovables
<input type="checkbox"/> Archaeology/History	<input type="checkbox"/> Finance	<input type="checkbox"/> Sociology/Culture
<input type="checkbox"/> Classical Studies	<input type="checkbox"/> Agriculture	<input type="checkbox"/> Life Science
<input type="checkbox"/> Applied Arts	<input type="checkbox"/> Literature	<input type="checkbox"/> Mathematics
<input type="checkbox"/> Engineering	<input type="checkbox"/> Library and Information Science	<input type="checkbox"/> Journalism
<input type="checkbox"/> Tourism/Travel	<input type="checkbox"/> Physics	<input type="checkbox"/> Psychology
<input type="checkbox"/> Language	<input type="checkbox"/> Medical Science	<input type="checkbox"/> Philosophy
<input type="checkbox"/> Energy/Resource	<input type="checkbox"/> Human	<input type="checkbox"/> Computing/Electronic
<input type="checkbox"/> Women's Studies	<input type="checkbox"/> Genealogy	<input type="checkbox"/> Recruit
<input type="checkbox"/> Theater	<input type="checkbox"/> Religion	<input type="checkbox"/> Manner/Custom
<input type="checkbox"/> Art	<input type="checkbox"/> Maps	<input type="checkbox"/> Article
<input type="checkbox"/> Amusement/Sports	<input type="checkbox"/> Local	<input type="checkbox"/> Chemistry
<input type="checkbox"/> Diplomacy/Politics	<input type="checkbox"/> Earth Science	<input type="checkbox"/> Environment
<input type="checkbox"/> Music	<input type="checkbox"/> Astronomy	

5.2. Method to issue library card

We reduced the processing time to issue library cards by skipping the step for filling out the library card issue application form. In addition, we placed a library card self-issue machine in the library that conveniently promotes patrons to get their library cards issued for themselves by using the ID.



[Figure 5] The process of patron registration



[Figure 6] The process of obtaining library cards in using the library card self-issue machine.

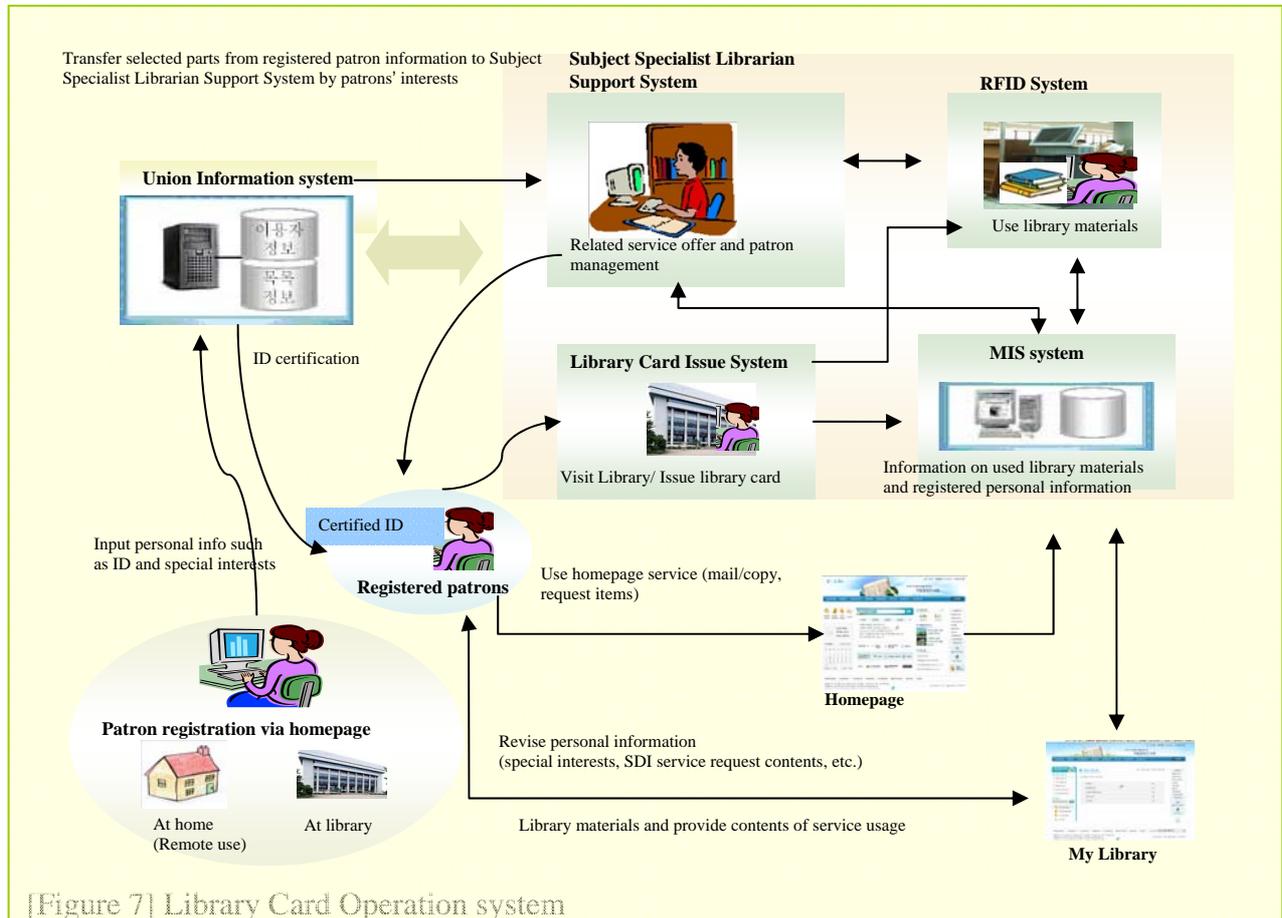
5.3. Library card operation system

We can find information about the online usage of library materials and services via patrons' IDs, while we can identify the offline usage of library materials through the items with RFID tags attached and library cards. In addition, we utilized ID and revised a program for those items without RFID tags attached. As a result, the items without the RFID tags can be checked out from the ILS (KOLIS), and we can get the status of the usage of library materials in real time for both online and offline. Specifically, a patron registers on the NLK's homepage and uses various services offered by the NLK, such as 'mail and copy service,' 'material reservation for weekend use', and 'application for late hours library use' using the authorized ID. As we were in the stage of introducing the library card policy, we excluded personal data from the required field such as resident's number after receiving a recommendation from the National Civil Rights Committee for protecting private information. We also clearly informed patrons about our strict management of personal information and special rights for patrons.

The Union Information System sends out registered personal information to the Subject Specialist Librarian Support System in order to provide individualized services and have librarians manage patron information. When a registered patron visits the library, gets a library card, and uses library materials, then the information about the used materials will be sent to the MIS after removing personal information. Then the information is sent to the Subject Specialist Librarian Support System for usage analysis. The information about used library materials or service details will be sent out to "My Library", and the system makes the bibliographies of the materials available for downloading to help patrons utilize information more effectively.

The Subject Specialist Librarian Support System is a service management system utilizing the data provided by the MIS, and it offers a one on one service to patrons by identifying individual patron's preference. The system supports subject specialist librarians to perform more centralized management by grouping registered patrons according to their subject interests. Ultimately, the NLK intended to conduct individualized patron analysis by each subject room and select core library patrons to promote more distinctive service development for them. This service effort has connected with the launch of NLK's subject information service and the process of fostering subject specialist librarians started in November 2004. It

can be considered as an exclusive responsibility for providing patron services by subject specialist librarians to upgrade the quality of service.



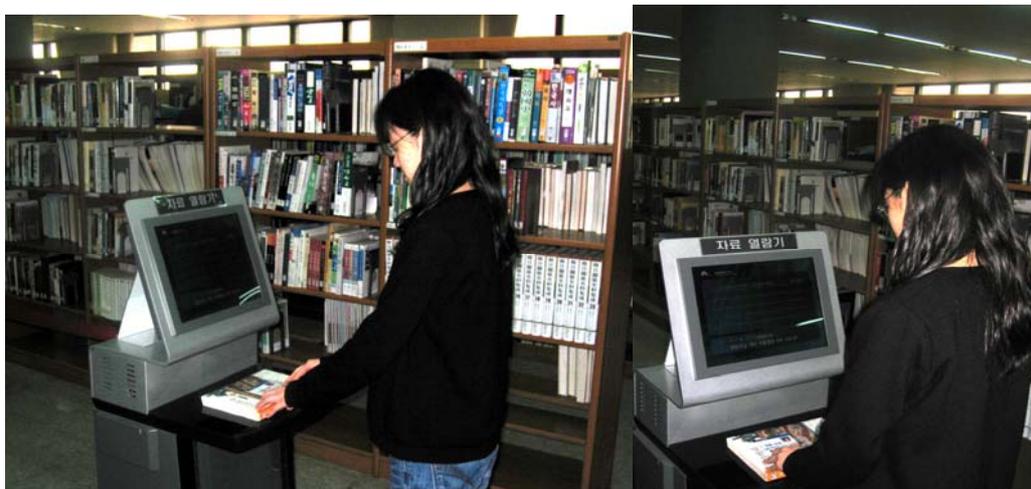
The organization of system application in figure 7 is comprised of the following systems: RFID system, RFID library card issue system, ILS (KOLIS), NLK's MIS, Subject Specialist Librarian Support System, and RFID system equipment control system.

6. Condition of existing RFID tags and operation tools

When the NLK introduced the RFID system, the biggest concern was the high cost of equipment. Both tags and related equipment were expensive to purchase. However, there were many controversies regarding the equipment matter owing to the fast-evolving RFID-related technology environment. The RFID tags used in the NLK is 13.56MHz Passive type manufactured by a local company (ECO), which used the chips by Philips. Recently, several local companies have made rapid progress in RFID technology. In the area of the RFID chip, Samsung developed 13.56MHz chip while KoreaCensor.com and RFID Lab developed

13.56MHz Reader⁶ in the area of RFID reader. Presumably, Korea's fast progress in this competitive environment and mobile RFID industry will reduce the cost during the system supplement process in the near future. Aside from the burden of the cost, the second challenge was the fast change of technology when we were introducing the RFID system.

The NLK brought in Passive 13.56MHz tags and readers. They work only when patrons physically touch library materials and library card. After then, it is counted as one. Thus, it was inconvenient for patrons who only used the library materials internally without checking out materials outside of the library, and it also inhibited the patrons to move around in the library freely. Alternatively, a self-check kiosk is now used for checking the usage of a subject room instead. Currently, the NLK has informed patrons about advantages from using the RFID system and has encouraged them to use the reader. Nevertheless, we understand that this alternative also inhibits patrons' customs while they use the library. Ultimately, we are currently looking for a method as to how we can check what materials patrons use in the library without inhibiting their ways. Although there are applicable technology evidences, the RFID system has to be handled and approach carefully. We've noticed that much transition occurred in various industries that are easily affected by the RFID application⁷ (For example, publication industry, mobile RFID technology development, standardization, etc).



[Figure 8] Self-check kiosk in a subject room

7. Enhance Patrons' Right from My Library Feature

The objectives of setting up the My Library feature are to treat patrons like the owners of the library, to provide ample spaces for patrons to get involved in library activities, and to offer patrons quality services. As a result, My Library can provide high-end services to patrons by linking up with the RFID system.

“My Library” provides patrons information on their used materials in the library and search information on the homepage. Eventually, “My Library” will play a role as an individual library to be offered to patrons, and the data in the individual library is downloadable. The downloading feature intends to help patrons not to repeat the same queries and save their time and walking in the library.

⁶ Sun Jin Kim, et al “RFID/USN Industry Trend and Development Outlook”, Electronic Telecommunication Trend Analysis vol 20 issue 3, p49-50

⁷ Jonathan Collins. “Publisher Tags All Library Books” RFID Journal, 2004. 9. 22



[Figure 9] A list of a patron’s used materials provided by My Library feature.

We are planning to add more features in “My Library”. We will provide information on books that are favored by those patrons whose subject interests are similar; for instance, the best top10 list of books read by patrons who have chosen similar subjects. We are planning to add information on books that are recommended by patrons. Also, we are conducting research to design various ways to support patrons’ voluntary activities at the library. For example, we will encourage them to provide book recommendation and book reviews. In addition, we will create an online patron community among patrons with similar interests to revitalize patrons’ activities. This effort is to enhance the relationship between patrons and librarians as well as patrons among themselves and to upgrade the effect of library advertisement and the satisfaction of library service. We will also develop more features to enhance the relationship between librarians and patrons in conjunction with the Subject Specialist Librarian Support System. We foresee that “My Library” will eventually become a personal homepage for each patron on the NLK’s homepage in the near future.

8. Continuous effort to develop new service models.

Upon introducing the RFID system, the NLK set up a service model, which is a model to show how technology advancement can satisfy individual patron needs. The NLK’s purpose is to develop a distinctive one on one service through patron analysis in order to provide satisfactory information to individual patrons and to design a system allowing quality service management and patron management continuously. We intend to build an effective network that connects patrons, library materials, and services and allows patrons to get information whether it is online or offline regardless of time and location. Especially, the usage analysis and service development using the RFID system and library cards are critical factors to build the U-Library and its success, because they play a significant role in making high quality content to be delivered to individual patrons in the U-Library. Similarly, we have noticed a contrary situation where the RFID-related research has been shifted from tags to operation system. Technology improvement will provide patrons to obtain relevant information more easily and more freely, and the NLK will aggressively research and develop new service models to meet those needs continuously.

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