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Assessment of the benefits of Taipei Public Library Intelligent Libraries and "FastBook" Automatic Book Lending Stations

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Abstract:

Intelligent Libraries and 'FastBook' Automatic Book Lending Stations are innovative service models that do not require the constant presence of library personnel to provide services. They are mainly installed in MRT stations, railway stations and other places where large numbers of people congregate. This study analyzed usage statistics for Taipei Public Library's (TPL) six intelligent libraries and three 'FastBook' stations and investigated readers' usage and satisfaction with the services. The result of this study showed that average visitations for borrowing from TPL's Intelligent Libraries and 'FastBook' stations were between 1,000 to 2,000 per month and the average number of visits per person per month was between 1 to 3 times. The peak borrowing period at each location was found to vary according to the characteristics of the location and the reader profile. Females borrowed more books than males, with the highest demographic group being females 41-50 years of age. The most popular topic category was 'language and literature' and readers mainly expected bestselling books to be provided. While access at each location varied, the convenience to customers was the main reason for using the services. The services used were primarily borrowing and returning materials and users preferred to browse the shelves to find the books they needed. The study also found that less than 40% of users reported encountering difficulties when using these services. Satisfaction ratings were highest with the spatial environment for Intelligent Libraries and the location of 'FastBook' stations. More than half of those surveyed reported that the use of Intelligent Libraries and 'FastBook' stations had increased their reading frequency, changed the way they preferred to obtain books and met their requirements for convenient access to library services.

Keywords: Intelligent Library, FastBook Automatic Book Lending Station, Taipei Public Library

Introduction

With the advance of information technology, the services of public libraries on the one hand face growing demands from the public, while on the other, face the challenge of reduced funding and staff resources. In response to these circumstances, TPL considered how to provide innovative and modern services and subsequently developed Intelligent Libraries and Automatic Book Lending Stations. However, these services do not replace existing library services, but rather the two are complementary. Therefore, together these services enable a broader and deeper reach, so that people have more convenient access to books and are less limited by time and space pressures. At the same time the library is able to effectively promote reading and provide practical assistance to the public in lifelong learning.

Intelligent Library and Automatic Book Lending Stations are alternative methods to address insufficient funding and staffing, and the unavailability of land for a library. They are a measure to extend library services, reading space and reading opportunities and facilitate modern services. Readers find them convenient for borrowing and returning books. Taipei Public Library has set up six Intelligent Libraries in succession since 2005, and five 'FastBook' Automatic Book Lending Stations since 2011. In order to understand usage, reader satisfaction and opinion with these new services, TPL analysed usage statistics and investigated readers' usage, satisfaction and expectations for Intelligent Libraries and 'FastBook' Automatic Book Lending Stations.

Literature Review

1. Services provided at an Intelligent Library and Automatic Book Lending Station

An Intelligent Library is where books are placed on shelves in an area where access control and inspection equipment are installed to manage readers' entry and exit. Through the use of valid documentation, readers' enter the library and use self-check machines to select and borrow and return books before leaving (Monley, 2011). Automatic Book Lending Stations are based on the concept and appearance of an automated shelf which provides readers with 24-hour book borrowing and returning. It is similar to the concept of a slot machine and a bank ATM, combined with RFID and automation technology so that users can complete their book borrowing and returning activity throughout the network. This means that the library's shelves, user authentication and shelf-check service are integrated into one station (Monley, 2011；Yeh, Shao-Ching, 2012；Huang Ching, n.d.). These two service types have a range of names. In some libraries the Intelligent Library is also called 'Openbook Intelligent Library'. The Automatic Book Lending Station is also called 'Library ATM', 'Self-Service Library', 'Intelligent Miniature Library', 'Mini Size Self-Service Library' and other names. TPL, in reference to the national and international definitions provided above, uses the names 'Intelligent Library' and 'Automatic Book Lending Station'. In addition, TPL added 'FastBook' to the term 'Automatic Book Lending Station' to highlight that it is a quick and convenient service for book borrowing and returning.

'Intelligent Library' and 'Automatic Book Lending Stations' have emerged in response to modern developments. It is a basic consideration that a door-to-door service is provided to extend to every corner of the city (He, Lan-Man, 2011). The Intelligent Library and

Automatic Book Lending services break through the passive service offered by the traditional library to satisfy users' demands for reading while also addressing insufficient library buildings. The smaller floor space, lower construction cost, shorter construction cycle and longer service time (depending on set location) associated with these services can provide readers with self-service book borrowing and returning functions and increased privacy while also saving on staff resources (Chen, Hsiu-Chun, 2010; Hsu Chiu, 2011).

2. The current state of the service for domestic and overseas public libraries' Intelligent Library services

Domestic and overseas libraries which have set up Intelligent Libraries include: SengKang Community Library and library@chinatown in Singapore, 24-hour Self-Service Library of Heping District, Shenyang City, Foshan City United Library and 24-hour Self-Service Library, Nanling City in China, Mid-Continent Public Library in Missouri, Library Express @ Redmond Ridge of King County Library System, and Yacolt Library Express of Fort Vancouver Regional Library District, Washington, D.C. in USA, as well as New Taipei City Library's Pangchiao Railway Station Low-Carbon Intelligent Library, Taipei Public Library's Neihu Intelligent Library, Ximen Intelligent Library, Songshan Airport Intelligent Library, Solar Library and Energy-Optimized House, Bailing Intelligent Library and East Metro Mall Intelligent Library in Taiwan.

These libraries have located Intelligent Libraries in a range of locations including: shopping centers, hypermarkets, transportation hubs (MRT station, railway station), community centers, business or industrial zones, the main library and branch buildings, parks and schools. In addition to the library's own set location, some locations are delivered in cooperation with enterprises or communities, for example, the enterprise may provide the site or sponsor funds for setup and operation. Another example is the library@chinatown in Singapore, which is sponsored and operated by the community. With regard to the floor area, the most common size is approximately 100m2, smaller units are approximately 33m2, 132-198m2, or more than 330m2. The area includes, space for self-service stations which are often equipped with desks and chairs, and some stations for self-help library card application and fee payment, an internet bar, computer classroom and activities space, etc. SengKang Community Library, the world first Intelligent Library, provides the most comprehensive services and also has the biggest floor area (1800m2). Furthermore, it provides readers with an online reference function, via a telephone and computer, so that readers can ask questions of a librarian who is at another location. A few Intelligent Libraries are used as service stations for readers to borrow reserved materials and return library materials. They also provide library collections for readers' to self-borrow on site. The library collections at Intelligent Libraries consist mainly of books and journals, with some having newspapers, video materials and e-newspaper reading. Readers can not only return their loans borrowed from Intelligent Libraries, but also in some cases, return loans borrowed from Automatic Book Lending Stations. The opening hours at Intelligent Libraries are usually more than 10 hours per day with some open 24 hours. However, some Intelligent Libraries are opened only after the main library is closed, such as Dongguan Library.

3. The current state of the service for domestic and overseas public libraries' Automatic Book Lending Stations

Automatic book lending stations set up by domestic and overseas public libraries include Contra Costa County Library, 'Free2Read & Ride' of Peninsula Library System and 'FPL Station' of Fullerton Public Library in California, 'Express @ Olney' of Montgomery County

Public Libraries in Maryland and Ottawa Public Library and Edmonton Public Library in Canada, Dongguan Library ATM and Self-Help Urban Community Library System of Shenzhen Library in China, as well as Kaohsiung City Library, National Public Information Library and Taipei Public Library in Taiwan.

The above set locations of Automatic Book Lending Stations include transportation hubs (MRT station, railway station), shopping centers, community centers, hospitals, the main library, municipal buildings, urban community and parking lots. Some university libraries cooperate with universities to set up and provide predominantly book collections with some audio-visual materials, video games and audio books. They may also have Automatic Lending Stations specifically for audio-visual materials.

Opening hours vary, some stations are 24-hour services and some are more than 10 hours per day, or match set locations. The size of the library collection available at Automatic Book Lending Stations ranges from 200 to 700 items. The service is mainly to support readers to self-serve book borrowing and returning, however, some overseas stations are for borrowing only. In addition, some libraries enable readers to return items lent from Automatic Book Lending Stations and also from other branches.

Apart from book borrowing and returning services provided by domestic and overseas public libraries' Automatic Book Lending Stations, some stations have additional functionality including: library card application, renewal, login to library website inquiry system for library information and personal borrowing record, deposit of advance payment and deduction and reservation of items borrowed on the reader's designated equipment. The 'Self-Help Urban Community Library System' of Shenzhen Library provides the most services. Shenzhen Library's equipment has the functionality to reserve materials to borrow from other libraries, available in the reservation materials cabinet.

To facilitate browsing, stations in Taiwan and China have a glass window to enable readers to see books or the spines of books in the library collection. In America and Canada, readers can only see library collections on the first layer of each shelf or the book categories and titles available through a touch screen. Where the equipment only allows readers to see collections on the first layer of each shelf, readers are expected to borrow from the collection that is visible.

Research methods

Methods, objectives and implementation of this study:

1. Methods and objectives of study:

This study analysed usage statistics for six Intelligent Libraries in TPL integrated library system and three 'FastBook' Automatic Book Lending Stations located in the main library, Taipei Railway Station and Taipei City Hall. The study adopted purposive sampling of users of Intelligent Libraries and 'FastBook' Automatic Book Lending Stations as the study population for questionnaires conducted with on-site users. Basic details for the Intelligent Libraries and 'FastBook' Automatic Book Lending Stations included in the study are in Table 1:

Table 1 Basic detail for Intelligent Libraries and 'FastBook' Automatic Book Lending Stations

	Name	Setup time	Space, m^2	Library collection quantity	Location	Service time
Intelligent Library	Neihu	07/2005	106	10,200	Shopping Center	06:00-23:00
	Ximen	05/2006	198	15,000	MRT Station	06:00-24:00
	Songshan Airport	06/2011	90	9,700	MRT Station	06:00-24:00
	Solar Library and Energy-Optimized House	10/2011	330	21,500	Park	08:30-21:00
	Bailing	12/2012	125	10,100	Elementary School	Mon.-Fri. 16:30-21:00 weekends & summer 09:00-21:00
	East Metro Mall	01/2013	100	9,100	Metro Mall	06:00-24:00
FastBook Automatic Book Lending Station	The Main Library	04/2011	NA	1,570	The Main Library	24 hrs
	Taipei City Hall	01/2013	NA	2,080	Taipei City Hall	07:00-22:00
	Taipei Railway Station	01/2012	NA	1,800	Railway Station	24 hrs

2. Implementation of study

The study conducted a pre-test questionnaire on July 25, 2013 of 10 users in TPL's intelligent libraries and 'FastBook' stations. No questionnaire revisions were required following the pre-test results. Subsequently, the formal questionnaire was conducted for on-site users in six intelligent libraries and three 'FastBook' stations in the Main Library, Taipei Railway Station and Taipei City Hall. For Intelligent Libraries, 1,006 questionnaires were issued, with 857 valid responses received (response rate of 98%); For 'FastBook' stations, 988 questionnaires were issued, with 812 valid responses received (response rate of 95%).

Analysis and discussion of the study results

This study analysed usage statistics of the integrated library system and the questionnaire results. Results of usage statistics and questionnaire analysis for Intelligent Libraries and 'FastBook' stations are described below:

1. Usage statistics for Intelligent Libraries and 'FastBook' stations

（1）Usage statistics for Intelligent Libraries

The six Intelligent Libraries analysed in this study are: Neihu Intelligent Library (located in large-sized shopping center), Ximen Intelligent Library (located in MRT Station), Songshan

Airport Intelligent Library (located in Airport MRT Station), Solar Library and Energy-Optimized House (located in the park), Bailing Intelligent Library (located in elementary school campus) and East Metro Mall Intelligent Library (located in Metro Mall). This study used the code IL-1, IL-2, IL-3, IL-4, IL-5 and IL-6 in order, to identify the services above.

A. Visitations:

Visitations to the six intelligent libraries were 531,784 in total for January-September, 2013 - an average of 59,087 visits per month. The highest number of visits was to IL-4 (average 28,927 per month), second highest was IL-6 (average 11,026 per month), followed by, in sequence, IL-2, IL-5, IL-3, and IL-1. The month with the highest visits was during summer vacation (80,274 in July and 77, 910 in August), with February having the lowest visits (44,904).

Table 2 Visitations to Intelligent Libraries

IL/ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Avg.
IL-4	25,501	20,830	24,437	21,104	22,618	34,168	43,215	41,295	27,172	260,340	28,927
IL-6	2,800	10,026	13,884	13,736	9,353	11,368	13,715	12,177	12,177	99,236	11,026
IL-2	8,254	6,359	6,012	6,103	6,169	7,435	8,822	7,753	7,753	64,660	7,184
IL-5	6,881	2,372	5,966	3,220	3,932	4,452	5,410	7,203	5,705	45,141	5,016
IL-3	4,271	3,815	4,277	3,792	5,185	5,165	6,196	6,029	4,494	43,224	4,803
IL-1	1,751	1,502	1,979	1,913	1,922	1,998	2,916	3,453	1,749	19,183	2,131
Total	49,458	44,904	56,555	49,868	49,179	64,586	80,274	77,910	59,050	531,784	59,087

B. Visitations for book borrowing:

The total number of visitations for book borrowing from the six Intelligent Libraries was 99,353 for January-September, 2013 - average 11,039 per month. The location with the highest number of visitations for book borrowing was at IL-5 (average 2,687 per month), second highest was at IL-4 (average 2,480 per month) and the lowest was at IL-1 (average 493 per month). The highest month of visitations for book borrowing was in July (12,651), second highest was January (12,387) and the lowest month was September (8,370).

Table 3 Visitations for book borrowing per month from Intelligent Libraries

IL./ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Avg.
IL-5	3,968	2,129	3,211	2,641	2,977	3,562	2,918	1,554	1,222	24,182	2,687
IL-4	2,810	2,352	2,464	2,294	2,221	2,505	2,980	2,613	2,084	22,323	2,480
IL-6	1,588	2,200	2,338	2,156	2,288	2,206	2,413	2,298	1,914	19,401	2,156
IL-2	2,471	1,916	2,215	2,094	2,038	2,137	2,385	2,371	1,749	19,376	2,153

IL./ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Avg.
IL-3	1,044	929	1,133	988	1,114	1,074	1,287	1,090	974	9,633	1,070
IL-1	506	398	439	434	472	502	668	592	427	4,438	493
Total	12,387	9,924	11,800	10,607	11,110	11,986	12,651	10,518	8,370	99,353	11,039

Generally the peak time for visitations for book borrowing from the six Intelligent Libraries for January-September, 2013 was 16:00-17:59. The peak time varied for the libraries and was as follows: IL-1 14:00-17:59; IL-3, IL-6 and IL-5 15:00-17:59; IL-4 16:00-17:59 and 20:00-20:59; and IL-2 17:00-18:59.

C. Quantity and category of book borrowing

Total book borrowing/returning quantity for the six Intelligent Libraries was 537,802 books for January-September, 2013. Libraries in order of highest to lowest loans/returns: IL-4, IL-5, IL-2, IL-6, IL-3 and IL-1.

The total number of books borrowed from the six Intelligent Libraries was a total of 319,955 for January-September, 2013. Libraries in order of highest to lowest loans: IL-5, IL-4, IL-2, IL-6, IL-3 and IL-1. In the same period, the total number of books returned to the six Intelligent Libraries was a total of 217,847 (average 24,205 books per month). Libraries in order of highest to lowest returns: IL-4, IL-2, IL-6, IL-5, IL-3 and IL-1. With regard to monthly statistics: the highest book loans/returns were in July, with January as the second highest month and September as the lowest month. The highest month for book loans was January, with the second highest month in June and the lowest month in September. The month with the highest book returns was July, the second highest month was August and the lowest month was September.

Table 4 Quantity of book borrowing/returning per month for Intelligent Libraries

IL / Month		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Avg.
IL-4	Borrow	10,116	7,742	8,114	7,613	7,280	8,272	9,721	8,462	6,456	73,776	8,197
	Return	8,094	7,798	7,564	6,964	6,603	6,797	8,321	8,233	6,287	66,661	7,407
Borrow+Return		**18,210**	**15,540**	**15,678**	**14,577**	**13,883**	**15,069**	**18,042**	**16,695**	**12,743**	**140,437**	**15,604**
IL-5	Borrow	15,104	9,389	12,773	11,520	12,411	14,702	9,766	4,252	3,085	93,002	10,334
	Return	4,787	3,200	3,786	3,290	3,532	3,470	4,370	4,271	2,999	33,705	3,745
Borrow+Return		**19,891**	**12,589**	**16,559**	**14,810**	**15,943**	**18,172**	**14,136**	**8,523**	**6,084**	**126,707**	**14,079**
IL-2	Borrow	7,515	5,797	6,439	6,097	5,844	6,351	7,213	7,125	5,123	57,504	6,389
	Return	5,614	5,045	5,104	4,727	4,828	4,801	5,362	5,659	4,286	45,426	5,047
Borrow+Return		**13,129**	**10,842**	**11,543**	**10,824**	**10,672**	**11,152**	**12,575**	**12,784**	**9,409**	**102,930**	**11,436**
IL-6	Borrow	4,527	5,636	5,885	5,357	5,705	5,349	5,842	5,446	4,625	48,372	5,375
	Return	996	3,936	4,991	4,658	4,646	4,440	4,874	4,602	3,849	36,992	4,110
Borrow+Return		**5,523**	**9,572**	**10,876**	**10,015**	**10,351**	**9,789**	**10,716**	**10,048**	**8,474**	**85,364**	**9,485**
IL-3	Borrow	3,403	2,910	3,397	3,039	3,498	3,377	3,933	3,363	2,909	29,829	3,314
	Return	2,173	2,224	2,551	2,252	2,594	2,323	2,746	2,535	2,361	21,759	2,418

IL / Month		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Avg.
Borrow+Return		**5,576**	**5,134**	**5,948**	**5,291**	**6,092**	**5,700**	**6,679**	**5,898**	**5,270**	**51,588**	**5,732**
IL-1	Borrow	2,151	1,553	1,801	1,715	1,790	1,886	2,641	2,248	1,687	17,472	1,941
	Return	1,430	1,323	1,623	1,296	1,303	1,452	1,691	1,713	1,473	13,304	1,478
Borrow+Return		**3,581**	**2,876**	**3,424**	**3,011**	**3,093**	**3,338**	**4,332**	**3,961**	**3,160**	**30,776**	**3,419**
Total	**Borrow**	**42,816**	**33,027**	**38,409**	**35,341**	**36,528**	**39,937**	**39,116**	**30,896**	**23,885**	**319,955**	**35,551**
	Return	**23,094**	**23,526**	**25,619**	**23,187**	**23,506**	**23,283**	**27,364**	**27,013**	**21,255**	**217,847**	**24,205**
	Borrow+Return	**65,910**	**56,553**	**64,028**	**58,528**	**60,034**	**63,220**	**66,480**	**57,909**	**45,140**	**537,802**	**59,756**

The demographic profile for book borrowing from the six Intelligent Libraries showed that females (58%) borrowed more than males (42%). At IL-1 males (54%) borrowed more than females (46%), however the percentage of females was higher than males for the other five Intelligent Libraries. With regard to age, generally, the highest quantity of loans were by people aged 41-50 (27%), the second highest group was people aged 31-40 (24%). However, at IL-5 the highest borrowing quantity was by persons aged 7-12 (23,718 books or 26%).

With regard to peak book borrowing times, overall the highest period was 16:00-17:59 for the six Intelligent Libraries. The peak period varied for individual libraries as follows: IL-1 at 14:00-17:59 and 19:00-20:59; IL-3 at 14:00-20:59; IL-5 at 11:00-11:59 a.m. and 15:00-17:59 before/after class; IL-6 at 15:00-20:59; IL-4 at 20:00-20:59 before closed and 16:00-17:59; IL-2 at 17:00-18:59 after class and off duty.

Table 5 Quantity of book borrowing per time period from Intelligent Libraries

Time/IL	IL-1	IL-2	IL-3	IL-4	IL-5	IL-6	Total
0:00-0:59	closed	488	1	closed		12	501
1:00-1:59		closed				closed	
2:00-2:59							
3:00-3:59							
4:00-4:59							
5:00-5:59						29	29
6:00-6:59		112	161			142	415
7:00-7:59		867	814	1	2	591	2,275
8:00-8:59	10	2,216	1,087	1,008	234	1,271	5,826
9:00-9:59	317	1,384	1,124	3,517	3,491	1,013	10,846
10:00-10:59	1,134	1,726	1,547	4,946	7,306	1,684	18,343
11:00-11:59	1,158	2,233	1,682	6,017	10,869	2,355	24,314
12:00-12:59	1,367	3,474	1,705	4,424	8,074	3,073	22,117
13:00-13:59	1,262	3,812	1,939	4,063	6,881	3,395	21,352
14:00-14:59	1,622	3,462	2,137	5,680	7,898	3,669	24,468
15:00-15:59	2,050	4,519	2,552	6,261	10,240	4,118	29,740
16:00-16:59	1,519	4,528	2,314	7,686	15,700	4,736	36,483

Time/IL	IL-1	IL-2	IL-3	IL-4	IL-5	IL-6	Total
17:00-17:59	1,426	5,762	2,652	8,110	10,909	4,424	33,283
18:00-18:59	1,187	6,268	2,373	6,355	3,472	4,165	23,820
19:00-19:59	1,503	4,553	2,169	5,862	2,974	4,139	21,200
20:00-20:59	1,639	4,208	2,349	9,737	4,926	4,095	26,954
21:00-21:59	1,168	4,226	1,969	109	26	3,217	10,715
22:00-22:59	110	2,466	907	0	0	1,763	5,246
23:00-23:59	0	1,200	347	0	0	481	2,028
Total	17,472	57,504	29,829	73,776	93,002	48,372	319,955

With regard to book category or topics, the 'Language and literature' category (48%) accounted for the highest quantity of loans from the six Intelligent Libraries. The only exception was for IL-2 where the 'Arts' (including cartoons) category (21,426 books, 37.3%) accounted for the highest quantity of loans.

Table 6 Category of book borrowing from Intelligent Libraries

Category/IL	IL-1（%）	IL-2（%）	IL-3（%）	IL-4（%）	IL-5（%）	IL-6（%）	Total
Language & literature	7,939（45%）	21,053（37%）	21,156（71%）	33,754（46%）	49,026（53%）	20,964（43%）	153,892（48%）
Applied science	2,755（16%）	4,787（8%）	1,405（5%）	11,605（16%）	6,955（7%）	8,962（19%）	36,469（11%）
Arts	1,167（7%）	21,426（37%）	730（2%）	4,849（7%）	5,337（6%）	2,407（5%）	35,916（11%）
World history & geography	1,521（9%）	2,840（5%）	4,593（15%）	6,180（8%）	5,742（6%）	5,331（11%）	26,207（8%）
Social sciences	1,096（6%）	2,436（4%）	644（2%）	5,509（7%）	6,004（6%）	4,299（9%）	19,988（6%）
Sciences	1,122（6%）	1,507（3%）	465（2%）	3,737（5%）	7,354（8%）	2,222（5%）	16,407（5%）
Philosophy	633（4%）	1,804（3%）	166（1%）	4,115（6%）	1,660（2%）	1,955（4%）	10,333（3%）
Pre-school books	467（3%）	141（0%）	68（0%）	928（1%）	7,316（8%）	547（1%）	9,467（3%）
Chinese history & geography	305（2%）	332（1%）	403（1%）	1,084（1%）	1,658（2%）	602（1%）	4,384（1%）
Religion	252（1%）	549（1%）	172（1%）	1,035（1%）	888（1%）	664（1%）	3,560（1%）
Generalities	215（1%）	629（1%）	27（0%）	980（1%）	1,062（1%）	419（1%）	3,332（1%）
Total	17,472	57,504	29,829	73,776	93,002	48,372	319,955

D. Borrowing rate of library collection

Total quantity of book borrowing from the six intelligent libraries was 319,955 books. Calculated on the basis of 75,600 total collection items in the six libraries, average borrowing

rate per book was 4.2 times. Analysis of individual Intelligent Libraries showed that the highest turnover rate of the collection was at IL-5 (9.2 times), second highest was IL-6 (5.3 times) and the lowest rate was at IL-1 (1.7 times).

Table 7 Borrowing rate of library collection from intelligent libraries

	IL-5	IL-6	IL-2	IL-4	IL-3	IL-1	Total
Quantity of Library collections	10,100	9,100	15,000	21,500	9,700	10,200	75,600
Quantity of loans /collection borrowing	93,002	48,372	57,504	73,776	29,829	17,472	319,955
Rate of collection borrowing (times)	9.2	5.3	3.8	3.4	3.1	1.7	4.2

（2）Usage statistics for 'FastBook' Automatic Book Lending Stations

The three 'FastBook' Automatic Book Lending Stations analysed in this study are located in the main library (at the entrance), Taipei Railway Station (at the platform, B1) and Taipei City Hall (inside of Taipei City Hall). In the study they are identified as FB-1, FB-2 and FB-3, respectively.

A. Visitations for book borrowing

Total visitations for book borrowing from the three 'FastBook' stations was 42,935 in January-September, 2013 - average 4,771 visitations per month. The highest visitations for book borrowing across the three stations was at FB-1 (average 2,268 per month), second highest was FB-3 (average 1,305 per month), followed by FB-2 (average 1,197 per month). With regard to the highest month for visitations for book borrowing across the three stations, January was highest (6,037 visitations), second highest was July (5,396 visitations) and the lowest was September (3,822 person-times).

Table 8 Visitations for book borrowing from 'FastBook' stations

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Avg.
FB-1	2,624	2,257	2,453	2,102	2,126	2,110	2,745	2,163	1,836	20,416	2,268
FB-3	1,928	1,308	1,353	1,202	1,310	1,029	1,502	1,229	884	11,745	1,305
FB-2	1,485	1,164	1,214	1,184	1,169	1,024	1,149	1,283	1,102	10,774	1,197
Total	6,037	4,729	5,020	4,488	4,605	4,163	5,396	4,675	3,822	42,935	4,771

The peak period for visitations for book borrowing from the three 'FastBook' stations was 15:00-18:59. For individual stations the peak periods were: FB-1 at 15:00-17:59; FB-2 at 17:00-19:59 after class/duty hour; FB-3 at 12:00-13:59 noon time and 15:00-15:59.

Table 9 Visitations for book borrowing at 'FastBook' stations per time period

Time/FB	FB-1	FB-2	FB-3	Total
0:00-0:59	42	29	2	73
1:00-1:59	15	7	9	31
2:00-2:59	2	7	6	15
3:00-3:59	4	5	0	9
4:00-4:59	8	12	1	21
5:00-5:59	22	57	0	79
6:00-6:59	46	105	34	185
7:00-7:59	162	331	300	793
8:00-8:59	516	452	682	1,650
9:00-9:59	763	388	407	1,558
10:00-10:59	1,252	447	713	2,412
11:00-11:59	1,578	440	810	2,828
12:00-12:59	1,628	595	1,323	3,546
13:00-13:59	1,662	600	1,314	3,576
14:00-14:59	1,619	562	675	2,856
15:00-15:59	1,814	714	1,379	3,907
16:00-16:59	2,258	778	861	3,897
17:00-17:59	1,844	1,050	1,165	4,059
18:00-18:59	1,523	1,090	1,128	3,741
19:00-19:59	1,320	1,028	563	2,911
20:00-20:59	1,416	885	253	2,554
21:00-21:59	555	666	87	1,308
22:00-22:59	273	405	21	699
23:00-23:59	94	121	12	227
Total	20,416	10,774	11,745	42,935

B. Quantity and category of book borrowing

The total borrowing/returning quantity for the three 'FastBook' stations was 106,572 for January-September, 2013. The order of stations from highest to lowest borrowing/returning quantity was: FB-1, FB-2 and FB-3. The total loans from the three stations were 56,504 books (average 6,278 books per month). The order of stations from highest to lowest loans was: FB-1, FB-3 and FB-2 (the difference between the latter two stations was only 416 books). With regard to quantity of returns, the combined total for the three 'FastBook' stations was 50,068 books (average 5,563 books per month). The order of stations from highest to lowest returns was: FB-2, FB-3 and FB-1.

With regard to statistics for the highest month for borrowing/returning – January was the highest month, July was the second highest and the lowest month was September. The highest month for the quantity of loans was January, second highest was July and the lowest month was June.

Table 10 Quantity of borrowing/returning for 'FastBook' stations

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Total	Avg.
FB-1	Borrow	3,640	3,204	3,458	2,942	3,050	3,032	3,689	3,037	2,508	28,560	3,173
	Return	1,987	1,718	1,669	1,420	1,409	1,468	2,292	1,927	1,666	15,556	1,728
Sub-Total		**5,627**	**4,922**	**5,127**	**4,362**	**4,459**	**4,500**	**5,981**	**4,964**	**4,174**	**44,116**	**4,901**
FB-2	Borrow	1,894	1,521	1,573	1,519	1,496	1,284	1,466	1,613	1,398	13,764	1,529
	Return	2,279	1,883	1,977	1,917	2,013	1,939	2,037	2,148	1,978	18,171	2,019
Sub-Total		**4,173**	**3,404**	**3,550**	**3,436**	**3,509**	**3,223**	**3,503**	**3,761**	**3,376**	**31,935**	**3,548**
FB-3	Borrow	2,283	1,634	1,593	1,439	1,568	1,282	1,844	1,493	1,044	14,180	1,576
	Return	1,200	1,845	2,120	1,842	2,042	1,700	2,133	1,969	1,490	16,341	1,816
Sub-Total		**3,483**	**3,479**	**3,713**	**3,281**	**3,610**	**2,982**	**3,977**	**3,462**	**2,534**	**30,521**	**3,392**
Total	**Borrow**	**7,817**	**6,359**	**6,624**	**5,900**	**6,114**	**5,598**	**6,999**	**6,143**	**4,950**	**56,504**	**6,278**
	Return	**5,466**	**5,446**	**5,766**	**5,179**	**5,464**	**5,107**	**6,462**	**6,044**	**5,134**	**50,068**	**5,563**
	Borrow +Return	**13,283**	**11,805**	**12,390**	**11,079**	**11,578**	**10,705**	**13,461**	**12,187**	**10,084**	**106,572**	**11,841**

With regard to the demographic profile for users of the three 'FastBook' stations, more than half of the loans were by females. With regard to age, people aged 41-50 (29%) accounted for the highest quantity of loans, and people aged 31-40 were the second highest (25%). With regard to the highest borrowing period, the overall peak period from the three 'FastBook' stations was 12:00-13:59 and 15:00-18:59. Peak periods varied across the individual stations as follows: FB-1 was at 16:00-16:59 during opening hour of the main library; FB-2 at 17:00-19:59 after class/duty hour; FB-3 at 12:00-13:59 noon time and 15:00-15:59. '

Table 11 Quantity of book borrowing per time period from 'FastBook' stations

Time/FB	FB-1	FB-2	FB-3	Total
0:00-0:59	130	137	2	269
1:00-1:59	22	26	11	59
2:00-2:59	5	21	6	32
3:00-3:59	13	5	0	18
4:00-4:59	8	12	1	21
5:00-5:59	66	80	0	146
6:00-6:59	72	105	36	213
7:00-7:59	320	368	530	1,218
8:00-8:59	742	524	1,158	2,424
9:00-9:59	1,052	397	459	1,908
10:00-10:59	1,795	544	839	3,178
11:00-11:59	2,139	461	881	3,481
12:00-12:59	2,169	859	1,785	4,813
13:00-13:59	2,222	737	1,819	4,778
14:00-14:59	1,942	664	675	3,281
15:00-15:59	2,386	846	1,551	4,783
16:00-16:59	3,059	1,014	861	4,934
17:00-17:59	2,534	1,381	1,267	5,182
18:00-18:59	2,097	1,534	1,351	4,982
19:00-19:59	1,971	1,421	574	3,966
20:00-20:59	2,160	1,120	254	3,534
21:00-21:59	981	843	87	1,911
22:00-22:59	507	527	21	1,055
23:00-23:59	168	138	12	318
Total	28,560	13,764	14,180	56,504

The book borrowing category or topic with the highest loans from the three 'FastBook' stations was 'Language and literature' with (49%).

Table 12 Category of book borrowing from 'FastBook' stations

Category/FastBook	FB-1（%）	FB-2（%）	FB-3（%）	Total（%）
Language & literature	16,223（57%）	5,250（38%）	6,392（45%）	27,865（49%）
Applied science	3,726（13%）	2,698（20%）	2,473（17%）	8,897（16%）
Social science	2,758（10%）	1,869（14%）	1,126（8%）	5,753（10%）
World history & geography	2,125（7%）	1,763（13%）	1,767（12%）	5,655（10%）
Philosophy	1,692（6%）	627（5%）	907（6%）	3,226（6%）
Arts	642（2%）	630（5%）	742（5%）	2,014（4%）
Sciences	746（3%）	489（4%）	353（2%）	1,588（3%）
Religions	252（1%）	132（1%）	206（1%）	590（1%）
Chinese history & geography	188（1%）	196（1%）	174（1%）	558（1%）
Generalities	208（1%）	84（1%）	40（0%）	332（1%）
Pre-school books	0（0%）	26（0%）	0（0%）	26（0%）
Total	28,560	13,764	14,180	56,504

C. Borrowing rate for the collections at 'FastBook' stations

The total quantity of loans from the three 'FastBook' stations was 56,504 books for January-September, 2013. Calculated on the basis of a total collection of 5,450 items across the three stations, the average borrowing rate per book was 10.4 times. Analysis of the individual stations showed that the highest turnover rate for the collection was from FB-1 (18.2 times), second highest was FB-2 (7.6 times) and the lowest was FB-3 (6.8 times).

Table 13 Borrowing rate of collection for 'FastBook' stations

	FB-1	FB-2	FB-3	Total
Number of library collections	1,570	1,800	2,080	5,450
Number of collection borrowings	28,560	13,764	14,180	56,504
Borrowing rate (times) of collections(each book average)	18.2	7.6	6.8	10.4

2. Questionnaire analysis for “Assessment of the Benefits of Intelligent Libraries”

（1）Usage of Intelligent Libraries

A. Frequency of use

Questionnaire respondents for the six Intelligent Libraries reported their frequency of use as mostly 1-3 times per month (33%), i.e. IL-1 (41%), IL-6 (32%), IL-5 (25%), IL-4 (40%) and IL-2 (40%). A frequency of use of one time per 6 months (and up) was mostly reported by users in IL-3 (32%).

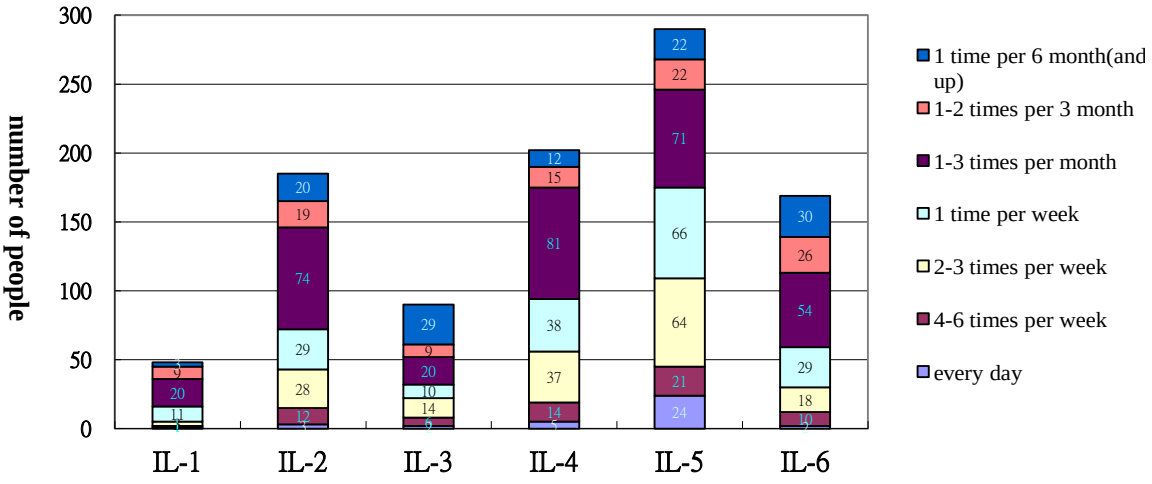

Fig.1 Frequency of use for Intelligent Libraries

B. Approaches for using Intelligent Libraries

Users of IL-1 mostly used this location because of shopping and living nearby (45% each); users of IL-4 and IL-5 reported living nearby, up to 70% (86% and 69%, respectively) ; users of IL-6 and IL-2 reported living nearby and commuting (30% each); users of IL-3 reported travelling (34%) followed by commuting for school (25%).

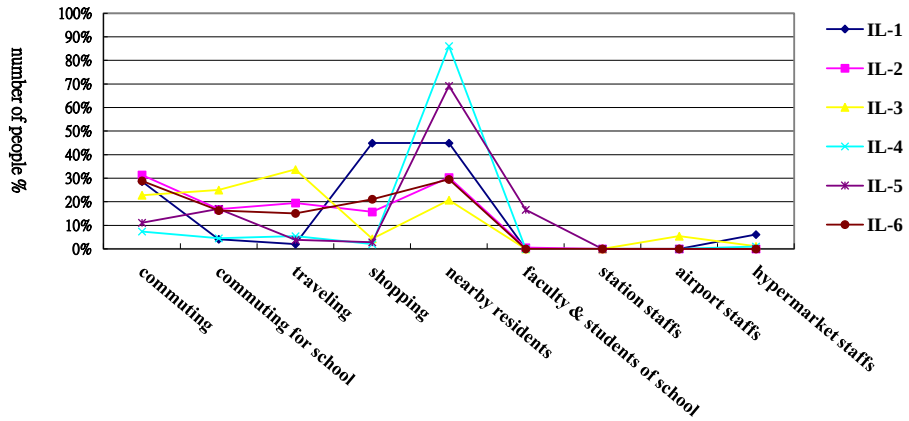

Fig.2 Approaches for using Intelligent Libraries

C. Reasons for using Intelligent Libraries

The overall reason reported for using Intelligent Libraries was because of their 'convenient location' (76%). This was the main reason provided by respondents at each location. The reason which had the lowest response rate was 'collections meet requirements' (20%). In addition, the Intelligent Libraries where respondents reported the highest rate for 'convenient transportation' were located in MRT stations or nearby Metro Mall, i.e. IL-2 (63%), IL-6 (57%) and IL-3 (53%).

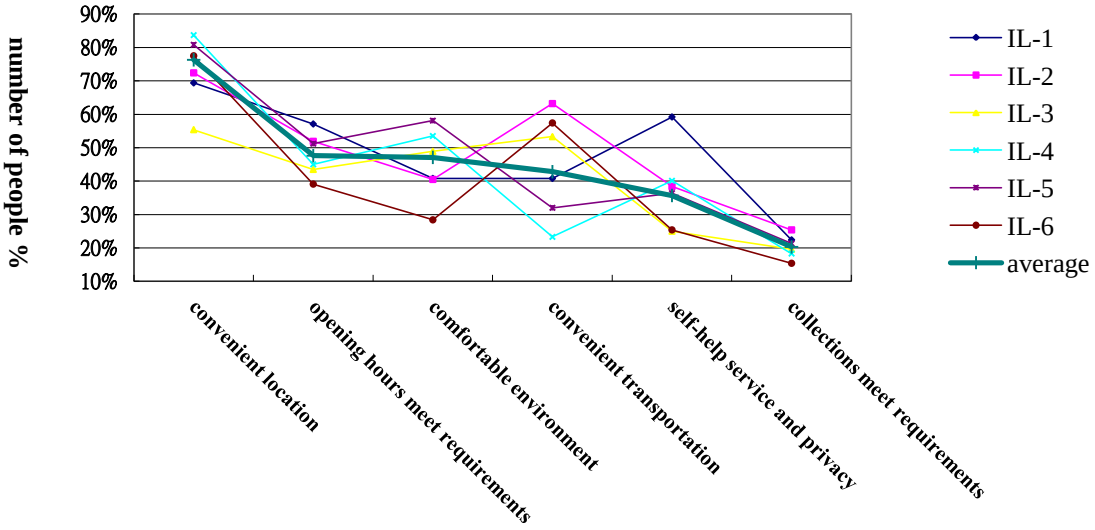

Fig.3 Reasons of using Intelligent Libraries

D. Average length of stay in intelligent libraries

Overall, the questionnaire respondents most frequently reported that their average length of stay was 31 min - 1 hour (35%), and this applied at IL-4 (43%), IL-2 (35%) and IL-5 (33%). While the average length of stay most frequently reported at IL-1 (53%), IL-6 (41%) and IL-3 (39%) was 11-30 minutes.

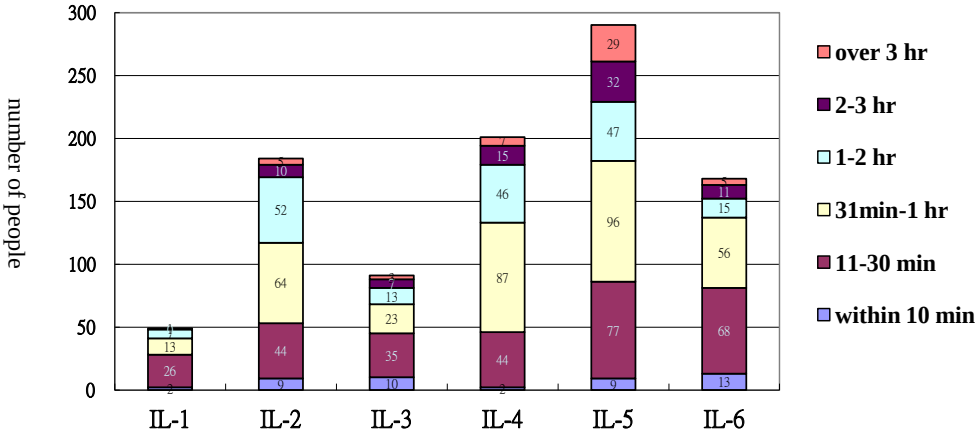

Fig.4 Average length of stay in Intelligent Libraries

E. Services used in Intelligent Libraries

Overall, the majority of respondents report they use a self-check machine for book borrowing (73%). Locations ranked in accordance with this use were: IL-1 (90%), IL-2 (80%), IL-4 and IL-5 (78% each) and IL-6 (62%). However, respondents at IL-3 reported that the service with the highest use was 'read materials in the library' (58%). The service with the second highest overall use reported by respondents was book returning through a self-check machine (59%). Locations ranked in accordance with this use were: IL-5 (68%), IL-1 (67%), IL-4 (65%), IL-2 (64%), IL-3 and IL-6 (37% each).

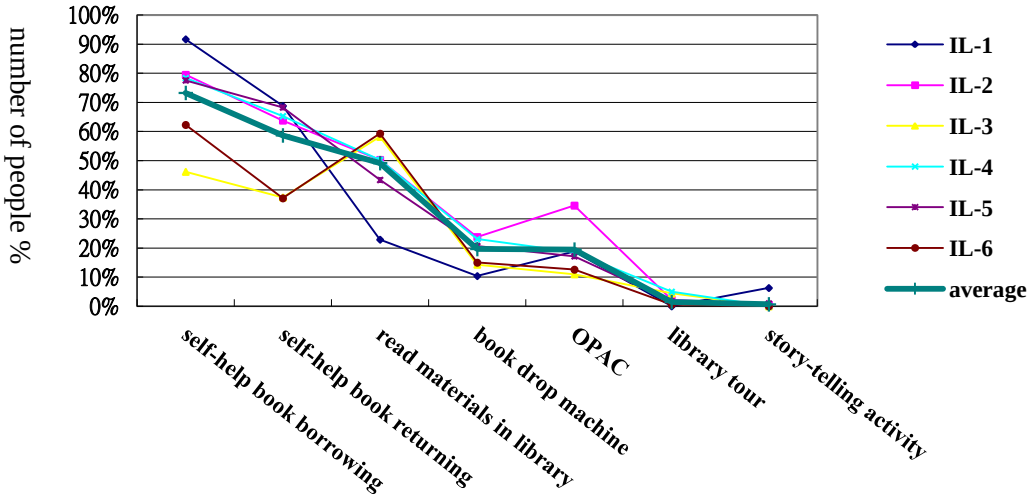

Fig.5 Services used in Intelligent Libraries

F. Difficulties encountered in the use of Intelligent Libraries

Less than 30% of users encountered difficulties in use of each Intelligent Library (IL-1 at 27%, IL-2 25%, IL-5 19%, IL-3 16%, IL-4 13%, and IL-6 10%). Of those users that reported having difficulties when using Intelligent Libraries, more than half reported 'couldn't find

needed books' in IL-2 (52%). There was a higher ratio for 'failure to borrow and return books through self-check machine' in IL-1, of the remaining five Intelligent Libraries the most commonly reported difficulty was 'failure to find needed books'.

G. Awareness of Intelligent libraries

Respondents report that they mainly became aware of Intelligent Libraries because they passed by and knew – response ranked in order: IL-6 (75%), IL-3 (70%), IL-4 (60%) and IL-2 (54%). Users at IL-1 became aware mainly through the TPL website (45%) and also through passing by (39%). Users at IL-5 became aware of the service through their friends, classmates, colleagues and neighbours (40%) and also through family members (30%).

H. Relationship between using Intelligent Library and reading frequency

Users of the six Intelligent Libraries most commonly reported that using the service increased their reading frequency (more than 90% for all), satisfied their requirements for convenient to access library services (more than 80% for all), and changed their ways and habits of acquiring books (more than 70% for all).

（2）Satisfaction of Intelligent Libraries

A. Overall satisfaction

Overall satisfaction with the six Intelligent Libraries was between "no comments" and "satisfied" (3.93), in which IL-5 was the highest satisfaction(4.05) and IL-3 in the second place(4.04), meaning both reached satisfaction and the remaining four were between "no comments" and "satisfied" - score in ranked order: IL-1 (3.96), IL-4 (3.87), IL-6 (3.83) and IL-2 (3.82).

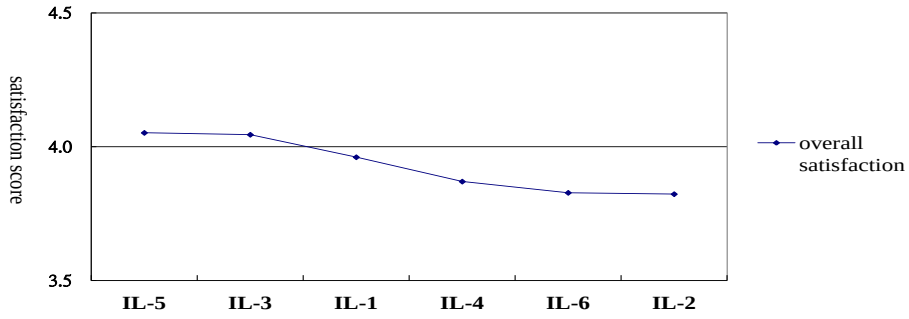

Fig.6 Overall satisfaction of Intelligent Libraries

B. Satisfaction in all aspects

Overall, users of Intelligent Libraries were most satisfied with the 'spatial environment' (4.20). The second highest satisfaction rating was for 'entrance/exit gate' (4.16), and then in

ranked order: ‘self-check machine’ (4.04), ‘self-help book drop’ (3.88), ‘OPAC computer’ (3.84), ‘service hotline’ (3.73) and ‘library collection’ (3.65).

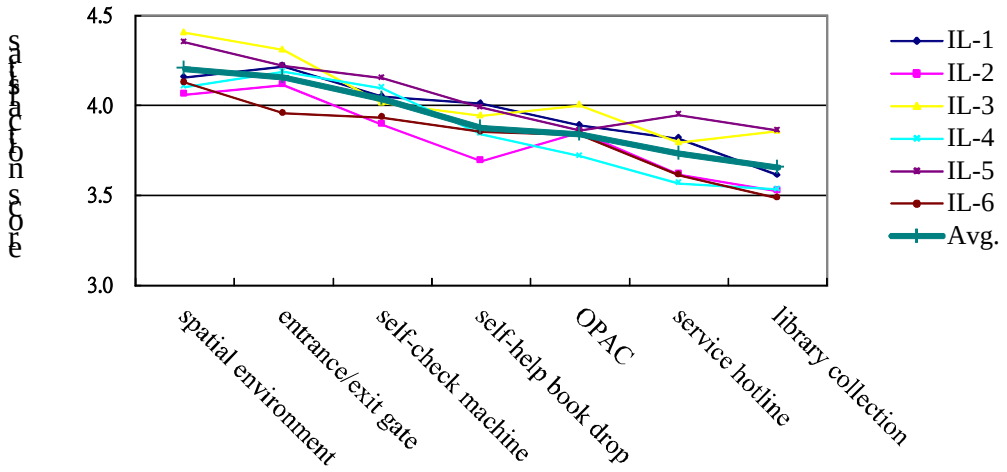

Fig.7 Satisfaction of Intelligent Libraries in all aspects

（3）Expectations for Intelligent Libraries

A. Collection improvements by subject or category:

Overall, at the six Intelligent Libraries 53% of users want more ‘bestsellers’ in the collection.

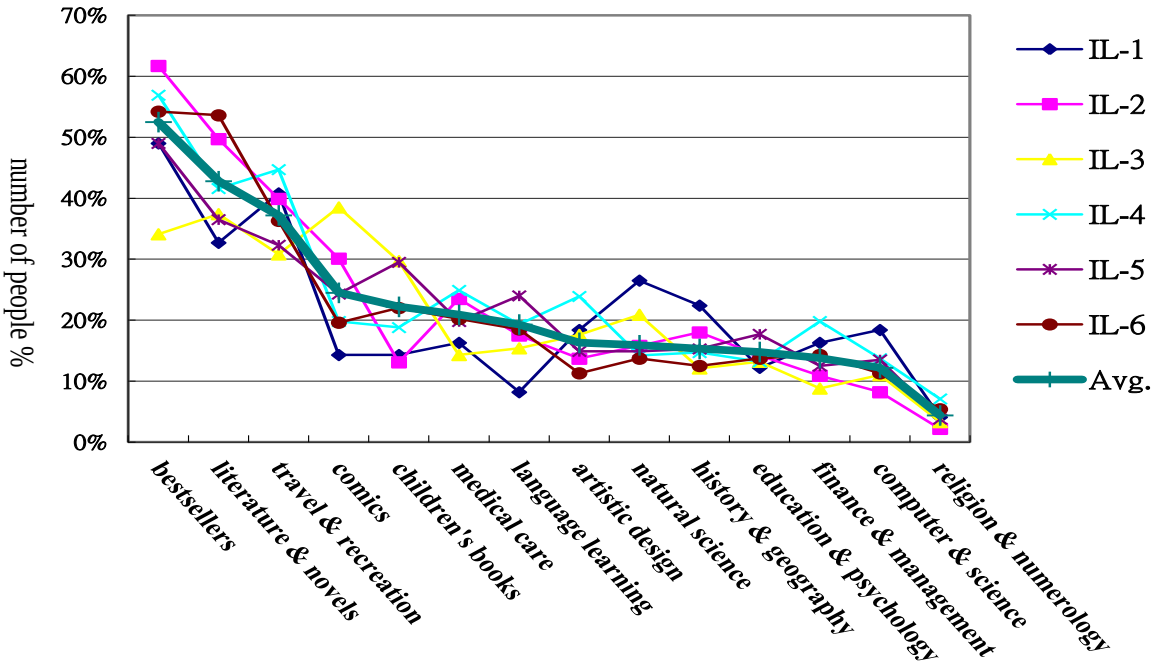

Fig.8 Collection subjects or categories for improvement at Intelligent Libraries.

B. Additional locations expected to set up intelligent libraries

Overall, respondents want additional Intelligent Libraries established at MRT stations (69%), other favourable locations reported were shopping centers, community activity centers, parks and railway stations.

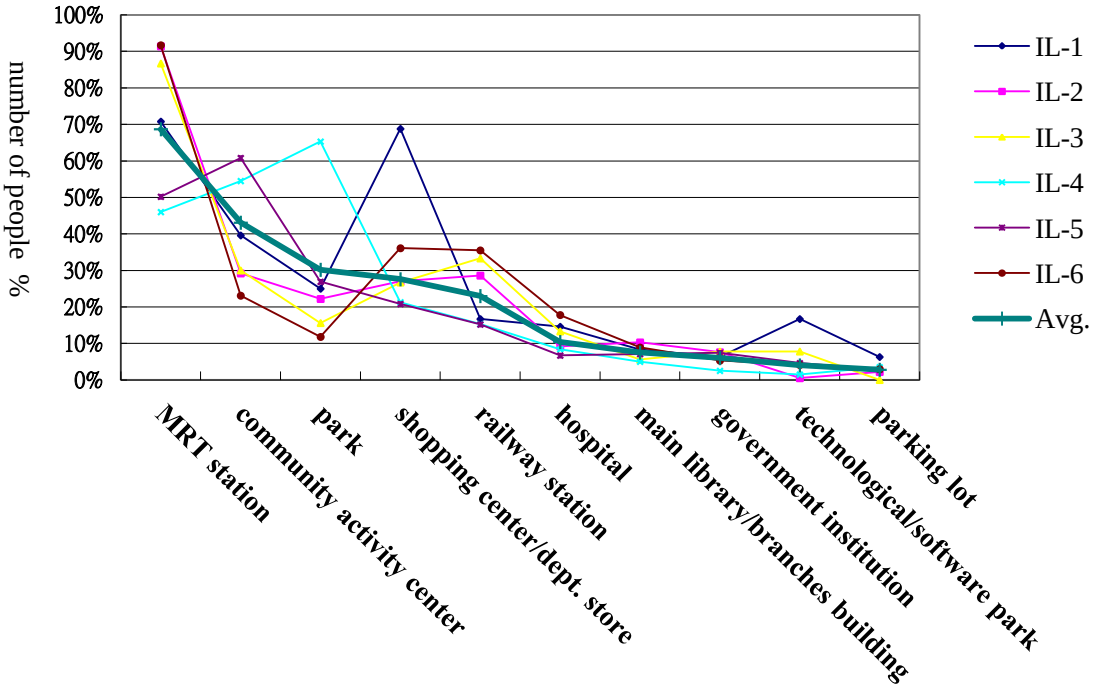

Fig.9 Additional locations wanted for establishment of Intelligent Libraries

3. Questionnaire analysis for "Assessment of the Benefits of 'FastBook' Automatic Book Lending Stations"

（1）Usage of 'FastBook' stations

A. Frequency of use

Overall, most users reported they use the three 'FastBook' stations 1-3 times per month (29%). However for FB-1, users reported '1 time per 6 months' (35%), followed by '1-3 times per month' (24%).

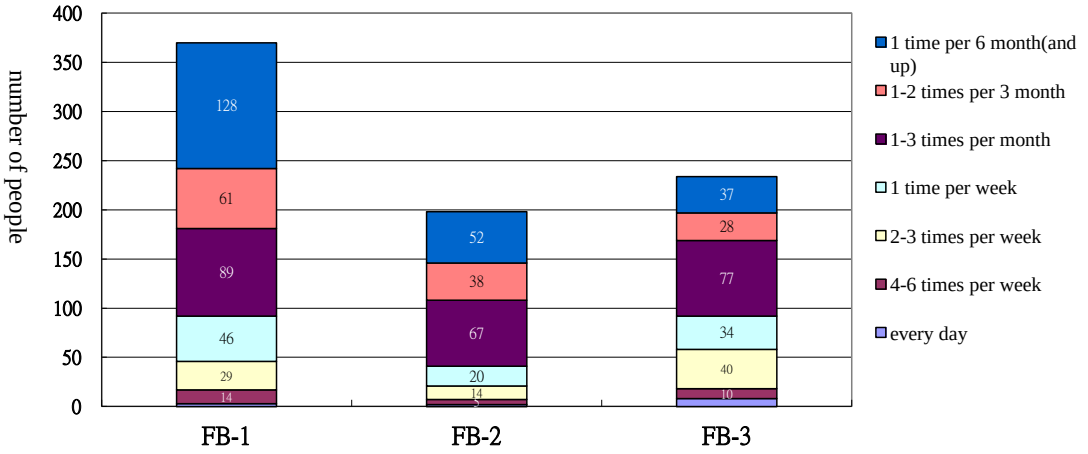

Fig.10 Frequency of use for 'FastBook' stations

B. Approaches for using 'FastBook' stations

More than half of the users of FB-1 used the 'FastBook' **station** on the way to the main library (58%); half of the users of FB-2 used the station when commuting (50%). With FB-3, 42% of users were employees of city government and used the station as it was nearby, the second highest use reported was when commuting (25%) and the general public used this station when visiting city government on business (24%).

C. Reasons of using 'FastBook' Stations

65% of users considered the 'convenient locations' of the three 'FastBook' stations as the main reason for use, the second highest reason was 'service hours meet requirements.'

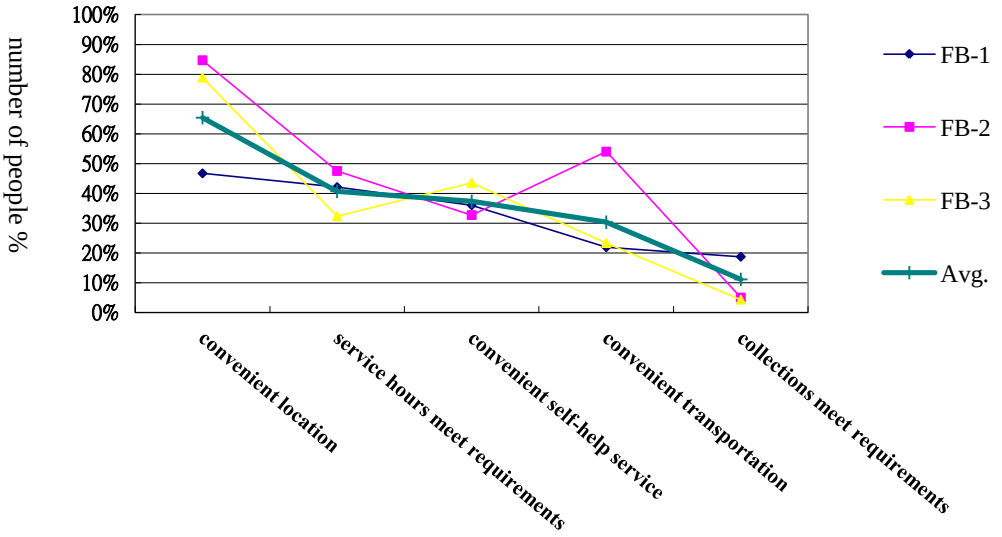

Fig.11 Reasons of using 'FastBook' stations

D. Services used at 'FastBook' stations

More than 80% of respondents used the three 'FastBook' stations to borrow books. The second highest use was to return books. Use rate for returning books was 80% (FB-2 and FB-3) and 54% (FB-1), respectively. The lowest used service was 'book renewal' at less than 20%.

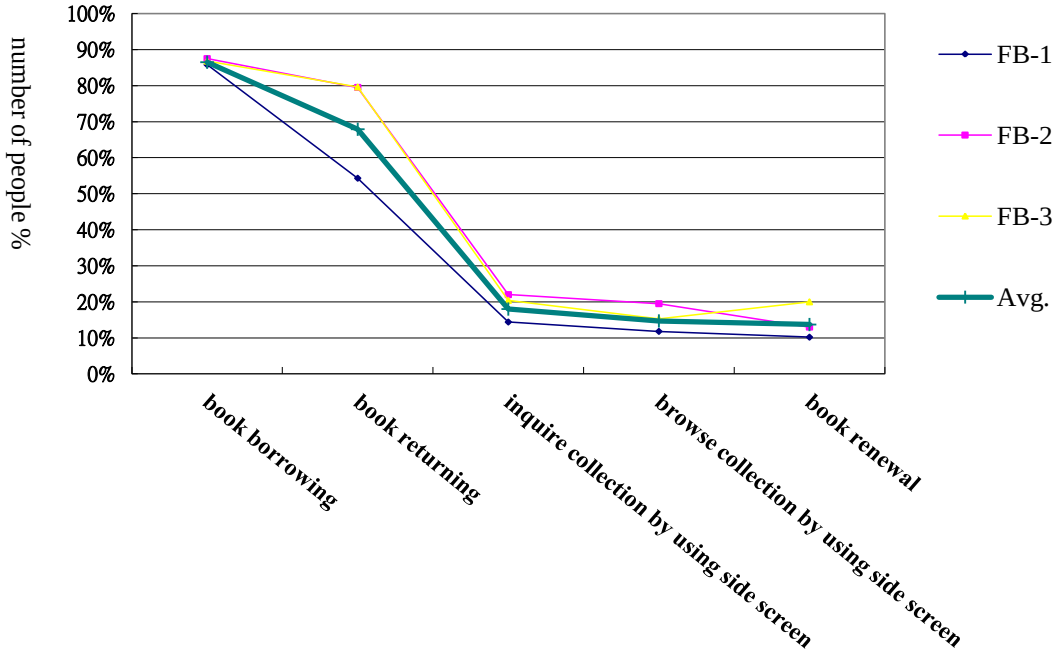

Fig.12 Services used at 'FastBook' stations

E. Difficulties encountered in the use of 'FastBook' stations

Less than 40% of users reported they had difficulties in using 'FastBook' stations (FB-2 32%; FB-1 30%; FB-3 15%). More than half of the users reported they had no difficulty. The issue most encountered by users was that they 'were not familiar with operation of machine' at FB-1 (40%), for the other stations the reason was mostly 'machine breakdown - FB-2 and FB-3 (30% each).

F. Awareness of 'FastBook' stations

The majority of users of the three 'FastBook' stations reported they were aware of the service because they 'passed by and knew' (FB-2 76%, FB-3 64% and FB-1 60%).

G. Relationship between using 'FastBook' stations and reading frequency

More than half of the users of the three 'FastBook' stations recognised that by using the services they increased their reading frequency, changed their ways and habits of acquiring books and satisfied their requirements for convenient access to library services.

（2）Satisfaction with ‘FastBook’ stations

A. Overall satisfaction

Overall satisfaction with the three ‘FastBook’ stations was between “no comments” and “satisfied.” In ranked order of highest to lowest satisfaction: FB-3 (3.95), FB-2 (3.93) and FB-1 (3.81).

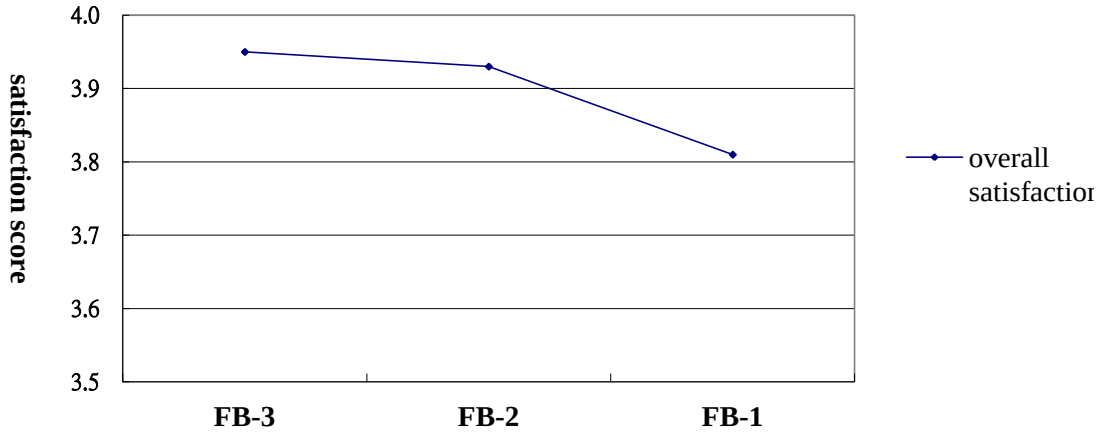

Fig.13 Overall satisfaction with ‘FastBook’ stations

B. Satisfaction in all aspects

As a whole, users were most satisfied with the locations of ‘FastBook’ stations (4.16), the second highest satisfaction was with the borrowing/returning system (4.05 each), and then in order of satisfaction: renewal function (3.85), side screen for browsing (3.83), side screen for inquiry (3.72), collections (3.71) and service hotline (3.65).

（3）Expectations for ‘FastBook’ stations

A. Collection improvements by subject or category

On average, 61% of users want increased ‘bestsellers’ at the three ‘FastBook’ stations.

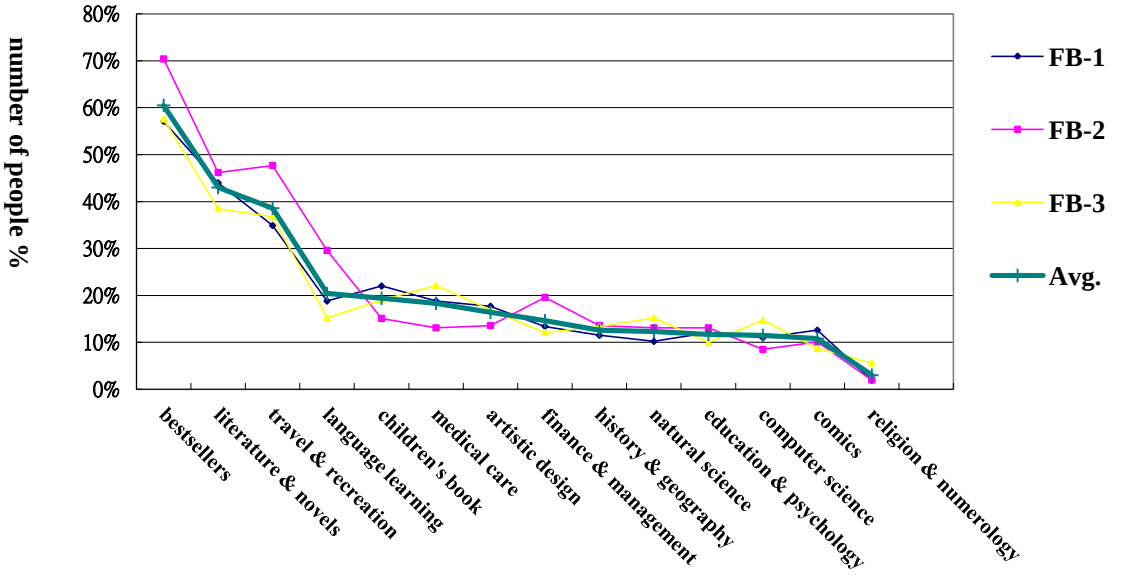

Fig.14 Collection subjects or categories for improvement at 'FastBook' stations

B. Additional locations wanted for 'FastBook' stations

Up to 81% of users of the three 'FastBook' stations want additional stations established with most wanting them at MRT stations. Other favourable locations were railway stations, shopping centers and government institutions.

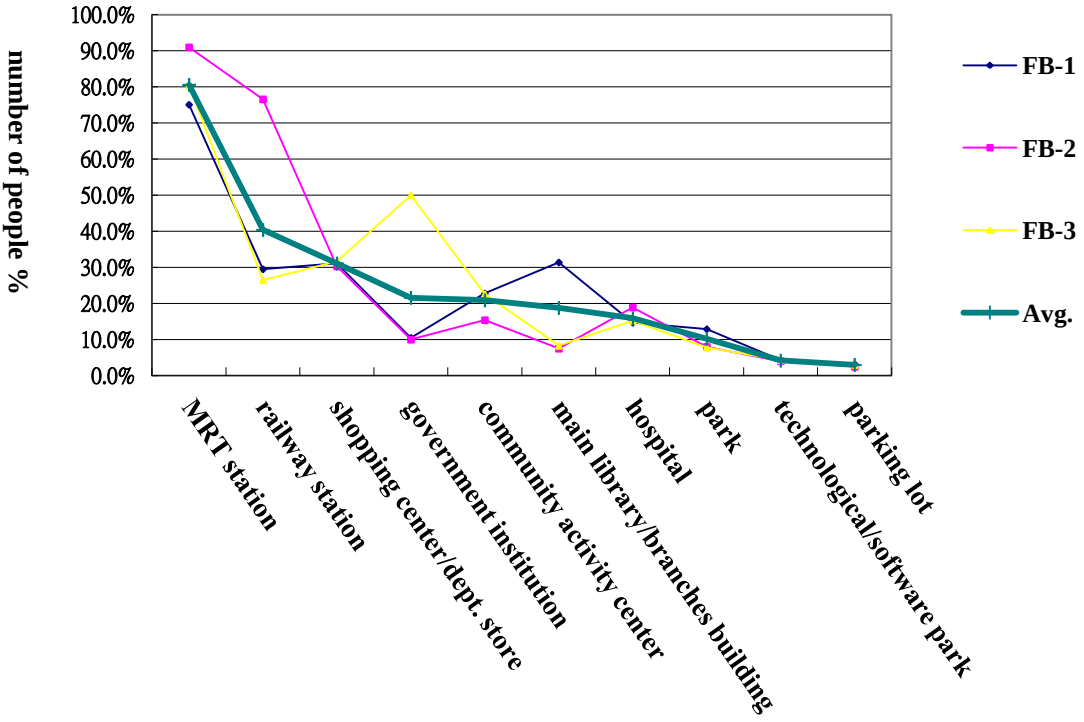

Fig.15 Additional locations wanted for 'FastBook' stations

Conclusions

This study aimed to explore usage as well as users' satisfaction and expectations of Taipei Public Library's six Intelligent Libraries and three 'FastBook' Automatic Book Lending Stations. The following is a summary of the important conclusions based on the analysis of the usage statistics and questionnaire research results:

1. Usage of Intelligent Libraries (IL) and 'FastBook' stations

（1）Average book borrowing person-time of IL and 'FastBook' stations is similar, between 1,000-2,000 person-times per month.

（2） Book borrowing quantity from IL-5 (Bailing IL) and IL-4 (Solar Library and Energy-Optimized House) are at the top two; FB-1 (The main library's 'FastBook') is the highest.

（3）Each IL and 'FastBook 'station has different peak periods - depending on the characteristics of the set location and reader profile.

（4）Females borrow more books and males from IL and 'FastBook' stations.

（5）Users aged 41-50 have the highest book borrowing quantity from IL and 'FastBook' stations, followed by users aged 31-40.

（6）The most popular category of books borrowed from IL and 'FastBook' stations is 'Language and literature.'

（7）Average borrowing rate (turnover rate) of the collection is IL 4.2 times; and from 'FastBook' stations it is 10.4 times.

2. Usage behaviours of Intelligent Libraries (IL) and 'FastBook' stations

（1）Frequency of using IL and 'FastBook' stations is mostly 1-3 times per month.

（2）Approach for using IL and 'FastBook' stations varies depending on the characteristics of the set location, for example, more people use the locations in MRT stations and railway stations when commuting.

（3）The main reason for using IL and 'FastBook' stations is their 'convenient location'.

（4）User's length of stay in IL is mostly 11 minutes to 1hour.

（5）The main purpose of using IL and 'FastBook' stations is 'book borrowing.'

（6）Users mainly look for needed books by direct shelf browsing in IL and 'FastBook' stations.

（7）Less than 40% of the users had difficulties in use of IL and 'FastBook' stations. The main difficulty reported for IL is 'cannot find needed books'; whereas in 'FastBook' stations it is 'machine is unavailable due to breakdown.'

（8）The channel for becoming aware of IL and ‘FastBook’ stations is mostly that users ‘passed by and knew.’

（9）More than 50% of the users recognized that using IL and ‘FastBook’ stations can increase their reading frequency, change their ways and habits of acquiring books and satisfy their requirements for convenient access to library services.

3. Users’ satisfaction, expectations and suggestions for Intelligent Libraries (IL) and ‘FastBook’ stations

（1）Average overall satisfaction of IL is similar to that of the ‘FastBook’ stations, which is between “no comments” and “satisfied”.

（2）Satisfaction at IL-5 (Bailing IL) and IL-3 (Songshan Airport IL) are highest, between “satisfied” and “very satisfied”; overall satisfaction of FB-3 (Taipei City Hall FastBook) is the highest.

（3）Satisfaction with different aspects between IL and ‘FastBook’ stations varies - it may be higher or lower.

（4）The majority of users want additional IL and‘FastBook’stations at MRT stations.

（5）The majority of users want increased bestseller books in IL and ‘FastBook’ stations.

（6）Users expect that IL and ‘FastBook’ stations can provide the service of taking reserved books.

（7）Users want improved book shelving at IL to reduce the situation of being unable to find needed books.

（8）Users expect that ‘FastBook’ stations have the functionality to support online inquiry of personal borrowing records.

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