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Factors affecting users' assessment of the economic value of university library services

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Abstract

Assessing the economic value of academic libraries has emerged as a new approach to the evaluation of library services. Using contingent valuation methods, we collected willingness to pay amounts for five different library services from users at four universities in Korea. Based on past research and the results from a preliminary survey at two institutions, we formulated five hypotheses that tested the efficacy of the factors predicting variations in willingness to pay values. The results indicate that university characteristics such as the type of institutions (public vs. private) and core mission (research vs. instruction) did not seem to affect differences in the service value assessments. The presence of payment cards in the data collection also did not seem to give variability in willingness to pay values. The only factor that seemed to affect these values turned out to be users' status: faculty members consistently assigned higher amounts than students. For economic valuation methods to be fully appreciated, we need reliable data collection methodologies and more systematic approaches to the factors affecting value assessments. This study is still in its infancy due to the small scope of participating institutions and users; however, this is just a first step towards the proper economic evaluation of library services.

Keywords

Academic libraries, CVM (contingent valuation method), economic value, evaluation, WTP (willingness to pay)

Introduction

The demand for evaluation methods of university libraries has resulted from the fact that universities are being recognized as an important economic asset of national competitiveness. This realization has led to an attempt to verify the effectiveness of investment in higher education, and university libraries also have had a chance to reconsider and promote the importance of their existence to their universities. The objective of this study is to demonstrate in concrete terms the economic value of a library to the institution as a whole.

Another main factor for the demand for university library valuation has been due to the changes in the information environment and the user environment. Nowadays, users show a tendency to prefer free information that is easily accessible and handy rather than information that is reliable and of high quality. In this status quo, valuation of the university library has become a way for libraries to prove their value as an asset to the university.

In an attempt to gather information about university libraries' values, Donovan(1996) targeted Tulane University's

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law students, Wong and Webb (2011) studied the students of a university (in Hong Kong), and De Jager (2002) worked with Capetown University's humanities students about the relationship between the amount of the library's resources that were borrowed and how well students studied. In similar studies, Whitmire (2002) researched the effect of a university library's resources and services on undergraduates' critical thinking abilities, while Matthews (2007) and Munde and Marks (2009) investigated service factors that had a positive influence on university libraries and their contributions. These studies quantitatively analyzed the grounds and the degree to which libraries contributed to their universities, but they did not attempt to analyze the economic value of libraries.

Research on the services provided by university libraries from an economic standpoint was conducted regarding reference services and collection services. Studies that converted reference services to labor value began in 1980 by Cable (1980) and have been continued by Kantor (1986), Abels (1997), and Kantor et al. (1995). Studies regarding the utility value of collection services have taken place in two directions. One is by measuring the time value. The study by King et al. (2004) assessed the hours of use of academic journals as a time value. The study by Tenopir and King (2007) assessed the value of time reduction by comparing the average usage time with cases done with and without journal collection.

The other direction is one that focuses on developing a quantitative measure of the library's return on investment (ROI) by tying faculty's use of library materials to the generation of grant income. In these studies, the focus has been on linking the use of library resources to successful grant proposals, initially at the University of Illinois at Urbana-Champaign (Luther, 2008) and then at eight additional institutions worldwide (Tenopir et al., 2010).

Recently, Melo and Pires (2011) published a study that measured the economic value of the Portuguese electronic scientific information consortium called 'b-on'. In their study, the economic value of the consortium was measured in two ways: the value of the time saved by using the service and the contingent valuation method (CVM). The benefit-to-cost (B/C) ratios derived from both methods were 1.91 and 3.32, respectively. As a means of quantifying the value of the library, ROI or B/C calculations are now being extended to cover the value of all key library products and services.

The contingent valuation method is a preferred form of a technique that was designed in order to elicit value assessments from people for non-market goods and services. In CVM studies, respondents are presented with fictional situations during face-to-face or phone interviews and then asked their preferences or intentions using WTP (willingness to pay) amounts for the economic value of environmental qualities and public goods. In comparison to the revealed preference method which derives value estimates from existing, comparable, market behaviors, CVM provides both direct (in the sense that value is stated by respondents) and realistic approaches to obtaining value assessments for goods and services that do not lend themselves readily to quantification. In CVM literature, the United States (US) National Oceanic and Atmospheric Administration (NOAA)'s expert panel guidelines on contingent valuation (Arrow et al., 1993) is the most frequently cited as a source of both theoretical and practical grounding. Chung et al. (2009) conducted a meta-analysis of 42 published studies of library economic valuation and identified 28 of these studies as having used CVM. CVM has found applications in a wide range of disciplines and situations and has had more than 2000 applications up to the early 1990s (Carson et al., 1994).

The values generated between the university library services and the user are generally divided into individual services such as circulation services, reference services, space services, interlibrary loan/document delivery, user education sessions, and integrated services where respective disparate services are combined (Saracevic and Kantor, 1997). These services create various values as evidenced in reports made by the Association of College and Research Libraries (ACRL) and the Research Information Network (RIN, www.rin.ac.uk) and the Research Libraries United Kingdom (RLUK, www.rluk.ac.uk). The ACRL, which is based in the US, arranged the categories, measurement indices, and measurement factors of the contribution of university libraries to their universities in a guide book-form in *Value of Academic Libraries: A Comprehensive Research Review and Report* (Oakleaf, 2010). However, this report did not extract or examine real data or measure their economic feasibility. In the UK, RIN and RLUK (2011) published a report entitled *The Value of Libraries for Research and Researchers*. This report measured the correlation between the number of students doing research, the procurement of research funding, and the research performance evaluation of the university against the number of the library's books, staff, and budget of 67 higher education institutions in England. They also analyzed the value of services the library provided to researchers and the library's level of contribution to research performance. This report suggested a result based on empirical data, but it did not measure the values contributed to various aspects of the university by the library; its range was also limited to values provided by studies and researchers. Therefore, to measure the university library's ROI, an in-depth review of the value contributed by each service and the measurement method of that value will be required.

The purpose of this article is to explore factors that influence university library users' economic value assignments for a variety of library services. Specifically, the study investigated the effect of institutional and user

Table 1. Value measurement plan outline of university libraries.

	P University's library	Q University's library
Measurement composition	Multiple services using single measurement method	Single service using multiple measurement methods
Target service of measurement	Book lending, electronic scholarly info, reference services, user education, space provisions	Electronic scholarly information service
Measurement	CVM	CVM, time value, alternative service value
Survey respondents	Undergraduate and graduate students, professors	Graduate students, professors
Value expressions	• WTP value of university library service stated by users • ROI	• Time saved by and cost of using electronic scholarly information service • WTP value of university library service stated by users • ROI

characteristics as well as the presence of payment card information in the CVM survey on users' WTP values. To answer this question, two university libraries located in Seoul, Korea provided a setting for a preliminary survey. The hypothesis was set up based on the problems and anomalies that appeared in the preliminary survey process. To test the hypothesis, a main survey, which calculated the WTP of the users of four university libraries that differed in size, sources of funding, and locations was carried out. The data was drawn from a 12-month study on the costs and value of library services at six Korean university libraries.

Preliminary survey

Measurement method

There were two objectives for the preliminary survey. One was to analyze the factors of the value measurement of a university library and to identify any problems in the procedure and methodology, while the other was to draw a hypothesis based on the problems found and to test the practicality of measuring the value of a university library. Therefore, in this preliminary survey, we used CVM, a direct measurement method, and time value as well as an alternative service value and an indirect measurement method to measure the value of the university library services.

The value measurement targets for the preliminary survey were the libraries of P and Q private universities located in downtown Seoul (Table 1). For the P University's library, the survey measured multiple main service values with CVM. The survey asked students about their WTP values for five main services: book lending, electronic scholarly information, reference services, user education sessions, and space provision (reading room). Professors were then surveyed regarding their WTP values for lending services, electronic scholarly information, and reference services. For the Q University's library, the survey measured the value of electronic scholarly information services using three measurement methods: CVM, time value, and alternative service value. The survey asked both professors and graduate students about the number of downloads and the frequency of utilization of electronic scholarly information services and their WTP.

The survey was carried out at the university libraries' lobbies and around campuses from June to July 2011 by administering questionnaires directly to the users. For the P University's library, 249 responses (34 from professors and 215 from students) were collected including five incomplete questionnaires that were discarded. For the Q University's library, 207 were collected (including five discarded responses due to incompleteness).

P University's library value measurement

In the CVM survey for the P University library users, the survey asked respondents how much they were willing to pay in case the university charged for each service. Considering that the research was exploratory in nature, the survey chose open-ended questions as the question form, which allowed respondents to describe the value price freely rather than limiting them to multiple-choice questions. A payment card (Table 2) was presented to the respondent as a reference.

The study surveyed professors and students separately. Professors were asked about three items: book lending, full-text article download, and reference services. The study calculated the average value, the 5%-trimmed average, and the median. The 5%-trimmed average is an average calculated after cutting 5% off of both the maximum and the minimum values. The decision to use the 5% cut-off was an arbitrary and yet pragmatic one: we tried to minimize the effect of outliers in the analyses as well as to keep the raw data intact as much as possible.

In a meta-analysis of CVM research, Noonan (2003) states that the mean value is generally 1.5 times higher than the median. The means and the medians measured in this study's preliminary survey partially agreed with Noonan's work depending on the type of service, but there were cases where the mean values were two to five times

Table 2. Payment card for P University library's value measurement applying CVM.

Item	Price (Korean Won)	Price (US Dollar)*
Campus shuttle bus ticket (one-way)	250	0.22
Mobile phone recharge fee at a convenience store	1000	0.86
Transcript issuing fee	1000	0.86
A cup of Americano at the university café	2000	1.73
Monthly fee at the university health club	20,000	17.26

*The exchange rate of $1 to 1159 Won as of 31 December 31 2011.

Table 3. P University students' WTP (unit: US Dollar).

	1 Book lending	1 Journal article download	1 Reference service	1 Library use education	1-hr Reading room use	1-hr Computer use	1-hr Seminar room use	1 Movie in a cinema room
Mean	0.57	0.67	0.26	3.31	0.42	0.39	0.86	0.91
Median	0.43	0.43	0.09	0.86	0.43	0.43	0.56	0.86
5% trimmed avg.	0.48	0.51	0.22	1.39	0.36	0.36	0.73	0.81

higher than the median, so it was not feasible to draw a generalized relationship. Thus, the study uses the mean as the value price of the university library and applies it in subsequent analyses. We also present the median and the 5%-trimmed average as well when necessary.

According to the survey results, the differences among the mean, the median, and the 5%-trimmed average were not large in WTP for students, but they were for professors. There was no large difference in WTP values between undergraduate and graduate students for all service categories. However, large differences exist between students and professors regarding book-lending services (Table 3 and Table 4).

Q University's library value measurement

The survey results show that at the Q University library, the average number of recent journal article downloads (students and faculty combined) was eight, and it took about 82.7 minutes to search and download them, resulting in an average of 10.3 minutes for one journal article.

When asked about using libraries and alternative services, 53% of the respondents answered that there was no difference in hours of use. Excluding those users who have not used alternative services, for each article download from the library saves about 1.4 minutes compared to using comparable, alternative services. For this, we calculated the total sum of both the saved time by using the library (30 users for a total of 195 minutes) as well as the alternative service (19 users for a total of 42 minutes), subtracted additional time spent for the alternative service from the time saved by using the library service, and then applied the differential (1.4 minutes) to those who indicated the existence of alternative service (110 users). In the same way, the extra cost of using alternative services was calculated at 0.097 US Dollar for each article download.

In addition to obtaining opportunity cost and time for using alternative services, we also collected data regarding WTP values for downloading domestic and international journal articles using library databases for the library users at Q University. Table 5 summarizes the survey results. It shows that the stated value amounts are twice or three times larger for international journal article use.

Hypotheses development

As a result of the analysis of the data obtained in the preliminary survey, we decided to focus our attention on the following factors as the potential determinants of value manifestations for university library services: university characteristics, user characteristics, and the existence of a payment card.

The difference in university library service values according to the university's characteristics

The results of the preliminary survey indicate that value amounts can differ by institutions. The target universities of the preliminary survey were both located in the capital area, but the result of WTP measurements among professors regarding electronic scholarly information service showed that P University's professors were willing to pay on average $5.82 per one international electronic journal article while professors of Q University were willing to pay on average $2.12, which was a difference of about 300%. This finding showed that university libraries'

Table 4. P University professors' WTP (unit: US Dollar).

	1 Book lending	1 International journal article	1 Domestic journal article	1 Reference service
Mean	6.31	5.82	2.81	2.88
Median	0.65	0.43	0.13	0.04
5%-trimmed avg.	1.18	0.73	0.28	0.24

Table 5. WTP value of Q University's electronic scholarly information use (unit: US Dollar).

		N	Mean	Median	5%-trimmed avg.
WTP for a domestic journal article	Professors and researchers	35	0.70	0.43	0.58
	Graduate students	139	0.86	0.43	0.66
WTP for an international journal article	Professors and researchers	34	2.12	1.51	1.87
	Graduate students	135	1.62	0.86	1.20

value could differ depending on the university type or characteristic.

In this context, Whitmire (2002) found that a university library's effect on students comes out differently depending upon the core mission of the university, such as a research-oriented university, a doctoral course-oriented university, a collegiate university, and a liberal arts-oriented university. In addition, in the studies of Hamrick et al. (2004) and Kuh and Hu (2001), the institution type (public or private), region, or levels of urbanization were chosen as the main variables in order to analyze the relationship between the university's characteristics and the students' achievements. The main survey was set up to test the difference of values by functional attributes, which are research oriented and education oriented, as well as by the institution type, such as public and private. The hypotheses were stated as follow.

Hypothesis 1. There will be differences in WTP values between users of research-oriented universities and education-oriented universities.
Hypothesis 2. There will be differences in WTP values between users of public universities and private universities.

The difference in university library value by user characteristics

The results of the preliminary survey also indicated that the WTP of professors and students for the same service differed heavily. At the P University, the WTP for borrowing one book was \$6.31 for professors on average and \$0.57 for students, which was a difference of 10 times, and the 5%-trimmed average also showed a difference that was two times greater (\$1.18 for professors and \$0.48 for students). These findings show that there might be significant differences in WTP amounts according to user status. Accordingly, the main survey was set up to test whether the position and major of users affect the value manifestations. The hypotheses were as follows:

Hypothesis 3. There will be differences in WTP values between students and professors.
Hypothesis 4. There will be differences in WTP values by major.

The difference in values according to the existence of a payment card

In the preliminary survey, the P University's WTP regarding electronic scholarly information differed by being three times higher compared to that of Q University. We can reasonably suspect that different questioning modes might have had some impact on the stated value amounts. Specifically, we presented payment card information to the respondents at the P university library whereas such information was absent for the respondents at the Q university library. Therefore, in the main survey we intended to examine if the difference shown was influenced by the availability of a payment card.

Hypothesis 5. There will be differences in WTP values between cases where a payment card is presented and where a payment card is not presented.

Main survey

Measurement method

The main survey applied CVM in order to measure the economic value of various services of university libraries. The main survey was administered face-to-face to

Table 6. WTP for university library services (unit: US Dollar).

	Book lending	International journal article	Domestic journal article	Reference service	User education	Reading room
N	743	733	733	730	711	722
Mean	0.83	1.23	0.84	0.46	2.25	0.77
Median	0.43	0.86	0.43	0.09	0.86	0.43
5%-trimmed avg.	0.62	0.93	0.66	0.27	1.50	0.60

respondents at the respective university's library lobby and on campus for two months from October through November 2011.

Regarding the diversity of services provided by university libraries, the survey categorized the measured service targets into lending services, reference services, electronic scholarly information services, user education sessions, and facility provisions, and it allowed the respondents to state the WTP value for each service. Since the respondents had to indicate value assessments for five different services, we used a simple prompt saying, 'If you place a monetary value for the library service you are using', instead of an elaborate imaginary situation.

The question type to obtain WTP amounts was open-ended. If the questions about the five services had been the double-bounded dichotomous choice type where respondents had to go through a series of amount prompts until they settle on their desired amounts, the questions would have been too complicated and the users might have felt uncomfortable stating the value.

To simplify measurement, we used simple units of measurements such as circulation transaction for a single book, one time use of reference service, and so on. In the case of the electronic scholarly information service, the number of article downloads was used instead of the number of searches. For the selection of institutions for the survey, we used the data from Rinfo (a scholarly information statistics system) provided by the Korea Education and Research Information Service (Korea Education and Research Information Service, 2012). After sorting the universities by type and core mission, we contacted libraries to see if they were willing to cooperate in a survey where three different groups of users (professors, graduate students, and undergraduates) participated. In the end, we selected four universities (A, B, C & D) that have the following institutional characteristics:

- A – Private, research-oriented university (over 10,000 enrolled students)
- B – Public, research-oriented university (over 10,000 enrolled students)
- C – Private, education-oriented university (5000–10,000 enrolled students)
- D – Public, education-oriented university (5000–10,000 enrolled students)

The total number of valid questionnaires collected from the four universities was 758. The makeup of respondents consisted of 63% undergraduates, 18% graduate students, 15% professors, and 4% other users. The respondents' majors (academic affiliation) were 45% humanities and social sciences, 40% natural sciences and engineering, 8% college of education, 4% medical sciences, and 3% in arts/sports.

The survey was administered through face-to-face interviews by trained graduate students near libraries and several key locations at the universities. We used care, to the extent possible, in order to draw a more representative sample – for example polling students at different times of the day and different days of the week and trying to gather data from a wide range of disciplines. But the fact that the subjects were drawn from a convenience sample means the study results need to be taken with caution.

WTP regarding university library services

WTP by service. The WTP values for the main services of four university libraries (lending services, international/domestic journal article use, reference services, user education, and reading room use) are shown in Table 6.

Out of the services for which WTPs are obtained, the average WTP value for a single user education session came out as the highest at $2.25. As for the electronic periodicals, the average WTP value for one international journal article was $1.23, and one domestic journal article was $0.84, which makes the value of the international journal article one and a half times higher than that of a domestic journal article. The median WTPs are determined in readily recognizable currency units (in Korean Won) of 100 ($.09), 500 ($.43), and 1000 ($.86).

WTP by status and major. Undergraduates were willing to pay the most for user education ($1.68) and the lowest for reference services ($0.32). Graduate students were also willing to pay the highest for user education and the lowest for reference services, but the WTP appeared to be slightly higher than that of undergraduates. The average WTP value reported by professors for university library services was higher than that of both undergraduates and graduate students, which makes the WTP value for user education the highest ($5.10) and that for international journals

Table 7. WTP value for university library services by status (unit: US Dollar).

Status		Book lending	International. journal article	Domestic journal article	Reference service	User education	Reading room
Undergraduate	Mean	0.70	0.99	0.81	0.32	1.68	0.76
	N	470	464	465	465	454	463
Graduate	Mean	0.80	1.19	0.65	0.45	2.10	0.84
	N	130	127	127	127	122	126
Professor	Mean	1.40	2.01	0.97	1.17	5.10	0.83
	N	106	105	104	101	99	96

Table 8. WTP values for university library services by major.

Major	Book lending	International journal article	Domestic journal article	Reference service	User education	Reading room
Humanities (*n*=92)	0.97	1.28	0.81	0.46	1.77	0.77
Social Science (*n*=235)	1.00	1.56	0.99	0.63	2.41	0.90
Natural Science (*n*-116)	0.81	1.04	0.78	0.35	2.46	0.87
Engineering (*n*=171)	0.61	0.82	0.59	0.37	2.38	0.59
Medicine (*n*=33)	0.83	1.15	0.92	0.43	1.55	0.81
Arts/Sports (*n*=18)	0.60	1.75	1.57	0.41	3.11	0.48
Education (*n*=59)	0.62	1.28	0.94	0.30	1.66	0.64

second ($2.01). For most services, the average WTP value differed between professors and students, but the WTP value for using a reading room did not differ much ($0.83 for professors and $0.84 for graduate students: Table 7).

Table 8 shows WTP amounts by major for each service measured. With regard to the average WTP value by major, humanities and social science majors were each willing to pay relatively more for services: $0.97 and $1.00 for book-lending services, respectively. For international journal article usage, arts/sports and social science majors were willing to pay the most. Arts/sports majors also showed the highest WTP value for user education sessions.

WTP by university's core mission. WTP values for university library services by university are shown in Table 9. For B University, a public, research-oriented university, the average WTP values for lending services, reference services, user education sessions, and reading room usage were $0.96, $0.54, $2.75, and $0.96, respectively, making their WTP values the highest of the four universities. C University, a public, education-oriented university, had average WTP values for international and domestic journal article usage of $1.50 and $1.05, respectively, making them the highest.

In comparison, A and D Universities, which are private universities, had WTP values lower than the two public universities across all services. One university, a private, research-oriented university, had the lowest average WTP values for reference services and user education. It can be assumed that the differences of core missions and type of each university were reflected in the results because WTP values for services differed by university; public universities' WTP values were higher than those of private universities.

Hypotheses test

Using the t-test and analysis of variance (ANOVA), this study tested whether there were statistical differences in the WTP values according to the characteristics of the university, the characteristics of the user, and whether a payment card was presented or not.

The difference in WTP value by university characteristics

> Hypothesis 1. There will be differences in WTP values between users of research-oriented universities and education-oriented universities.
> Hypothesis 2. There will be differences in WTP values between users of public universities and private universities.

Hypotheses (1) and (2) were developed to test whether there were differences in WTP values according to characteristics of function and foundation subjects. However, based on the results of the analysis, no statistical difference was identified between research-oriented and education-oriented universities; therefore, Hypothesis (1), which tested the difference by functional characteristics, was rejected (Table 10).

Table 9. WTP values for the university library services by university.

	Book lending	International journal article	Domestic journal article	Reference service	User education	Reading room
University						
A Univ. (*n*=180) (private/research oriented)	0.70	1.29	0.82	0.37	1.81	0.66
B Univ. (*n*=197) (public/research oriented)	0.96	1.15	0.75	0.54	2.75	0.96
C Univ. (*n*=188) (public/education oriented)	0.86	1.50	1.05	0.49	2.56	0.74
D Univ. (*n*=160) (private/education oriented)	0.77	0.95	0.75	0.43	1.76	0.70

Table 10. T-test on WTP value difference by the university's functional characteristics.

		N	M	t	p
Book lending	Research-oriented	384	0.83	0.131	.896
	Education-oriented	359	0.82		
International journal article	Research-oriented	381	1.22	−0.189	.850
	Education-oriented	352	1.24		
Domestic journal article	Research-oriented	382	0.78	−1.469	.142
	Education-oriented	351	0.91		
Reference service	Research-oriented	380	0.46	−0.057	.955
	Education-oriented	350	0.46		
User education	Research-oriented	370	2.31	0.259	.796
	Education-oriented	341	2.19		
Reading room	Research-oriented	379	0.82	1.131	.259
	Education-oriented	343	0.72		

The t-test results for WTP values for library services of public and private universities by operating type are summarized in Table 11. Users' WTP for the five total services (journal usage was separated into domestic and international) showed no statistical differences between public and private institutions except for library user education and reading room service. Therefore, Hypothesis (2) was partially adopted.

The difference in WTP value by user characteristics

With regard to user characteristics, two hypotheses were proposed based on the user's status and academic affiliation (major).

> Hypothesis 3. There will be differences in WTP values between students and professors.

Table 12 shows ANOVA results and post-hoc analysis of WTP values by respondents' status. Examining the difference in WTP value by status, professors showed higher WTP values than students (undergraduate, graduate students) throughout all services except for domestic journal and reading room usage. Therefore, Hypothesis (3) was also partially adopted.

> Hypothesis 4. There will be differences in WTP values by major.

An ANOVA test was carried out to see if there were any statistical differences in WTP values for each service by the users' major field, and the results are summarized in Table 13. It shows that WTP values for just the electronic scholarly information service, such as international and domestic journal article use, showed differences among the groups. However, according to the Scheffe test's post-hoc analysis, WTP values only had a meaningful difference for international journals between users of social science and engineering. There was no difference among user groups on domestic journal usage in post-hoc analysis. Therefore, except for partial services, a user's major did not affect the WTP value. Hypothesis (4) was only partially adopted.

After dividing the users by status into professor, graduate student, and undergraduate, undergraduates and professors showed no difference by major, but graduate students had a difference in WTP value by major for book lending and reference services at the 0.05 level of significance. Upon post-hoc analysis, the book lending WTP values of humanities graduate students were higher than those of engineering students. There was no difference in rank among the groups regarding reading room usage by post-hoc analysis.

The difference in WTP value by whether a payment card is presented

> Hypothesis 5. There will be differences in WTP values between cases where a payment card is presented and where it is not.

Table 11. T-test on WTP value difference by the university's subject of foundation.

		N	M	t	p
Book lending	Public	392	0.91	1.769	.077
	Private	351	0.73		
International journal article	Public	386	1.32	1.359	.174
	Private	347	1.13		
Domestic journal article	Public	385	0.90	1.321	.187
	Private	348	0.78		
Reference service	Public	387	0.51	1.448	.148
	Private	343	0.40		
User education	Public	380	2.66	2.060	.040*
	Private	331	1.78		
Reading room	Public	381	0.85	2.040	.042*
	Private	341	0.68		

*$p<0.05$.

Table 12. ANOVA results on WTP value difference by status.

		N	M	F	p	Post-hoc analysis (Scheffe test)
Book lending	Professor	106	1.40	10.981	0.000***	prof. > undergrad. > grad.
	Graduate	130	0.80			
	Undergraduate	470	0.70			
International journal article	Professor	105	2.01	15.146	0.000***	prof. > undergrad. > grad.
	Graduate	127	1.19			
	Undergraduate	464	0.99			
Domestic journal article	Professor	104	0.97	2.430	0.089	no difference (prof., grad., undergrad.)
	Graduate	127	0.65			
	Undergraduate	465	0.81			
Reference service	Professor	101	1.17	25.740	0.000***	prof. > undergrad. > grad.
	Graduate	127	0.45			
	Undergraduate	465	0.32			
User education	Professor	99	5.10	13.393	0.000***	prof. > undergrad. > grad.
	Graduate	122	2.10			
	Undergraduate	454	1.68			
Reading room	Professor	96	0.83	0.342	0.711	no difference (prof., grad., undergrad.)
	Graduate	126	0.84			
	Undergraduate	463	0.76			

**$p<0.01$, *** $p<0.001$.

The goal of Hypothesis (5) was to examine the change in WTP value that comes from the difference in the CVM's questionnaire plan. The existence of a payment card, which plays a role as a reference when stating WTP, was turned into a variable. When conducting the survey, we alternated between two types of questionnaires: one contained payment card information and the other one did not. There were no differences between the two types of questionnaire except for the existence of a payment card. According to the analysis results (Table 14), similar value prices appeared irrespective of the payment card's existence, and Hypothesis (5) was rejected.

Discussion

This study attempted to measure a university library's service value using contingent valuation method and to identify factors that affect the variability in value assessments. With regard to the measurement strategies and the results, the following issues are worth considering.

First, WTP values for user education had the highest amount among book lending, international journals, domestic journals, reference services, user education sessions, and reading room use. For many of the users of this service, we can assume that they have marked the WTP

Table 13. ANOVA results on journal article WTP value difference by major.

		N	M	F	p	Post-hoc analysis (Scheffe test)
Book lending	Humanities	94	0.97	1.852	0.086	no difference
	Social Science	240	1.00			
	Natural Science	121	0.81			
	Engineering	174	0.61			
	Medicine	33	0.83			
	Arts/Sports	19	0.60			
	Education	61	0.62			
International journal article	Humanities	93	1.28	3.033	0.006**	social science > engineering
	Social Science	238	1.56			
	Natural Science	121	1.04			
	Engineering	172	0.82			
	Medicine	33	1.15			
	Arts/Sports	17	1.75			
	Education	58	1.28			
Domestic journal article	Humanities	93	0.81	3.322	0.003**	no difference
	Social Science	238	0.99			
	Natural Science	120	0.78			
	Engineering	173	0.59			
	Medicine	33	0.92			
	Arts/Sports	17	1.57			
	Education	58	0.94			
Reference service	Humanities	92	0.46	1.582	0.149	no difference
	Social Science	237	0.63			
	Natural Science	119	0.35			
	Engineering	171	0.37			
	Medicine	33	0.43			
	Arts/Sports	18	0.41			
	Education	59	0.30			
User education	Humanities	93	1.77	.394	0.883	no difference
	Social Science	228	2.41			
	Natural Science	113	2.46			
	Engineering	167	2.38			
	Medicine	33	1.55			
	Arts/Sports	18	3.11			
	Education	58	1.66			
Reading room	Humanities	91	0.77	1.775	0.102	no difference
	Social Science	235	0.90			
	Natural Science	116	0.87			
	Engineering	169	0.59			
	Medicine	33	0.81			
	Arts/Sports	18	0.48			
	Education	59	0.64			

**$p<0.01$.

from a 'learner's' point of view by regarding the service as a lecture where the users invest their time and acquire new knowledge. International journal downloads had the second highest WTP, and this reflects the essential role of a university library in supporting research and study by providing scholarly information, especially by acquiring the vast amount of scholarly journal contents published by international publishers.

Second, the study measured the value of university libraries using open-ended questions. The rationale behind opting for the open-ended question type instead of the double-bounded dichotomous choice question was to ease the pressure on respondents and to keep the questions straightforward. As a result, the range of WTP values was very broad, and it caused some degree of difficulty in the calculation of reliable values. In this study we used arithmetic

Table 14. Test on mean difference by the existence of payment card information.

		N	M	t	p
Book lending	Payment card	368	0.82	−0.094	0.926
	No payment card	375	0.83		
International journal	Payment card	363	1.15	−1.063	0.288
	No payment card	370	1.30		
Domestic journal	Payment card	363	0.81	−0.726	0.468
	No payment card	370	0.87		
Reference service	Payment card	362	0.41	−1.216	0.224
	No payment card	368	0.51		
User education	Payment card	351	2.29	0.153	0.879
	No payment card	360	2.22		
Reading room	Payment card	361	0.81	0.805	0.421
	No payment card	361	0.74		

averages for summarizing and analyzing results and this is typical in many CVM studies. However, in future studies it will be worthwhile to conduct analyses using other statistics such as the median or 5%-trimmed average.

The users' WTP values regarding university library services measured in this study were determined personally by individual users about the value of particular services. Thus the derived WTPs must have been reflected not only by a user's individual experience of using library services but also by the characteristics of the institute the user belongs to, personal characteristics of the user, situational attributes, and the composition of the questionnaire. At the present time, few studies have detailed how to measure academic library service value, and systematic analyses on factors that affect WTP are scarce. Therefore, this study identified the characteristics of the university providing the service, the characteristics of the user, and characteristics related to survey composition as potential factors that might influence WTP values of users, and selected and tested hypotheses to see if these characteristics actually affect WTP amounts.

The results of analysis of WTP differences according to university characteristics, user characteristics, and survey composition can be summarized as follow.

First, among the five factors set up through the preliminary survey and literature review, the only factor that showed a statistically significant effect on WTP values among university library users was the status of the users. On the other hand, the general environment of a university library – university characteristics (education or research-oriented, private or public), users' major, and the survey composition (existence of payment card) did not produce differences in WTPs by and large.

Second, it is easy to understand that professors' WTP level was cast higher than that of students. However, it is difficult to conclude that the service value that professors experience is higher than that of undergraduates or graduate students. The high WTPs of the professor group may show a relative value about services, but it could also reflect the economic levels between the professor group and the student group. Although small in number, there were substantially high WTP amounts observed in the professor group's data that was absent in student groups. In the case of very high WTP values, which can be also regarded as outliers, it can be said that these high values reflect a relatively high service value rather than the economic position of the particular user. Therefore, users' WTP values were affected by a complex combination of individual economic level and experienced level of services. A measurement method that can distinguish these differences will need to be developed.

Third, even though there were no statistically significant results, additional research into the characteristics included in this study (university, user's major, the existence of a payment card) is still necessary. In order to achieve methods of measuring valid WTP values, this study contacted individual users through face-to-face surveys and limited the target institute of research to four universities with a high level of cooperation. Therefore, the results of our hypotheses tests should be considered provisional. If related data are collected and analyzed in different situations at other times, clearer results regarding the research questions of this study could be achieved.

Conclusion

Recently, the value of a university library has become a key area of the actual performance of a university. The value of a university library assesses the contribution made by the library services with various properties to the success of professors and students through the subjective judgment of users who actually benefit from these services. The intangible character of value and the subjectivity of value judgment are the main reasons that value measurements are difficult to carry out; therefore, a university library's value should be investigated and in-depth research on measurement methods should be conducted in order to draw more valid conclusions regarding this topic.

Contingent valuation method (CVM), which is usually applied in the public sector and to public libraries, has the advantage of being readily applied to measuring use and non-use values most directly, but only a few advanced research studies have been published on value measurement of the entire service offerings of a university library with the application of CVM. The main reason for this lack of studies is that scholarly attention to investigate the university library's value has only just begun, and methodological apparatus for measuring the value of library services of universities that have complex and varied characteristics is still lacking.

In this context, the value measurement performed in this study was meaningful in that this study was an experimental measurement one that applied a single measurement method, CVM, to various services. Also, the study tried a methodical explanation by testing hypotheses on various factors that affect WTP, a value of service stated by users. In the hypotheses test, WTP differed according to the users' status (who the user is) and partially by characteristics of the institution. However, the survey method did not seem to influence the WTP amounts. In the ever-expanding information service environment (including a university library), continuous research needs to be carried out to measure the relative value of library services based on users' individual value judgment and on the factors that affect their value judgment. Through these efforts, we can collect credible data and provide insights that various stakeholders of university library services can utilize and learn from.

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