

# A Study of Institutional Repository Service Quality and Users' Loyalty to College Libraries in Taiwan: The Mediating & Moderating Effects

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## Abstract

*The evolution of information technologies has produced changes in learning, creating ubiquitous learning. This paper presents a case study on institutional repository service quality and users' loyalty to College Libraries in Taiwan.*

*Hierarchical regression analysis was used to test the hypotheses. (1) Institutional repository service quality has a direct positive prediction on users' loyalty. (2) Institutional repository service quality has an indirect positive prediction, through the mediation effects of user satisfaction on user loyalty. (3) Users' perceived value has a moderating effect between user satisfaction and user loyalty.*

**Keywords:** *Institutional repository, Service quality, User satisfaction, Loyalty, Perceived value*

## 1. Introduction

The university library has such important tasks as supporting teachers and students in teaching, researching, learning and promotion. The global development of the Internet has changed information generation, transmission and use. Students are able to learn at home or in the research laboratory, no longer limited to physical libraries. Cyberspace allows omnipresent learning.

Institutional repository (called IR) is a typical learning system, a mechanism to preserve and use institution research output. Research output such as journals, papers, research reports, slides and teaching materials are preserved using digital methods, creating a network platform that provides a system for searching and using full-text documents. It can be said that a search engine does not replace the main content output of a particular organization, but adds a conduit to access researched materials as in [1]. The Taiwan Ministry of Education commissioned National Taiwan University Library to plan "Building academic institutional achievement repository program" to build a platform for Taiwan academic institutional repository (called TAIR) to assist Taiwan's universities and colleges to build their IR systems.

This research adopted the mediating and moderating effects to investigate the relationship between institutional repository service quality and users' loyalty to College Libraries in Taiwan, and hope to enhance practical skills and satisfaction of College students. The remainder of this paper is organized as follows. In the next section, we give a brief of literature review. We present the research methods in section 3. In section 4, the research results of the proposed scheme are stated. And some conclusions and suggestions will be made in the last section.

## 2. Literature review

The institutional repository indicates the type of Institution collection, including the different purposes by different units usually refers to the academic outputs from the University members as in [2]. Gibbons considered that the most obvious characteristics of IR is the recorded digital content, including the different types of digital or digital entity objects, for example: text, sound, images, learning objects, data sets and so on. The most attractive feature is that materials can be preserved long-term in security, and the research results can be shared with the public without risk to the original

documents.

Reference [3] found that the IR focus is in the search, browse, long-term preservation, and interoperability with other data systems. The basic functions of IR systems include: browsing by community, general, quick, advanced search, search results display in pages, full text downloading, recording update, Metadata, supporting multi-media files in multiple languages, OAI-PMH, webpage design, indexed by search engines, user interface and so on. Reference [4] referred to related literature about several famous IR systems: DSpace, Eprints, Bepress, several foreign military IR systems, etc., and pointed out ten primary aspects of the proposed functions as follows: types of items stored in the system, brief introduction and explanation of the system, item browsing, item searching, search results, value added services, digital rights management, personalized information management, user feedback, and system lists and statistics.

IR must be able to make research, teaching and academic achievement centralized in a single system or platform, extending product visibility through easy searched from OAIster, Google, Yahoo and other search engines. This exposure greatly increases the “see level” and the chance for research to be accessed and quoted. Finally, users are allowed to understand the overall academic achievement performance of the various institutions and departments.

## 2. 1. Taiwan academic institutional repository

Taiwan Ministry of Education commissioned National Taiwan University Library to plan “Building Academic Institutional Achievement Repository Program” for three years (May 2006-July 2009). Through this platform, to take “distributed building and centralized showing” operating mechanism and copy the seed institution using the concept to help Taiwan universities and colleges build their IR systems. Using the TAIR interface browse mode, the Open Archives Initiative agreement captures metadata regularly from various Institutional NTUR systems. Figure 1 shows the TAIR interface search mode. AJAX technologies are used to capture real-time information from various Institutional NTUR systems. Figure 2 shows the browse and search full-text format for the subject queried in institution profiles. Through the Taiwan IR system (TAIR) platform, Figures 3-4 show simple and advanced browsing and searching for institution, academic, author, title, date and other items as in [5].

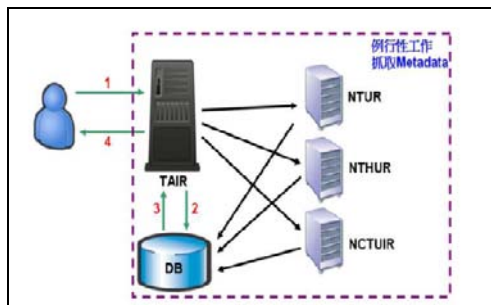


Figure 1. TAIR browse mode

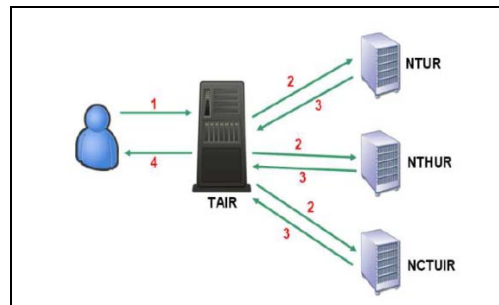


Figure 2. TAIR search mode



Figure 3. TAIR homepage

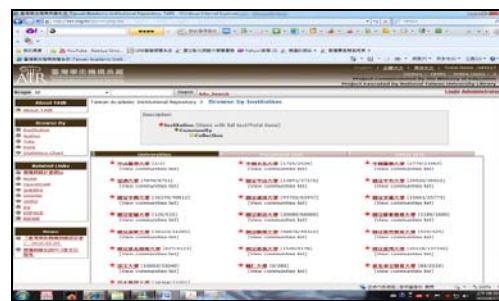


Figure 4. TAIR homepage-institution

## 2. 2. HIT academic institutional repository

The main content of the academic institutional repository is closely related to the academic outputs by staff and students from colleges, such as dissertations, journals, papers, technical reports, research projects, cooperating cases, creation, invention, patents and student projects. Hsiuping Institute of Technology (HIT) actively developed the digital repository with campus characteristics, including: (1) Teachers' teaching experience, research inventions, technology development and industry-university cooperative performance. (2) The results of student practical monograph, to heritage and highlight technical and vocational educational effectiveness. (3) The development of Division characteristics and overall performance and results. (4) Various seminars, lectures of experts, academic and cultural activities' records.

In 2007, HIT became a seed institution of National Taiwan University "IR30 Plan" and counsel six around institutions to build their IR systems, central Taiwan's academic achievements and retrieval platform. HIT students could view and search simple and advanced data through Institutional Repository home page, titles, authors, journals, etc, as shown in Figures 5-8.



Figure 5. HITIR homepage

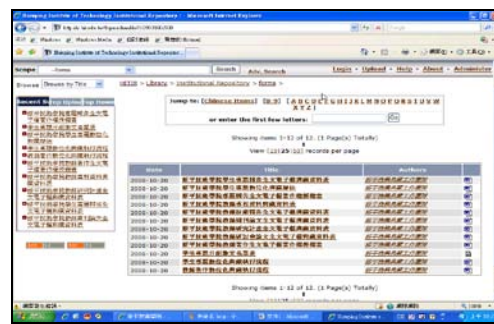


Figure 6. HITIR homepage - titles



Figure 7. HITIR homepage - authors



Figure 8. HITIR homepage - journals

## 3. Research methods

In this section, we discussed with research hypotheses, research framework, and research subject and research assessment.

### 3. 1. Research hypotheses

#### 3. 1. 1. Relationship between service quality and users' loyalty

Reference [6] pointed out that service quality would affect individual's consumptive behavior, that is, the relation between service quality and customer loyalty is highly relevant. Similarly, Reference [7] found that the service quality could affect the frequency of library resource use. References [8]-[9] confirmed that service quality and user loyalty has a positive relationship. Institutional repository library service quality is defined as users' subjective comments that the average score between

importance and satisfaction items on the institutional repository service quality survey. The first hypothesis was proposed as follows:

H<sub>1</sub>: Institutional repository service quality has a positive impact on users' loyalty.

### 3. 1. 2. The mediating effect of users' satisfaction

Service quality had a significant positive effect on users' loyalty; references [7] - [9] revealed that there is a positive relationship between user satisfaction and loyalty. To investigate whether the service quality and users' relationship is more well-defined through users' satisfaction, the second hypothesis was proposed as follows:

H<sub>2</sub>: Institutional repository service quality has an indirect positive impact, through the mediation effects of users' satisfaction on users' loyalty.

### 3. 1. 3. The moderating effect of perceived value

Users' satisfaction affected users' loyalty. To explore whether the moderating effect of perceived value enhances or weakens users' loyalty, the third hypothesis was proposed as follows:

H<sub>3</sub>: Perceived value has a moderating effect between user satisfaction and loyalty.

## 3. 2. Research framework

Based on the research objectives and the literature review, we developed this conceptual framework, as illustrated in Figure 9.

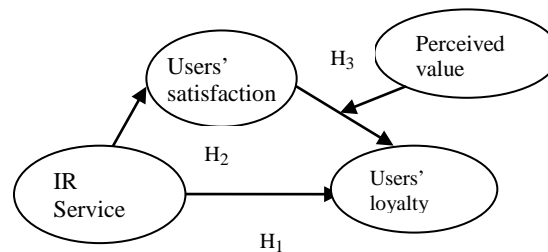


Figure 9. Research framework

## 3. 3. Research subject

Practical project, the characteristic course, is to enable students to integrate theory and practice based on learned knowledge and skills at college. The research subjects in this study were senior students in the Day Division of Engineering at HIT, including Department of Electronic Engineering, Department of Electrical Engineering, Department of Industrial Engineering and Management, Department of Chemical Engineering and Department of Mechanical Engineering. We totally issued 112 questionnaires with purposive sampling method, 110 questionnaires were received. After eliminating inappropriate samples, there were 83 valid ones, and the valid response rate was 75%.

## 3. 4. Research assessment

This research was based on relative theories, the main reference was as in [9]-[10] evaluation index of E-Service quality in Technological University Libraries, and modified the research assessment of service quality indicators after had discussed with librarian, leaders, scholars and experts.

## 4. Research results

After collecting the data, the SPSS v.12.0 was used to evaluate statistics and analyze data. Statistic

methods used included descriptive statistics, reliability analysis, correlation analysis, and regression analysis.

#### 4. 1. Reliability

In general, reliability refers to correctness and precision of measurement instruments. As for consistency, it refers to the consistency of reliability. We used Cronbach's  $\alpha$  coefficient as consistent measurement of the internal consistency of questionnaire items. This study also used this method to test the consistent extent of questionnaire completion. According to Tables 1-5, all reliability is above 0.7. Therefore, measurement items have very good internal consistency and correctness as approved in [11].

**Table 1.** The reliability of service quality total scale (emphasis)

	Corrected Item-Total Correlation	Cronbach's $\alpha$ if Item Deleted	Alpha value
1. How well is the IR website designed?	.725	.942	
2. How well is the IR website framework arranged?	.756	.941	
3. How easy to navigate is the IR website?	.759	.941	
4. How often is the content of IR website updated?	.719	.942	
5. How user-friendly is the IR website design?	.775	.941	
6. How easy to use is the catalog query system of IR website?	.697	.943	
7. How helpful to users is the IR website in collecting academic materials?	.606	.945	
8. How handy is IR website connected and used off campus?	.768	.941	
9. How fluent is the IR website around the clock?	.719	.942	
10. How is the availability in downloading full papers via the IR website?	.606	.945	
11. How affluent is IR website digital database?	.788	.940	
12. How easy to use is the IR digital database?	.757	.941	
13. How accessible is the IR digital database?	.765	.941	
14. How extensive can the IR digital resources satisfy academic demands?	.718	.942	
Total (N=83)			.946

**Table 2.** The reliability of service quality total scale (satisfaction)

	Corrected Item-Total Correlation	Cronbach's $\alpha$ if Item Deleted	Alpha value
1. How well is the IR website designed?	.772	.953	
2. How well is the IR website framework arranged?	.782	.952	
3. How easy to navigate is the IR website?	.727	.953	
4. How often is the content of IR website updated?	.756	.953	
5. How user-friendly is the IR website design?	.764	.953	
6. How easy to use is the catalog query system of IR website?	.787	.952	
7. How helpful to users is the IR website in collecting academic materials?	.676	.955	
8. How handy is IR website connected and used off campus?	.794	.952	
9. How fluent is the IR website around the clock?	.828	.951	
10. How is the availability in downloading full papers via the IR website?	.651	.956	
11. How affluent is IR website digital database?	.818	.951	
12. How easy to use is the IR digital database?	.795	.952	
13. How accessible is the IR digital database?	.742	.953	
14. How extensive can the IR digital resources satisfy academic demands?	.790	.952	
Total (N=83)			.956

**Table 3.** The reliability of perceived value scale

	Corrected Item-Total Correlation	Cronbach's $\alpha$ if Item Deleted	Alpha value
1. IR digital services are important and valuable to me.	.758	.828	
2. IR digital services make me feel that it becomes easier than before.	.802	.789	
3. IR digital services are more methodical than traditional services.	.728	.858	
Total (N=83)			.876

**Table 4.** The reliability of users' satisfaction scale

	Corrected Item-Total Correlation	Cronbach's $\alpha$ if Item Deleted	Alpha value
1. The digital collections of IR are always handy.	.666	.841	
2. My experience with digital collections of IR has been pleasant.	.448	.874	
3. IR provides the digital resources I request.	.595	.850	
4. IR digital services always meet my needs.	.698	.835	
5. IR digital services have met my expectations.	.696	.836	
6. IR digital services have helped me quite a lot.	.657	.842	
7. IR digital services are very efficient.	.722	.831	
Total (N=83)			.864

**Table 5.** The reliability of users' loyalty scale

	Corrected Item-Total Correlation	Cronbach's $\alpha$ if Item Deleted	Alpha value
1. I would recommend digital services of IR to others.	.586	.830	
2. I think of IR first when I need digital services.	.681	.731	
3. It is important for me to continue to use digital services of IR	.738	.671	
Total (N=83)			.876

#### 4. 2. Validity

This study refers the relevant literature and discussions with the librarian, leaders, scholars and experts to achieve content validity. Exploratory factor analysis (EFA) was used to test the scale factor validity. The principle component method and rotated by Varimax with Kaiser Normalization method were used to extract the factor load. The number of factors extracted as the criterion for eigenvalue greater than 1.

Through factor analysis, Service quality scale extracted only one factor and the accumulative explained variance was 64.02%. The accumulative explained variance users' perceived value scale was 80.35%. The accumulative explained variance of users' satisfaction scale was 56.31%. The accumulative explained variance of users' loyalty was 73.30%.

#### 4. 3. The rank of IR service quality for emphasis and satisfaction

To understand users' perception of IR service quality, this study found that the top five emphases items on IR service quality shown in Table 6, and the top five of satisfaction about IR service quality shown in Table 7. Four overlapped top items revealed that users concerned the functions than elegance of IR. In addition, the range for mean of perceived value was 3.66 to 3.70, the range for mean of users'

satisfaction was 3.37 to 3.70, and the range for mean of users' loyalty was 3.46 to 3.72.

**Table 6.** The rank of service quality total scale (emphasis)

	Mean	Std. Deviation	rank
9. How fluent is the IR website around the clock?	3.59	0.78	1
10. How is the availability in downloading full papers via the IR website?	3.58	0.90	2
7. How helpful to users is the IR website in collecting academic materials?	3.57	0.81	3
8. How handy is IR website connected and used off campus?	3.57	0.84	3
4. How often is the content of IR website updated?	3.54	0.75	5
2. How well is the IR website framework arranged?	3.53	0.77	6
11. How affluent is IR website digital database?	3.52	0.83	7
3. How easy to navigate is the IR website?	3.51	0.76	8
6. How easy to use is the catalog query system of IR website?	3.48	0.79	9
5. How user-friendly is the IR website design?	3.47	0.83	10
14. How extensive can the IR digital resources satisfy academic demands?	3.46	0.87	11
12. How easy to use is the IR digital database?	3.45	0.83	12
13. How accessible is the IR digital database?	3.45	0.82	12
1. How well is the IR website designed?	3.42	0.72	14
Total (N=83)			

**Table 7.** The rank of service quality total scale (satisfaction)

	Mean	Std. Deviation	rank
9. How fluent is the IR website around the clock?	3.77	0.83	1
7. How helpful to users is the IR website in collecting academic materials?	3.71	0.79	2
2. How well is the IR website framework arranged?	3.65	0.85	3
8. How handy is IR website connected and used off campus?	3.64	0.88	4
10. How is the availability in downloading full papers via the IR website?	3.64	0.90	4
12. How easy to use is the IR digital database?	3.63	0.84	6
6. How easy to use is the catalog query system of IR website?	3.61	0.82	7
14. How extensive can the IR digital resources satisfy academic demands?	3.60	0.85	8
4. How often is the content of IR website updated?	3.59	0.88	9
11. How affluent is IR website digital database?	3.57	0.83	10
3. How easy to navigate is the IR website?	3.55	0.82	11
13. How accessible is the IR digital database?	3.54	0.80	12
1. How well is the IR website designed?	3.53	0.69	13
5. How user-friendly is the IR website design?	3.51	0.85	14
Total (N=83)			

#### 4. 4. Assessment of hypothesis 1

##### Hypothesis 1:

**Institutional repository service quality has a positive impact on users' loyalty.**

The results of Hierarchical regression analysis are shown in Table 8. There was a significant prediction for quality of service (antecedents) to users' loyalty (outcome variable) after controlling the basic information, the standardized coefficients  $\beta$  was .355( $p < .01$ ), (see M2). That result illustrated service quality has a significant positive effect on users' loyalty. In other words users' loyalty corresponds directly to service quality. Therefore,  $H_1$  was accepted.

#### 4. 5. Assessment of hypothesis 2

##### Hypothesis 2:

**Users' satisfaction had mediating effect between service quality and users' loyalty.**

Reference [12] proposed the mediating effect of three conditions: First, antecedents have a significant predictive effect on mediator. Second, antecedents have significant predictive effect on outcome variables. Third, mediator has significant predictive effect outcome variables, but the antecedents' will be decreased while both joined simultaneously the regression model. If there is a

decline, the antecedents no longer have a significant predictive effect. One outcome variable which claimed "complete mediation" and antecedents have still significant predictive effect on outcome variables, as "partial mediation" as in [13].

Hierarchical regression analysis was utilized to examine the mediating relation as shown in Table 8. That result illustrated: Service quality (antecedents) have significant predictive power on user satisfaction (mediator), standardized coefficients  $\beta$  was .315 ( $p < .01$ ), corresponded with the first condition (see M1). Second, service quality (antecedents) have significant predictive power on users' loyalty (outcome variable), standardized coefficients  $\beta$  was .355 ( $p < .01$ ), corresponded with the second condition (see M2). Third, According to the mediating effect, found that users' satisfaction has a significant predictive power on users' loyalty ( $\beta = .656$ ,  $p < .01$ ), but service quality becomes non-significant for prediction, ( $\beta = .148$ , n.s.) (see M3). The third condition holds. From this perspective, users' satisfaction had complete mediating effect between service quality and users' loyalty.  $H_2$  was accepted.

**Table 8.** Hierarchical regression analysis: the mediating effect

	Users' satisfaction	Users' loyalty	
	M1	M2	M3
<b>control variables</b>			
gender	.082	-.040	-.040
( $\Delta R^2$ )	(.007)	(.002)	(.002)
<b>antecedents/moderator</b>			
service quality	.315**	.355**	.148
users' satisfaction			.656**
( $\Delta R^2$ )	(.096)**	(.122)**	(.508)**
$R^2$	.103	.124	.510
adjusted $R^2$	.081	.102	.491
F	4.596**	5.661*	27.403**

\*  $p < .05$ ; \*\*  $p < .01$ ; 2-tailed significance

#### 4. 6. Assessment of hypothesis 3

##### Hypothesis3:

**The perceived value had moderating effect between users' satisfaction and loyalty.**

To verify the moderating effect, this study adopted research program as in [12]: First, the input control variables, next to antecedents, moderator and interaction variables to predict outcome variables. However, in order to avoid the collinear problem, this study referred to Aiken and West method as in [14]. The antecedents and moderator were standardized and the average conversion through linear shift is 0 (centered to means). The product was then calculated. There is a significant moderating effect if the interaction variables have significant predictive power on the outcome variables.

In turn, gender, users' satisfaction, users' satisfaction, perceived value and users' satisfaction  $\times$  perceived value were invested in regression model, to predict users' loyalty shown in Table 9. The Hierarchical regression analysis results showed that the interaction of users' satisfaction and perceived value has a significant predictive effect ( $\beta = .173$ ,  $p < .05$ ) on user loyalty. Therefore, the perceived value had a significant moderating effect between user satisfaction and loyalty. In order to confirm the interaction effect patterns whether as originally expected, this study refer to Aiken and West (as in [14]) approach, the mean values of the users' satisfaction (antecedents) and perceived value (moderator) plus or minus one standard deviation were taken into the regression model as equation(1)

$$\text{User loyalty} = \beta_0 + \text{gender} \times \beta_1 + Z \text{ scores of users' satisfaction} \times \beta_2 + Z \text{ scores of perceived value} \times \beta_3 + Z \text{ scores of users' satisfaction} \times Z \text{ scores of perceived value} \times \beta_4 \dots\dots\dots(1)$$

To understand whether the moderator effect is expected as in the original assumptions, this study calculated the average Z score (0) of Z scores of users' satisfaction and Z scores of perceived value plus or minus one standard deviation ( $\pm 1$ ), which will be (-1, -1), (1, -1), (-1, 1) and (1, 1) into the regression model, there were four combinations, then control variables (gender) were substituted into

average value. So there were four predictive values for users' loyalty, that is 9.25 (lower users' satisfaction, lower perceived value), 10.98 (higher users' satisfaction, lower perceived value), 9.9 (lower users' satisfaction, higher perceived value) and 12.39 (higher users' satisfaction, higher perceived value). The lower perceived value of two points (9.25 and 10.98) can be drawn into one line together and similarly higher perceived value of two points (9.9 and 12.39) can be drawn into one line together. Figure 10 depicts that there was a stronger positive relationship between users' satisfaction and users' loyalty if perceived value is higher, but there were weaker positive relationship between users' satisfaction and users' loyalty if perceived value is lower, consistent with the original expected, H<sub>3</sub> was accepted.

**Table 9.** Hierarchical regression analysis: the moderating effect

	users' loyalty			
	M1	M2	M3	M4
<b>control variables</b>				
gender	-.04	-.098	-.085	-.105
<b>antecedents</b>				
users' satisfaction		.702**	.523**	.528**
<b>moderator</b>				
perceived value			.240**	.259*
<b>interaction items</b>				
users' satisfaction × perceived value				.173*
( $\Delta R^2$ )	(.002)	(.491)**	(.516)**	(.545)**
$R^2$	.002	.491	.516	.545
adjusted $R^2$	-.011	.478	.498	.522
F	.131	38.532**	28.107**	23.374**

\* p<.05; \*\*p<.01; 2-tailed significance



**Figure 10.** The moderating effects of perceived value between users' satisfaction and users' loyalty

Regardless whether a higher or lower perceived value, user satisfaction has positive effects on user loyalty, and user loyalty has a higher perceived value than those with lower perceived value. In the lower user satisfaction situation, user loyalty differences between higher and lower perceived value was not significant. However, there were obvious differences in the higher user satisfaction situation, as shown in Figure10. In sum, the results showed in higher user satisfaction situation, higher perceived value has significantly increased influence on user loyalty.

## 5. Conclusions and suggestions

This study proposed hypotheses and verified the relationship and effects among IR service quality, perceived value, users' satisfaction and users' loyalty. The authors tested whether IR service quality is conducive to user loyalty and whether there were mediating effect caused by user satisfaction, and moderating effect by perceived value.

### 5. 1. Conclusions

The following summary is divided into three parts: the main effect, mediating effect, and moderating effect.

### **5. 1. 1. The main effect**

The results showed that IR service quality has a significant positive effect on user loyalty ( $\beta=.355^{**}$ ). This means that when users feel more obvious IR service quality, their loyalty is more intense for IR. The results generally are consistent with references [8]-[10] and [15]. It will increase students learning effect if library often encourage them to use IR service, so library enhance IR service quality, students will increase re-use IR wish.

### **5. 1. 2. The mediating effect**

IR service quality has a significant positive prediction on users' loyalty ( $\beta=.355^{**}$ ), however, the forecast of IR service quality on user loyalty declined when a mediator was added. Non-significant ( $\beta=.148$ ), then users' satisfaction has a significant positive prediction ( $\beta=.656^{**}$ ) on users' loyalty, indicating that user satisfaction had a mediating effect between service quality and user loyalty.

### **5. 1. 3. The moderating effect**

The results show that perceived value had a moderating effect between user satisfaction and loyalty. The higher the user satisfaction, the higher user loyalty if the perceived value is high. Conversely, the lower the user satisfaction, the lower the user loyalty if the perceived value is low. Therefore, if the library made users understand the utility and convenience of IR digital services, user loyalty can be increased.

## **5. 2. Suggestions**

The following summary is divided into three parts: the IR equipment, promotion for IR, and further research.

### **5. 2. 1. IR equipment**

Owing to the rapid development of mobile devices, there is more interface link to institutional repository platform. For example, computer, mobile phone, etc. However, users' convenience will decide their intention whether to re-use or not. Therefore, it will be the key factor that the function and transmission pattern of entering to use institutional repository.

### **5. 2. 2. Promotion for IR**

As users' perceived value could moderate effect between users' satisfaction and loyalty, it is important that how to increase user' perceived value using promotion for institutional repository. For example, teacher's announcements, students' word of mouth, relative activity and relative race, etc.

### **5. 2. 3. Further research**

In this study, the research subjects were senior students from Division of Engineering of HIT. The findings and results are not suggested to be applied or generalized to students from other Divisions or other colleges. Thus, a more in depth and large-scale research in the future is needed.

Previous research [15] has supported that service quality is a potential predictor for user loyalty. The results from this study show that IR service quality had a direct positive prediction for user loyalty. Although user satisfaction completes mediation effects, IR service quality had an indirect positive prediction. Thus, this is a serious issue for libraries to increase user satisfaction in the future.

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