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The Relationship between Library Technology, Support, Environment, and Postgraduate Students' Utilization of Web-Based Library and Information Services in Malaysian Academic Libraries †

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Abstract: This research examines the utilization of Web-Based Library and Information Services (WBLIS) in academic libraries. Digital technology promotes the use of WBLIS, including during the COVID-19 pandemic. Few Malaysian studies have investigated utilization and its factors. Three factors of WBLIS utilization were identified: library technology, support, and the environment. WBLIS's output and outcome were emphasized. A conceptual model was developed and tested using non-probability sampling. A 38-item, five-point Likert Scale online survey was distributed to postgraduates from 20 public universities. Raosoft sampled 383 research, comprehensive, and focused universities using stratified sampling. SMARTPLS version 3 was used to test hypotheses on 527 respondents. Harmon's Single Factor test eliminated single-source bias. All measurement and model criteria were met. All hypotheses on the relationships between library technology, support, and environment on WBLIS utilization were supported. The findings will contribute to academic librarianship and related fields. Malaysian universities and the Ministry of Higher Education will benefit from improving academic libraries' impact on learning, research, and universities' institutional value. Future research may include private university, polytechnic, and community college students and academicians. Comparative studies and qualitative research can be conducted.

Keywords: web-based library and information services; academic library; utilization; output; outcome; library technology; library support; library environment

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1. Introduction

For centuries, academic libraries have been one of the main catalysts that play critical roles in providing university students with access to diverse information, knowledge, and research resources. Despite their long-standing establishment and tradition, academic libraries' existence was originally merely established to serve their parent institutions [1]. This is still the same aspiration behind their presence today, with even more pressure to prove their impact, strategic value, and visibility as well as to adhere to the need to ensure all library investments are justified [2–4]. In the Malaysian higher education system, academic libraries are set to uphold their responsibilities with regard to the provision of effective library services and resources that support teaching, learning, and research goals aligned with the quality expectations of all academic programs designed and offered at both the undergraduate and postgraduate levels. The Malaysian Qualifications Agency (MQA) expresses that this is one of the requirements necessary if an academic program is to obtain and maintain accreditation.

It is necessary to emphasize the trend in the Malaysian educational system. Since the entire globe is being driven by the massive rise of digital technology, universities are being challenged to develop innovative technologies to enhance their academic communities'

learning and research pursuits. It has become a top priority to educate and prepare Malaysian youths to make a meaningful contribution to society's ever-changing industries and needs. Malaysia's Minister of Higher Education, Datuk Seri Noraini Ahmad, wrote in a prominent daily local newspaper that the provision of high-quality education is essential if Malaysians of all ages and backgrounds are to be empowered to gain new knowledge and improve their skills through access to a variety of online learning and educational resources [5]. Indeed, this is where Malaysian academic libraries can play their role in shaping their services to adapt to the emerging and increasing information wants, needs, and behaviors of university library users. In this regard, it can be said that academic libraries in Malaysia are well-equipped with Internet-driven and Web-based library and information services (WBLIS), giving their users better access, control, and flexibility to use the educational and research resources available and accessible online. Since this paper focuses on postgraduate students at Malaysian public universities as a specific type of library users, it seeks to examine the relationship between relevant factors that influence their utilization of WBLIS, as will be described in further detail below.

2. Problem Statement

In this study, the evaluation of the factors that influence the utilization of WBLIS in higher learning institutions reveals important gaps, including in knowing the frequency of use, as well as the learning and research outcomes achieved by students. In Malaysia, many studies of academic libraries focus on surveys to determine user satisfaction and perceived service quality. At the Universiti Malaysia Pahang (UMP), [6] students' perceptions and levels of satisfaction with service quality were investigated. [7] Similar research conducted at the Universiti Malaya (UM) library on service quality and customer satisfaction focused on academics, using SERVQUAL dimensions. Though the respondents in [7] stated that library services had a positive impact on their teaching, learning, and research, there is no further explanation given with regard to the outcome of WBLIS in terms of changes in their skills, competencies, and behaviors [8] and the extent to which WBLIS, for example, has stimulated their new thinking [9]. Furthermore, there is also a gap found in Malaysia in terms of studies that give emphasis to the frequency of use, which according to [2,3,10] has the importance of implying libraries' usage from the output perspective. Therefore, it becomes an interest of this present research to examine the context of the utilization of WBLIS from two perspectives: output (implicit) and outcome (explicit). Regarding the factors that influence the utilization of WBLIS, what is most fundamental is to align them accordingly with students' learning and research needs, and with their decisions and choices in utilizing the services. As a result of the initial search and review of the literature to be discussed below, three factors were identified: library technology, support, and environment.

3. Literature Review

The literature pertaining to the utilization of WBLIS was searched, acquired, analyzed, and reviewed. Particular emphasis was placed on the academic libraries at the institutions of higher education, with a focus on the research and learning needs of students.

3.1. Utilization of WBLIS

This study focuses on the utilization of WBLIS, which are comprised of five service points: library websites, WebOPAC, online databases, digital reference services, and institutional repositories. As highlighted previously in the problem statement section, the utilization of WBLIS examined in this study focuses on output and outcome perspectives. The output dimension is concerned with the frequency of use of WBLIS as outlined by [3] and [10] and considers the following:

- Visiting the library website as the primary gateway to information;
- Finding/retrieving books or other materials via WebOPAC;
- Finding/retrieving/downloading articles from online databases;

- Sending inquiries via digital reference services;
- Finding/retrieving/downloading a university's intellectual materials via a library's institutional repository.

For the purpose of data collection, the source of data is a survey that asks respondents to indicate their self-reported frequency of use of every WBLIS service point, as suggested by [2]. In addition, the same survey it aims to collect data from respondents in relation to the outcome dimension, with reference to [9], believing that utilization of WBLIS generates results as follows:

- Inspires new ideas/thinking;
- Helps to justify focus of study;
- Contributes to improved results of study;
- Helps to enhance knowledge and research skills.

3.2. Library Technology

According to [11], users' continuous desire to use a digital library is correlated with the perceived usefulness and the convenience of use of the WBLIS, which includes WebOPAC and electronic resources. In focus group interviews conducted to study the digital library (DL) system in the context of military education, the majority of respondents emphasized the need for providing sufficient information on each link to the library services on the DL system. Without enough description of the links to WebOPAC and electronic resources, for example, the users might not know the purpose of the services and would waste time navigating pages to access the needed content. This finding is in line with [12], revealing that if users found such services to be difficult to use and not user-friendly, they may turn their attention to finding alternatives. Scholars in [13] highlight postgraduate students' preferences for utilizing different databases and sources of information obtained in libraries or from other platforms. In fact, as per their research, postgraduate students prefer and use Google Search, Google Scholar, Wikipedia, Yahoo, and Amazon (weekly, 57.9%) above the library's electronic databases such as Emerald (weekly, 26.7%) and Ebsco (monthly, 14.3%). The reasons for this were that the students viewed Google Search, Google Scholar, and other search engines as being more accessible, less limited, and easier to access, use, explore, learn, and understand, as compared to subscribed library databases. Additionally, accessibility is a factor that may affect users' desire to utilize information resources available online or via mobile platforms [14]. Mobile internet was rated highly by 88% of 227 students because it is available from anywhere, at any time, and is more convenient to use, increasing access to library resources and services.

3.3. Library Support

As demonstrated in a survey at La Trobe University in Australia, 97% of respondents stated the academic library helped their learning and research success, and 90% claimed that being in the library connected them to the university and university life [2]. Meaningfully, the study disclosed that 69% of students with a self-reported A or B grade average utilized the online library every day or multiple times each week. In a more recent study, [15] presented findings on users' perceptions of library facilities at the University of Cape Coast. Due to their intensive research, postgraduate students were found to use the internet facility at the university library more than undergraduate students. This is also connected to the fact that their engagement in research requires considerable use of electronic resources. However, the participating postgraduate students all agreed that the academic library did not provide these resources in sufficient quantity. As a result, while the survey found that 86% of postgraduate students were aware of the library's internet and electronic resources, only 66% truly used the library's electronic services. This reveals how important library support and facilities are in shaping how students think their information needs are met and how much their positive or negative experiences would influence how much they utilize the library services. [16] found that at Sheffield University, students had misconceptions about academic librarians' functions. As the data revealed, out of 237 re-

spondents, 146 and 135 believed librarians' work related to book shelving and reservations, while only 38 and 35 recognized librarians' functions in providing subject-specific research assistance and teaching them information and research skills. This failure to understand the functions and expertise of academic librarians has caused the library support provided to be poorly utilized.

3.4. Library Environment

Academic libraries must have both physical and virtual presences to adapt to the evolving learning and research information system defined by online access to digital and global materials. As stated by [17], the existence of academic libraries at universities should not be limited by time or geography. One of the most important responsibilities of academic librarians, according to [18], is to adapt library services to students' shifting learning patterns. In this regard, [18] also underlined the necessity of analyzing and collecting user feedback on library spaces. [19] revealed their findings that using academic libraries as an area to study alone, in groups, or with technology has proven to be beneficial to first-year students. However, as students progress to the upper level of study, they will find that information resources become increasingly important, with less emphasis on library space. Regarding postgraduate students, [20] disclosed that whether enrolled in a taught or research program, these students have a specialized preference in terms of space use, placing the silent study room above the group space and communal spaces as their top priority. From [21]'s qualitative research on academic library users' preferences for virtual reference services, it was revealed that the aspects of personalness and informality are important to users. It is concerned with the convenience and synchronicity of communication methods with the librarians; for example, it considers convenient methods such as live chat provided by the virtual platform that influences them to utilize virtual reference services.

3.5. Conceptual Research Framework

Based on the research problems and the review of the literature, a conceptual research framework is developed and assessed to examine the relationship between three factors: library technology, support, and environment (known as TSE factors), as well as the utilization of WBLIS (known as WBLISU) in academic libraries that focus on postgraduate students in Malaysia. The conceptual research framework is shown in Figure 1.

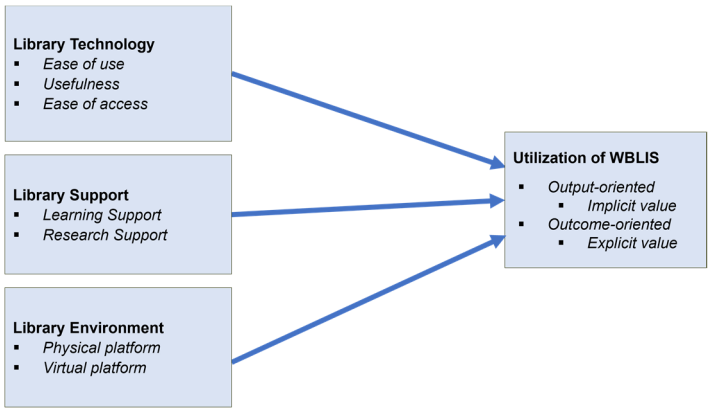

Figure 1. Conceptual research framework.

Based on the framework, the purpose of this study is to examine the relationship between TSE factors as the independent variables (IV) and the utilization of WBLIS as the dependent variable (DV). Each variable has its dimensions as depicted in Figure 1. In line with the framework, three hypotheses have been developed, as stated below:

- *H1: Library technology has a significant relationship with the utilization of WBLIS.*
- *H2: Library support has a significant relationship with the utilization of WBLIS.*
- *H3: Library environment has a significant relationship with the utilization of WBLIS.*

4. Methodology

Using the technique of non-probability sampling, a research framework was tested with postgraduate students from 20 public institutions. Prior to the actual data collection, the instruments' validity and reliability were determined by preliminary testing. Experts in the field of Library and Information Management provided reviews and feedback, which were followed by a pilot study involving 49 postgraduate students from public universities in Malaysia. The goal of the pretesting in this study is to assess the effectiveness of the questionnaire so that potential respondents can understand all items, and to offer the most direct evidence for the validity of the questionnaire data for each item. For the actual data collection, the sample size of 383 was determined by the Raosoft calculator, and stratified sampling was utilized to represent three university clusters: research, comprehensive, and targeted universities. Using a five-point Likert Scale with 38 distinct items, a web-based questionnaire was developed. To evaluate the hypotheses, data from 527 respondents were gathered and analyzed using SMARTPLS version 3 software. In this investigation, the single factor test of Harmon was employed to remove the bias produced by data collection from a single source. In this investigation, all measurement model and structural model requirements were satisfied. Finally, an examination of the structural model was conducted in order to evaluate the hypothesized relationships between variables.

5. Findings

This section describes the demographic profile of respondents who have participated in this study. Next, it discusses the reliability results, and finally, the related findings that are aligned with the research objective to examine the relationship between three factors, including library technology, support, and environment, as well as postgraduate students' utilization of WBLIS in academic libraries.

5.1. Demographic Profile

362 of the 527 respondents were female, while 165 were male, as shown by the respondents' demographic profiles. According to their composition by university clusters, 184 responses were collected from research universities, 112 questionnaires were gathered from focused universities, and 231 responses were obtained from comprehensive universities. Next, 344 respondents were enrolled in research-based programs, 141 respondents were enrolled in coursework-based programs, and 42 respondents were enrolled in mixed programs. The study received 275 responses from master's degree students. Additionally, 249 doctoral students but just 3 postgraduate diploma students participated in this investigation.

5.2. Common Method Bias

The Common Method Bias (CMB) test is required for this study to guarantee that the measurements are reliable and valid. To address concerns regarding how CMB may affect the study's results, Harman's one-factor test was used. In Harman's test, all items (measure latent variables) are consolidated into one common factor. In this study, all 38 items from all constructs under examination were analyzed and limited to a single factor. As a result, the single component amounted for only 33.327% of the overall variance, which is less than the benchmark value of 50%, indicating that common technique bias was unlikely to be a contaminant of the study.

5.3. Reliability Analysis

Cronbach's alpha coefficients were used to measure the reliability and internal consistency of the scales used in the study, as shown in Table 1. Cronbach's alpha values for all factors were more than 0.6, indicating that the reliability level was sufficient and acceptable (George and Mallery, 2003). The overall consistency, or Cronbach's Alpha values, of all 38 items for each dimension featured in the instrument ranged between 0.639 and 0.932. The usefulness dimension was discovered to be the most important, with a score of 0.932.

Research support obtained the lowest value of 0.639, and according to George and Mallery (2003), this dimension should be kept because dropping any of its elements would not significantly raise the value. This indicates that the overall index of the scale's internal consistency within the instrument is reliable, without unexpected abnormalities in the data.

Table 1. Reliability analysis results.

Variables		Number of Items	Cronbach's Alpha
Library Technology	Ease of Use	4	0.896
	Ease of Access	4	0.857
	Usefulness	4	0.932
Library Support	Learning Support	5	0.795
	Research Support	4	0.639
Library Environment	Physical Space	4	0.857
	Virtual Space	4	0.861
Utilization of WBLIS	Output	5	0.722
	Outcome	4	0.913

5.4. Findings: The Relationship between TSE Factors and the Utilization of WBLIS

The examination of structural models was conducted to evaluate the relationship between the structural models' importance and their relevance. Refs. [22,23] recommended the use of bootstrapping to identify the significance and relevance of structural model linkages. Table 2 displays the path coefficient values for the structural model. In this investigation, the T-value varies between 4.32 and 9.499. This shows a statistically significant connection (T-value greater than 1.645 and *p*-value below 0.05). In this study, the *p*-value is 0.00 for all variables, which is statistically significant. This is supported by Hair et al. (2017), who stated that a *p*-value of 0.05 is the minimum acceptable level for one-tailed and two-tailed tests.

Table 2. Path Coefficient of the Structural Model.

	T Values	*p* Values
Library Technology -> WBLISU	9.499	0.000
Library Support -> WBLISU	4.222	0.000
Library Environment -> WBLISU	4.321	0.000

Derived from the analysis results depicted in Table 2, below are the findings of the hypotheses testing shown in Table 3.

Table 3. The Findings of Hypotheses Testing.

Variables	Hypotheses	Findings
Utilization of WBLIS; Library Technology	H1: Library technology has a significant relationship with the utilization of WBLIS.	Supported (T–9.499, *p*–0.000)
Utilization of WBLIS; Library Support	H2: Library support has a significant relationship with the utilization of WBLIS.	Supported (T–4.222, *p*–0.000)
Utilization of WBLIS; Library Environment	H3: Library environment has a significant relationship with the utilization of WBLIS.	Supported (T–4.321, *p*–0.000)

6. Discussion and Conclusions

As this study demonstrates a significant correlation between library technology and the utilization of WBLIS among postgraduate students, this conclusion is congruent with those of previous studies. The authors of [24] determined in a study on the impact of undergraduate students' adoption and usage of mobile library applications in academic libraries at Joongbu University that perceived usefulness, interactivity, and ease of use of mobile apps have a significant impact on students' attitudes and intentions regarding adopting mobile applications. According to [25], the use of web library services by students is determined by their views on how they help to complete learning courses and tasks efficiently and on time. In addition, [12] noted that the lack of use of digital library resources to enhance teaching and learning among users was due to their perceived usefulness and usability in the context of Web resources. Regarding ease of access, it is necessary for academic libraries to take note of the various types of effort that users prefer to minimize and how it is possible to enable them to do so, with the ultimate goal of improving their information-seeking experience that will boost their desire to utilize WBLIS via online or mobile platforms [14].

The statistical results suggest that library support has a significant relationship with the utilization of WBLIS by postgraduate students. In this situation, library support involves encouraging postgraduate students to use WBLIS in their academic libraries in support of their learning and research activities. This finding is supported by previous studies. According to [26], the role and involvement of academic librarians in supporting the educational mission through their instructional efforts that result in student learning outcomes would increase the visibility and value of the academic library to the parent institution. On the contrary, as pointed out by [16], students' failure to comprehend and acknowledge the roles and skills of academic librarians is the root cause of their underutilization of library resources and services.

This study reveals that the library environment is a significant predictor of WBLIS utilization among postgraduate students. Academic library users should be able to utilize WBLIS and effectively communicate and complete their work in library environments that are regarded as including both physical and virtual spaces. According to [27], academic libraries must be always readily accessible and visible to their users in any location. In this context, to sustain their relevance in the rapidly developing learning and research information environment, which is defined by online access to digital and ubiquitous content, academic libraries must have a virtual presence. Meanwhile, the physical space remains important to students. The researchers of [20] disclosed that the academic library is perceived as primarily a place for learning and information-seeking by students, whether undergraduate or postgraduate.

Finally, this research is anticipated to offer substantial theoretical, methodological, and practical contributions to the field of academic librarianship and related fields of study. In addition, the management of Malaysian universities and the Ministry of Higher Education will be able to understand more about crucial aspects involved in enhancing the positive effects academic libraries have on students' learning and research, as well as the universities' institutional impact and value.

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