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5 Sustainability of Open Source Integrated Library Systems in University Libraries of Bangladesh: A Study

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ABSTRACT: This study evaluated the sustainability of the existing Open Source Integrated Library Systems (OSILS) in University Libraries of Bangladesh from the professionals' point of view to contribute in achieving the SDGs regarding higher education. The study was conducted among 179 library professionals from 21 university libraries to measure the sustainability of the existing OSILS (Koha) by using a structured questionnaire which was adapted after undertaking a pilot survey. The quantitative approach was used to test the hypotheses based on the primary data. The factors for the sustainability of the existing OSILS were analyzed by multiple regressions where six dimensions of sustainability were applied as independent variables, and the overall sustainability was used as the dependent variable. The Cronbach's Alpha and Bartlett's test indicated good reliability of the overall questionnaire items. Moreover, the factor analysis with varimax rotation, discriminant validity, commonalities, multicollinearity, VIF, and KMO value indicated the validity of the study. The overall mean of Koha's sustainability was 3.99 on a 5 point scale indicating that Koha is a sustainable OSILS which is performing efficiently in the university libraries of Bangladesh. Among the 30 sustainability statements, both "international standard options" and "OPAC" occupied the highest mean whereas the "improvement is being done based on user needs" formed the lowest mean. The regression model was established as significant ($P<0.001$) and explained 48.6 percent of the variation in the overall sustainability. The model revealed that the usability ($P<0.001$) and cost-effectiveness ($P<0.004$) of Koha are significant factors for its sustainability in the university libraries of Bangladesh. This study used a purposive sampling technique given its convenience for handling a large population size of 21 universities and for collecting data from the existing library professionals. As Koha is identified as a sustainable OSILS, the library professionals of Bangladesh can opt for this software to automate their libraries. This study will build consciousness among library professionals and prompt further research on continuous evaluation of the sustainability of the existing OSILS. An attempt has been made to evaluate the sustainability of OSILS in university libraries of Bangladesh for the first time. The study developed and validated an instrument for evaluating the sustainability of OSILS focusing on the experiences of the library professionals.

Keywords: sustainability, Koha, open-source integrated library system, or OSILS, open-source software, library management systems, university libraries, Bangladesh.

I. INTRODUCTION

An OSILS is “Library Management System” (LMS) that is also known as “Enterprise Resource Planning” (ERP) system for a library (Alam 2017). Koha is the first and most extensively used OSILS which is free library management software with source code under the "GNU General Public License" (GPL). Katipo Communications of New Zealand developed the Koha software in 1999 which went live for the first time in January 2000 (Eyler 2003). Koha includes acquisition, cataloging, OPAC, circulation, Inter-Library Loan, serials control, patron management, and report generation modules (Alam and Mezbah-ul-Islam 2019). It has two Graphical User Interfaces (GUIs) - one for users, another for staff. It usually includes two relational databases which are the bibliographic database and patron database. Kiriyanant (2012) observed that each item and patron has a unique ID in the database which allows Koha to track its activities. All functional modules, interfaces, and database are integrated by a unified system of Koha (Alam, 2018). Usually, ILSs can be divided into 3 kinds which are proprietary, freeware and open source (Chouhan 2010). There is no vital difference between the functions and features of freeware, proprietary and open source ILSs, but the vital difference can be seen in their distribution and development process (Kumar and Abraham 2009). The copyright holder of Koha provides the right to use, study, modify and distribute the software to anyone for any purpose (Alam 2019). The adoption and practice of Koha in libraries and information institutions are gaining momentum over the world including Bangladesh (Kumar and Jasimudeen 2012, Alam 2017).

The Sustainable Development Goals (SDGs) included 169 targets and are to be achieved between 2016 to 2030. Drawing many useful lessons from the Millenium Development Goals (MDGs), the 4th goal of the SDGs emphasizes the “equity and quality of education in a life-long learning approach” which were not included in the MDGs. The 4th goal of SDGs is “to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”. The 3rd target of the 4th goal (target-4.3) of SDGs is “by 2030, ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university” (SDG 2019). The university libraries of Bangladesh have a vital role to ensure equitable and inclusive quality education and promote lifelong learning. To achieve the SDGs regarding higher education, sustainable OSILS is needed to provide users with the expected quality services. Based on the available literature, very few studies have been undertaken about the practical experience of Koha implementation (Ahammad 2014), challenges and remedies for OSILS adoption (Alam 2017), usability test of OSILS (Khatun and Ahmed, 2018), adoption and satisfaction of OSILS (Alam, 2018), and factors for OSILS adoption (Alam and Mezbah-ul-Islam 2019) but very few efforts have been made to assess the sustainability of the existing OSILS in Bangladeshi university libraries. Thus, it is anticipated that an evaluation of the sustainability of the existing OSILS in university libraries of Bangladesh will help contribute to the achievement of the SDGs.

II. LITERATURE REVIEW

In Bangladesh, initially, Koha was installed at BRAC University Library in 2010 (Afroz 2014). Twenty-one university libraries, seven institutional libraries, five college libraries, and three school libraries are now using Koha in Bangladesh (Koha-community 2019). According

to SLiMSBD Community (2019), one university library, twelve institutional libraries and five college libraries are using SliMS in Bangladesh. Koha, Evergreen, NewGenLib, PMB, and SLiMS are popular OSILS around the world (Müller 2011, Alam 2018). Muller (2011) identified Koha as the most mature and sustainable OSILS by conducting a multidimensional analysis among twenty open source and free software. The Cambridge Dictionary (2019) defined sustainability as the "quality of being able to continue over a period of time". To conduct the study on the sustainability of OSILS in Bangladeshi university libraries, some literature was reviewed under the following six concepts:

2.1 Usability

Khatun and Ahmed (2018) tested the usability of OSILS of BRAC University Library from user perceptions and found positive results of the existing OSILS and its usability. Kiriyanant (2012) found that fifty-nine percent of university libraries in Pathumthani and Bangkok of Thailand tended to move towards the OSILS adoption although they presently used proprietary Integrated Library System. Among them, fifty-five percent thought that they would choose Koha when they sought to transform their ILS software. Marshall Breeding conducted a global survey in 2016 among 4042 libraries from ninety-two countries on ILS and found that Koha got the highest marks in the perceptions survey (Breeding 2017).

2.2 Skilled Manpower

For enhancing the adoption and use of the software worldwide, the development of koha is being done by an emerging user community cooperating to accomplish their technological goals. Alam (2018) found that twelve Bangladeshi universities have implemented OSILS by their own team. BRACU Library provided vendor support for three university libraries, EWU Library provided vendor support for two university libraries, and three commercial vendors provided support to four university libraries for implementing ILS through Koha.

2.3 Environment

Alam (2018) revealed that nineteen university libraries were organizing in-house training on OSILS for their library staff. Only ten university libraries were organizing training on OSILS for the professionals of other libraries. Twelve university libraries assigned their library professionals for attending training on OSILS organized by other organizations. Eighteen university libraries had taken the initiative for the promotion of the use and benefits of OSILS at their university campus. Koha-community is considered active because it has a serious mass of contributors, developers, and users from the beginning to till now (Müller, 2011).

2.4 Maintenance

In choosing appropriate OSILS, Muller (2011) recommended that libraries should base their decision not only on the software's efficiency and performance but also on its fundamental flexibility to adapt readily to their users' future needs. Koha offers the most international options which are choice of date format (US, metric, ISO), an alternative of MARC record (MARC21 or UNIMARC), and preference of 25 languages. Alam (2018) showed that six university libraries integrated RFID technology with Koha, and six university libraries integrated Koha with their university's ERP system in Bangladesh. Currently, fourteen

university libraries are being upgraded their OSILS with stable upgraded versions. Fifteen OSILSs were being maintained by their library team, four OSILSs were being maintained by their university IT team, and two OSILSs were being managed by the combination of both IT and library team in Bangladesh.

2.5 Progress

Thousands of libraries around the world adopt the functionalities of Koha by each adding functions and features. Koha releases follow a regular calendar based on monthly maintenance releases and bi-annual feature releases. Feature releases are made each May and November on or around the 22nd of the month. Maintenance releases are made each month on or around the 22nd of the month. Initially, the Koha was released in January 2000, and the latest stable version was released on 28 November 2018 (Koha-Community 2018).

2.6 Cost-effectiveness

Riewe (2008) surveyed the libraries that used the largest OSILS like Evergreen and Koha and different proprietary ILS and found that OSILS was more cost-effective than proprietary ILS. Alam and Mezbah-ul-Islam (2019) revealed that the open source code, cost-effectiveness, freedom from licensing fee, easy to incorporate with other software, supporting community, and backup and restore systems significantly influenced library professionals of Bangladesh to adopt Koha in their university libraries. Singh (2013) showed that the key factor for considering the adoption of OSILS in the libraries of the USA was the cost-effectiveness of OSILS compared to proprietary ILS. Arch (2011) revealed three critical aspects for choosing an OSILS which were open source code, cost-effectiveness, and functionality.

From the above discussion, very few efforts have been made to evaluate the significant factors for the sustainability of the existing OSILS in the university libraries of Bangladesh from the professionals' point-of-view. A question that is raised concerns whether or not the existing OSILS is sustainable in university libraries of Bangladesh.

III. RESEARCH OBJECTIVES

The study has the following objectives based on the questions raised, research gaps and social impact.

1. To measure the sustainability of Koha in the university libraries of Bangladesh.
2. To evaluate the significant factors for the sustainability of Koha in the university libraries of Bangladesh.

IV. RESEARCH HYPOTHESES

The question that is raised here is which factors have a significant impact on the sustainability of Koha in the university libraries of Bangladesh. Based on the objectives, and questions raised, the study has formulated the following hypotheses:

H-1: Higher the usability of features of Koha, higher the level of sustainability.

H-2: Greater the availability of skilled manpower in the libraries, greater the level of sustainability of Koha.

H-3: More positive environment in the libraries regarding Koha, greater the level of sustainability.

H-4: Better the maintenance facility of the Koha, higher the level of sustainability.

H-5: Better the progress activities of Koha, greater the level of sustainability.

H-6: Higher the cost-effectiveness of Koha, higher the level of sustainability.

V. METHODOLOGY

At present, there are two international, forty-five public, and 103 private universities in Bangladesh (UGC 2019). Among them, twenty-one university libraries are currently using Koha. This study made an attempt to collect both quantitative and qualitative data from primary and secondary sources to determine the objectives, and test the hypotheses. In order to collect primary data, twenty-one university libraries were selected for the study whose libraries are now using Koha. The 30 statements of sustainability of Koha were taken from the available literature which were modified focusing on the following six dimensions, i.e., (1) usability – usability of major features of Koha; (2) skilled manpower - availability of OSILS expert, professional skill and technical knowledge of library staff; (3) Environment – willingness of library professionals, adequate training, promotion, funding, and ICT infrastructure; (4) Maintenance – flexibility of customization, integration, data migration, options, ability of control, backup, restore, and availability of community support; (5) Progress – maturity, improvement, timely releases, and meeting the user needs; and (6) Cost-effectiveness – freedom from licensing fee, low implementation and maintenance cost. Besides, a statement for assessing the overall sustainability of Koha was incorporated into the survey. A multiple regressions analysis evaluated the significant factors for the sustainability of Koha where six dimensions were used as independent variables and overall sustainability was used as the dependent variable.

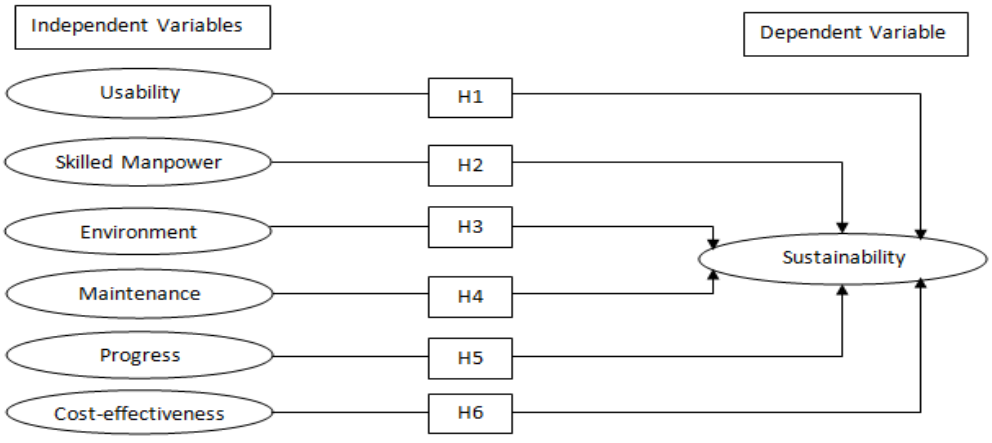

Figure 5.1 Conceptual Framework

5.1 Data Collection Tools

The questionnaire included demographic information of library professionals, 30 statements representing six dimensions of sustainability and a statement for assessing the overall sustainability of Koha. A 5-point agreement scale was administered containing "5= Strongly Agree, 4= Agree, 3= Less Agree, 2= Disagree, and 1= Strongly Disagree" to evaluate the significant factors for the sustainability of Koha. A pilot survey was done before finalizing the questionnaire which assisted to reform the technological and technical terms that were used in the context of Bangladesh.

5.2 Sampling and Data Collection Methods

The purposive sampling technique was applied for collecting primary data given the large population size from 21 universities, collecting data from the existing library professionals, and making this study more convenient. The researcher visited all the selected university libraries and disseminated the questionnaire to the library professionals who had a minimum qualification of postgraduate-diploma/Master/Bachelor in Library and Information Science. Total 194 (80.83%) questionnaires were returned out of 240, and it was found that 179 (74.58%) questionnaires had been fully completed by the library professionals who were considered for analysis.

5.3 Statistical Methods

SPSS Version 22 was used to assess the sustainability of Koha by descriptive statistics. Besides, a multiple regressions analysis evaluated the significant factors for the sustainability of Koha. Cronbach's Alpha and Bartlett's test assessed reliability. Moreover, the factor analysis with varimax rotation, discriminant validity, histogram, commonalities, normal probability plot, multicollinearity, VIF, and KMO value measured the validity of the study.

5.4 Reliability

Nunnally (1978) suggested that "alpha value should be 0.70 or higher". Cronbach's Alpha results showed that the internal consistency of all statements is $\alpha = 0.863$, and 30 sustainability statements is $\alpha = 0.892$ indicating the overall questionnaire items have good reliability. The Bartlett's Test of sphericity "should have a value of 0.05 or less" (Schierholz and Laukkanen 2007). The Bartlett's test has p-value = 0.001 for 30 statements indicated that the internal consistency of the data is appropriate.

5.5 Validity

Kaiser-Meyer-Olkin (KMO) value of 30 sustainability statements on Koha is 0.833 which means statistically the sample size (179) is significant for regression analysis and there is no data related problem. Factor analysis was performed with varimax rotation, and when no constraints were imposed on factor extraction, only six factors were recovered with a total variance of 66.25 percent and a total of 30 items out of 30 were loaded on the factors. The result indicated that each of the six factors, i.e., usability, skilled manpower, environment, maintenance, progress, and cost-effectiveness had an eigenvalue of greater than one instructed that all the independent variables were significant to conduct the study. Fornell and Larcker (1981) suggested that "If the average variations derived from the correlated latent variables are higher than the alpha coefficient of each scale, discriminating validity is achieved". The results supported discriminating validity because the correlation between one

factor and another (0.008 to 0.773) is as low as the each factor's coefficient alpha (0.885 to 0.896). The items loading of extracted from variables were revealed between 0.574 and 0.875 for eight statements of usability, between 0.766 and 0.781 for three statements of skilled manpower, between 0.503 and 0.808 for five statements of environment, between 0.572 and 0.734 for seven statements of maintenance, between 0.505 and 0.776 for four statements of progress, and between 0.546 and 0.807 for three statements of cost-effectiveness suggested that all the items represent the respective dimensions of sustainability successfully. Nadiri (1970) suggested that "all commonalities of a perfectly sufficient sample above 0.5 are acceptable". The commonalities of the variables extracted between 0.514 and 0.785 for 30 sustainability statements out of 30 recommended that the variance in all the statements is within a suitable range. However, the results of the statistical methods indicated the validity of the study.

VI. DATA ANALYSIS AND FINDINGS

6.1 Demographic Information of Respondents

Among the 179 respondents, the most significant number of the respondents were from Dhaka University (25, 14%), followed by BRAC University (14, 7.8%), East West University (13, 7.3%), Bangladesh University of Engineering & Technology (13, 7.3%), Rajshahi University (12, 6.7%), Northern University Bangladesh (10, 5.6%), Daffodil International University (9, 5.0%), International Islamic University Chittagong (8, 4.5%), Independent University Bangladesh (8, 4.5%), Khulna University of Engineering & Technology (8, 4.5%), Eastern University (7, 3.9%), Shahjalal University of Science & Technology (7, 3.9%), University of Liberal Arts Bangladesh (6, 3.4%), Sher-e-Bangla Agricultural University (7, 3.4%), Green University Bangladesh (6, 3.4%), Southeast University (6, 3.4%), Premier University (5, 2.8%), United International University (5, 2.8%), Chittagong Independent University (4, 2.2%), Manarat International University (4, 2.2%), and Chittagong Veterinary & Animal Sciences University (3, 1.7%). Among the responses, 73 (40.2%) were from public university, and 106 (59.2%) were from private university. Among the responses, 64 (35.8%) were female, and 115 (64.2%) were male. The more significant proportion of the respondents were Assistant Librarian (48, 26.8%), followed by Library Officers (47, 26.3%), Assistant Library Officers (31, 17.3%), Deputy Librarian (18, 10.1%), Senior Library Officers (13, 7.3%), Senior Assistant Librarian (12, 6.7%), Librarian (4, 2.2%), Joint Librarian (3, 1.7%), and Junior Assistant Librarian (3, 1.7%).

6.2 Qualification and Experience of Respondents

The more significant proportion of respondents (152, 84.9%) received Master's degree in Information Science and Library Management, followed by PGD (11, 6.1%), PhD (9, 5.0%), MPhil (5, 2.8%), and Bachelor's degree (2, 1.1%). It is found that 40.2 percent of the respondents did not have any degree in ICT. Only 36.3 percent of respondents attended a certificate course, 19.0 percent of respondents have PGD, and 4.5 percent of respondents have a Master's degree in ICT. Among the respondents, 78.2 percent have training on Koha, and 97.2 percent have working experience in Koha. The most significant number of respondents (51, 28.5%) have three years of work experience, followed by four years of work experience (37, 20.7%), six years of work experience (28, 15.6%), one year of work experience (25, 14.0%), two years of work experience (24, 13.4%) and five years of work experience (14, 7.8%).

6.3 Overall Sustainability of Koha in University Libraries of Bangladesh

Table 5.1 illustrated that the overall mean of Koha's sustainability was 3.99. Among the thirty statements, both the "international standard options" and "online public access catalog" occupied the highest sustainability mean of 4.31. The "circulation service" occupied the second highest sustainability mean of 4.26, followed by both "easy to customize for local needs" and "technical knowledge of library professionals" scored 4.25, "easy backup and restore system of Koha" scored 4.22, both "freedom from licensing fee" and "easy control over the data and software of Koha" scored 4.20, "supporting community" scored 4.18, easy cataloguing, scored 4.17, "data migration ability of Koha" scored 4.16, "lower maintenance-cost of Koha" scored 4.15, both "easy to manage patron" and "availability of skill manpower" scored 4.13, "easy to integrate with other software" scored 4.11, "training & retraining on Koha" scored 4.09, "availability of local OSILS expert" scored 4.07, both "auto email/SMS notification is interesting" and "lower the implementation cost of Koha" scored 4.06, "IT infrastructure" scored 4.00, "control overdue fine" scored 3.98, "willingness of library professionals" scored 3.94, "report generation" scored 3.92, both "overall usability of Koha" and "adequate funding for adoption and maintenance" scored 3.74, "promotional activities" scored 3.72, "serials management" scored 3.53, "e-resources management" scored 3.49, "stocktaking module" scored 3.40. On the other hand, the service statement "acquisition module" formed the lowest mean of 3.22. Among the six dimensions of sustainability, the "maintenance" achieved the highest sustainability mean of 4.20, followed by "skilled manpower" scored 4.15, "cost-effectiveness" scored 4.14, "usability" scored 4.07, "environment" scored 3.90, and "progress" scored 3.41.

Table 5.1 Overall Sustainability of Koha in University Libraries of Bangladesh

ID	Items	Mean	STD	Item Loading	**Communalities**
01-Usability	Easy cataloging into Koha	4.17	.717	.641	.594
02-Usability	Easy circulation service	4.26	.906	.848	.777
03-Usability	Easy to control overdue fine by Koha	3.98	.945	.818	.722
04-Usability	Easy to understand and navigate the OPAC	4.31	.772	.875	.785
05-Usability	Report generation module is user-friendly	3.92	.883	.705	.605
06-Usability	Easy to manage patron in Koha	4.13	.807	.810	.756
07-Usability	Auto email/SMS notification is interesting	4.06	.993	.691	.625
08-Usability	I would like to use Koha in the future	3.74	.759	.574	.614
09-Skilled Manpower	Availability of local OSILS expert	4.07	1.009	.766	.660
10-Skilled Manpower	Availability of Skill manpower	4.13	.870	.781	.778

11-Skilled Manpower	Technical knowledge of library professionals	4.25	.811	.770	.663
12-Environment	Availability of IT infrastructure in the library	4.00	.972	.808	.693
13-Environment	Availability of training & retraining on Koha in Bangladesh	4.09	.839	.801	.655
14-Environment	The willingness of library professionals to accept Koha	3.94	.943	.524	.711
15-Environment	Adequate funding for adoption and maintenance	3.74	.788	.503	.771
16-Environment	Availability of promotional activities	3.72	.906	.663	.536
17-Maintenance	Data migration ability of Koha	4.16	.751	.646	.570
18-Maintenance	International standard options of Koha	4.31	.705	.716	.674
19-Maintenance	Easy control over the data and software of Koha	4.20	.688	.734	.613
20-Maintenance	Availability of supporting community	4.18	.728	.572	.592
21-Maintenance	Easy to customize for local needs	4.25	.854	.713	.586
22-Maintenance	Easy to integrate with other software	4.11	.827	.703	.592
23-Maintenance	Easy backup and restore system of Koha	4.22	.736	.701	.657
24-Progress	The maturity of Koha is excellent	3.53	.991	.659	.685
25-Progress	The improvement is being done based on user needs	3.22	1.089	.505	.514
26-Progress	The authority releases updated version timely	3.49	1.008	.776	.737
27-Progress	The updated version satisfy current needs	3.40	1.109	.732	.687
28-Cost-effectiveness	Freedom from licensing fee	4.20	.803	.546	.591
29-Cost-effectiveness	Low implementation cost of Koha	4.06	.740	.807	.701
30-Cost-effectiveness	Comparatively Low Maintenance-cost of Koha	4.15	.760	.707	.731
	Overall	**3.99**	**.426**		

6.4 Hypotheses Test through Multiple Regressions Analysis

Multiple-regression analysis was done for evaluating the significant factors for sustainability where overall sustainability was applied as the dependent variable, and six factors were used as the independent variables. Table 5.2 shows that the model explained 48.6 percent of the variation in sustainability, as recommended by adjusted R^2 value ($R^2 = 0.486$). The P value of the model of regression analysis is ($P<0.001$) indicated that the entire model was recognized as significant. Many authors use Cohen's criteria "(less than .01 = trivial; .01 up to .30 = week; .30 up to .50 = moderately strong; .50 or greater = strong)" to determine whether the correlation between dependent and independent variables is strong or weak (Cohen and Cohen 2003). The correlation in the model was properly established as strong (Multiple R = 0.709) as per the Cohen's criteria. Residuals are "the difference between the obtained and predicted dependent variable scores which represent unexplained variation". A model with "large regression sum of squares in comparison to the residual sum of squares indicates that the model accounts for most of the variation in the dependent variable" (Michigan State University 2017). The regression model counted most of the variations in the dependent variable because the model has a large regression sum of squares (51.638) compare to the residual sum of squares (51.021).

Table 5.2 Model Summary of Factors for Adoption of OSILS

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.709[a]	.503	.486	.545	.503	29.014	6	172	.000

Table 5.3 shows that two factors had significant impact on sustainability of Koha which were usability ($b = 0.612$; $p<0.001$); and cost-effectiveness ($b = 0.197$; $p<0.004$). Other four factors, skilled manpower ($b = -.175$, $p>0.059$); environment ($b = 0.118$, $p>0.189$); maintenance ($b = -.095$, $p>0.159$); and progress ($b = .069$, $p>0.332$) were not significant. However, skilled manpower and maintenance had an insignificant negative impact on the sustainability of Koha. The standardized beta values indicated that the usability of Koha had the most significant impact on the sustainability of Koha.

Table 5.3 Regression Results with 6 Dimensions

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	.452	.398		1.135	.258	-.334	1.238		
	Usability	.699	.078	.612	8.919	**.000**	.545	.854	.614	1.629
	Skilled Manpower	-.175	.092	-.175	-1.902	.059	-.356	.007	.343	2.918
	Environment	.134	.101	.118	1.320	.189	-.066	.334	.359	2.787
	Maintenance	-.132	.094	-.095	-1.414	.159	-.317	.052	.640	1.562
	Progress	.063	.065	.069	.973	.332	-.065	.191	.576	1.735
	Cost-effectiveness	.238	.081	.197	2.934	**.004**	.078	.398	.639	1.565
a. Dependent Variable: Overall Sustainability										

Figure 5.2 and 5.3 show the histogram and normal probability plot explained that the dependent variable is normally distributed and no deviation from the assumptions. The residual statistics would be confident not to restrict the use of the model.

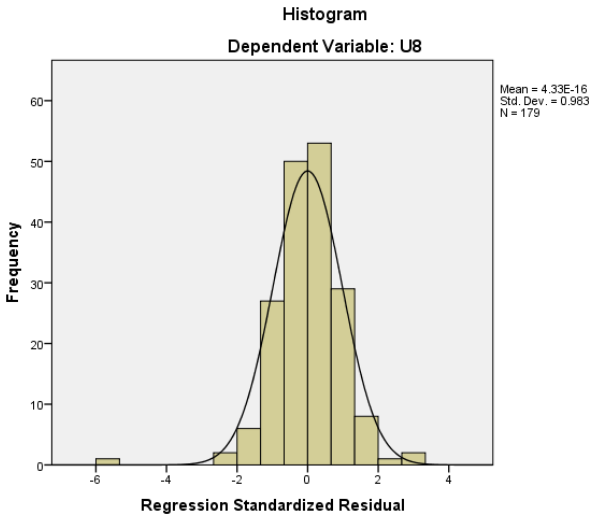

Figure 5.2 Visual Identification of the shape of Normal Distribution

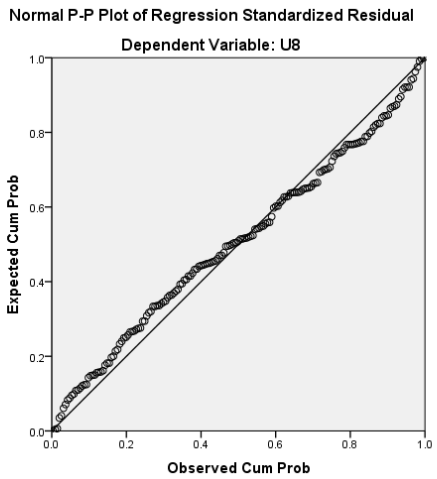

Figure 5.3 Normal Probability Plot of the Standardized Regression Residual

Andaleeb and Simmonds (1998) recommended that the multicollinearity or correlation between independent variables should not happen in a good regression model (Andaleeb and Simmonds 1998). According to Spsstests.com (2015), "if the variance inflation factor (VIF) value lies between 1 and 10, then there is no multicollinearity problem". Based on the coefficients output - collinearity statistics, obtained VIF values are 1.629 for usability, 2.918 for skilled manpower, 2.787 for the environment, 1.562 for progress, and 1.565 for cost-effectiveness indicating multicollinearity symptoms do not exist in the regression model and a moderate correlation is present between the predictors.

VII. DISCUSSION

A total of one hundred ninety-four (80.83%) questionnaires were returned out of 240. Among them, 179 (74.58%) questionnaires were completed by the respondents and were considered for analysis. The main aim of the study was to evaluate the significant factors for the sustainability of the existing OSILS in Bangladeshi university libraries from the viewpoints of library professionals. The significant factors for the sustainability of Koha were evaluated by conducting multiple regression analysis. The Bartlett's test has p-value = 0.001 for 30 statements recommended that the internal consistency of the data is appropriate. The Cronbach's Alpha values recommended that the internal consistency of all items is $\alpha = 0.863$, and 30 statements for the sustainability of Koha is $\alpha = 0.892$ indicating the overall questionnaire items have a good reliability.

The overall KMO value matrix is 0.833 for 30 sustainability statements on Koha indicating that the sample size (179) is statistically significant for regression analysis. Factor analysis with varimax rotation showed that only six factors were recovered which had a total of 66.25% of the variance, and a total of 30 items out of 30 were loading on the factors. However, the latent root criterion showed that six factors had eigenvalues of higher than one which instructed that all the independent variables, i.e., usability, skilled manpower, environment, maintenance, progress, and cost-effectiveness were significant to conduct the study. The correlation between one factor and the other (0.008 to 0.773) was as low as the alpha coefficient of each factor (0.885 to 0.896) indicating the discriminating validity is exists. The items loading of the extracted from variables were shown to be between 0.574 and 0.875 for eight statements of usability, between 0.766 and 0.781 for three statements of manpower, between 0.503 and 0.808 for five statements of environment, between 0.572 and 0.734 for seven statements of maintenance, between 0.505 and 0.776 for four statements of progress, and between 0.546 and 0.807 for three statements of cost-effectiveness suggested that all the items successfully represent the respective dimensions of sustainability. The histogram and normal probability plot explained that the dependent variable was normally distributed and no deviation from the assumptions. The residual statistics was logically confident which indicated not to restrict the use of the model. The commonalities of the variables extracted between 0.514 and 0.785 for 30 sustainability statements recommended that the variance in all the items was within a suitable range. The VIF values obtained from 1.562 to 2.918 indicating multicollinearity symptoms did not exist in the regression model where a moderate correlation was present between the predictors.

The findings of this study showed that the overall mean of Koha's sustainability was 3.99 on a five-point scale indicating Koha is a sustainable OSILS which is performing effectively in Bangladeshi university libraries. Among the thirty statements, both the "international standard options" and "OPAC" achieved the highest sustainability mean of 4.31. On the other hand, the service statement "improvement is being done based on user needs" got the lowest mean of 3.22. Among the six dimensions of sustainability, the maintenance achieved the highest sustainability mean of 4.20, followed by skilled manpower with 4.15, cost-effectiveness with 4.14, usability with 4.07, environment with 3.90, and progress with 3.41. The entire regression model was established as significant and clarified 48.6 percent variation in sustainability. The model revealed that the usability and cost-effectiveness of Koha had a significant impact on the sustainability of the existing OSILS in university libraries of Bangladesh. The standardized beta values suggested that usability had the most significant

effect on the sustainability of Koha. But, the skilled manpower of the libraries, local environment regarding Koha, maintenance facility of the software, and timely progress of Koha had no significant effect on overall sustainability. However, the skilled manpower of the libraries and maintenance facilities of Koha had an insignificant negative impact on the overall sustainability of the existing OSILS.

Muller (2011) had conducted a three-step evaluation of the twenty free and OSILS software and found that Koha consistently received the best results at all stages of his research. He also determined that Koha is the most mature and sustainable OSILS. Sunil and Harinarayana (2013) evaluated the performance of 9 OSILS packages using a three-step analysis against their 682 features under six main evaluation modules and showed that Koha had high-quality features to meet their requirements. Yang and Hoffman (2010) stated that the OPAC of Koha is more advanced and innovative than Evergreen and Voyager. Kumar and Jasimudeen (2012) revealed that adoption and use of OSILS in Indian libraries are gaining momentum, and Koha's excellent features have made it popular among the user community within a short period of time. Breeding (2013) pointed out that according to the Library Technology Guide of Marshall Breeding, 1,579 libraries are using Koha, and 1,092 libraries are using Evergreen around the world. Among them, 414 libraries implemented Koha independently whereas only 22 libraries implemented Evergreen independently. The Koha software achieved different types of awards which are the LIANZA/3M Award 2000, Interactive New Zealand Awards 2000, Les Trophées du Libre 2003, Not-for-Profit Organization Computerworld Excellence Awards 2004, and Finalist of the New Zealand Open Source Award 2014 (Wikipedia 2019). From the above discussion, it can be determined that Koha is a sustainable OSILS which is performing efficiently in Bangladeshi university libraries.

VIII. CONCLUSION

The study evaluated the sustainability of the existing OSILS in Bangladeshi university libraries based on the viewpoints of 179 library professionals from twenty-one universities. Six dimensions of sustainability were computed through multiple regressions analysis to assess the significant factors for the sustainability of Koha, where overall sustainability was applied as a dependent variable and six factors were applied as the independent variables. Cronbach's Alpha and Bartlett's test indicated good reliability of overall questionnaire items. Moreover, the factor analysis, discriminant validity, histogram, commonalities, multicollinearity, normal probability plot, VIF, and KMO value recommended the validity of the study. The findings of the survey indicated that Koha is a sustainable OSILS, which is performing efficiently in Bangladeshi university libraries. The entire regression model was established as significant and clarified 48.6 percent variation in overall sustainability. The model recommended that usability and cost-effectiveness are significant factors for the sustainability of Koha in university libraries of Bangladesh. As Koha is identified as a sustainable OSILS, the library professionals of Bangladesh can select Koha software with confidence to automate their libraries. Through this research, an attempt has been made for the first time to evaluate the sustainability of Koha in Bangladeshi university libraries focusing on the professionals' experience that will build consciousness among library professionals and prompt further research on different aspects of OSILS.

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