Role of Absorptive Capacity in Predicting Continuance Intention to Use Digital Libraries: An Empirical Study

Mohamed Emran Hossain[1], Touhid Bhuiyan[2], Imran Mahmud[2(✉)], T. Ramayah[3], and Brenda Scholtz[4]

[1] Universiti Sains Islam Malaysia, Nilai, Malaysia
emran@daffodilvarsity.edu.bd
[2] Daffodil International University, Dhaka, Bangladesh
{t.bhuiyan, imranmahmud}@daffodilvarsity.edu.bd
[3] Universiti Sains Malaysia, Penang, Malaysia
ramayah@usm.my
[4] Nelson Mandela University, Port Elizabeth, South Africa
Brenda.Scholtz@mandela.ac.za

Abstract. The purpose of this paper is to investigate the impact of absorptive capacity and the quality dimensions of technology on students' continuance intention to use the e-library system. To measure the continuance intention, an integrated research model was developed using expectation-confirmation theory (ECT) and absorptive capacity theory. This empirical study was undertaken at a university in Bangladesh with a sample size of 297. Data was collected via a survey questionnaire. The results reveal that the dimensions of absorptive capacity have a strong effect on confirmation of the system and a partial impact on perceived usefulness (PU). Confirmation of the system has a significant effect on the PU of and satisfaction with the system. Satisfaction was found to be a strong predictor for the continuance intention to use the e-library. Finally, ECT fully fits in this context and students' satisfaction has the largest effect on the continuance intention.

Keywords: Absorptive capacity · Bangladesh · Continuance intention
e-library · Expectation-confirmation theory · Partial least squares

1 Introduction

In the current digital era, students and teachers across all educational levels are extensively using information technology (IT). Those who use IT for academic activities within schools, colleges or universities can be classified in different ways—as digital natives, the Google generation, or the Internet generation [1]. Among other technologies within the academic environment, there has been a global increase in the provision of online library services, which provide access to digitized traditional books, e-books, online journals, research papers and theses [2]. According to [3], 70% of students complete their tasks online. Additionally, 77% of educators consider online education to be similar to face-to-face teaching, and perceive an electronic library

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(e-library) as a powerful, reliable, and valid way for students to prepare high-quality reports [4]. The advantages of using an e-library include efficient services and remote access, improved ease of tracking digital resources and flexibility in searching [5]. Academic online library provides information-rich products, catalogues, digital collections and also allow access to students/researchers high quality scientific information through the web [6].

An e-library is a new concept that could enhance teaching and learning in developing countries like Bangladesh [2]. Despite the lack of interest from the University Grants Commission (UGC), two public universities currently provide partial support for an e-library. Meanwhile, private universities, such as the Daffodil International University (DIU), BRACU and ASAUB, offer full e-library support by collaborating with global libraries [2].

This research focuses on the e-library of DIU, a renowned university in Bangladesh. Despite providing a comprehensive web-based library [2] (see Table 1), DIU has found that student adoption of the e-library is still low. Among the students who have adopted the e-library, total usage is at 55.75% (see Table 2), which means that 44.25% of resources remain unused. As a result, attention is needed to measure the continuance intention which indicates students are influenced by the initial use of e-library to continue to use it further.

Table 1. Online resources of DIU library

Number of registered students in library	10,148
Online book transition report monthly and yearly	Monthly = 2,350 Yearly = 29,850
Total number of books, e-books, journals, articles, and other resources	Books = 26,250 E-books = 13,985 Articles and Journals = 13,877 Voice Library = 32 E-magazines = 286
Connection with foreign libraries, IEEE saga, etc.	30
Frequency of e-books, journals, articles, and others resources downloaded	E-books = 150 Articles and Journals = 167 Voice Library = 80 E-magazines = 100
Member information: 1. Number of male and female students 2. Number of students based on department	1. Male students = 6,780 2. Female students = 3,368 (i) FSIT = 4,124 (ii) Business and Economics = 3,100 (iii) Allied health Science = 685 (iv) Humanities and Social Science = 719

Table 2. Online resource usage of DIU library

	Items	Frequency	Usage
Books	26,250	29,850	113%
E-books	13,985	150	1.07%
Articles and Journals	13,877	167	1.2%
Voice Library	32	80	250%
E-magazines	286	100	34.96%

The purpose of this paper is to understand the phenomenon of continuance intention of students to use an e-library and the antecedents affecting this. This study aims to extend the expectation-confirmation theory (ECT) for information systems' (IS) continuance intention suggested by [7] by integrating the absorptive capacity theory identified by [8]. Thus, the research question of this study is:

RQ: Is there a relationship between a student's absorptive capacity and their continuance intention to use an e-library system?

Drawing on the ECT for IS continuous and absorptive capacity theories, it is proposed that absorptive capacity of understanding, assimilating and applying have a positive effect on perceived usefulness (PU) and the confirmation of using an e-library, which will lead to students' satisfaction and continuance intention of the e-library. The research question of this study was addressed by distributing a survey among users of the e-library provided by DIU and analyzing this data.

This paper is organized as follows: the first section presents a brief review of e-libraries in Bangladesh, the relevant literature, and highlights the unique contributions of the work, while the second section outlines the theoretical foundation of the research. The third section discusses the research model and identifies the hypotheses that were tested, which is followed by a summary of the research method, a description of the data analysis and presentation of the results. Finally, the findings, the implications thereof and future research directions are discussed.

2 Introduction Theoretical Foundation and Development of Hypotheses

2.1 Expectation-Confirmation Theory for IS Continuance

The concept of ECT is based on the satisfaction observed in users' behaviour after the purchase of an item. ECT is widely used in marketing, where [9] suggested that measuring consumer behaviour and customer satisfaction is essential, for they are key determinants of subsequent behaviour, such as repurchase intention. In the case of IT use, [7] suggested using ECT to measure the post-implementation behaviour of users. The model of ECT was thus renamed to the expectation-confirmation model (ECM).

The ECM suggests that the users' intention to reuse a product or continue service use is determined primarily by their satisfaction with prior use of that product or service (see Table 3). Satisfaction is viewed as the key to building and retaining a user's focus

Table 3. Definition of the constructs of ECT theory

Constructs	Definition
Perceived usefulness	Users' perception of the expected benefits of System use
Confirmation	Users' perception of the congruence between expectation of system use and its actual performance
Satisfaction	User satisfaction with prior use of that product or service
Continuance intention	Users' intention to continue using the system

on a system. Thus, investing in user satisfaction should result in the continued intention to use that system.

[10] declared PU, adapted from TAM model, to be a key determinant of user satisfaction because it reflects a long-term belief in the expected benefits of the system. In literature, ECT-IS continuance theory was used to measure the continuance intention of different technologies such as the virtual community [11], mobile messaging [12], information system continuance [13], and online shopping [14]. In the e-library context, a similar idea was emphasized by [15, 16]. As a result, the first formulated hypothesis of the paper is:

H1: PU has a positive effect on satisfaction with an e-library system.

User confirmation (CON) is assessed by users to determine their evaluative response of the system. CON is also a determinant of PU and satisfaction with the system in an educational setting [15]. So, the following hypotheses are:

H2: User confirmation has a positive effect on the PU of an e-library system.
H3: User confirmation has a positive effect on satisfaction with an e-library system.

The users' intention to continue using the IT system primarily relates to their level of satisfaction with using this system. [7] reported that, after the first stage relating to users' belief of the PU of a system, the users' confirmation of using that system will follow. Finally, if they are satisfied with the functionality of the system, they may continue to use it. Similar results were found in the e-library context from the research of [15, 16]. Thus, the fourth hypothesis of this study is:

H4: User satisfaction has a positive effect on his/her continuance intention of an e-library.

2.2 Absorptive Capacity and IS Continuance

[8] described absorptive capacity as a theory that investigates the capabilities of a firm to understand, assimilate, and apply new knowledge through its employees. The theory explained that an organisation could become innovative and achieve a higher level of employee performance when its employees absorbed new knowledge. Absorptive capacity has been applied in a diverse range of research streams, such as knowledge management, IT governance, IT innovation, IT business value and IT adoption [17].

Table 4. Definition of the constructs of absorptive capacity

Construct	Definition
Absorptive capacity for understanding (ACU)	Users' ability to understand the system and its exact value
Absorptive capacity for assimilating (ACA)	Users' beliefs about their ability to operate the system
Absorptive capacity for applying (ACC)	Users may use the system if they have relevant basic knowledge, confidence in their operational ability, and the ability to apply the knowledge gathered from the system to improve learning outcomes

The dimensions of absorptive capacity are understanding, assimilating and applying (see Fig. 2). Several definitions of the constructs of absorptive capacity are provided (see Table 4).

According to [18], the applicability of absorptive capacity is in the context of innovation, inter-organizational learning and new product development which can foster a firm's performance. To adopt knowledge, it is necessary to examine absorptive capacity as a skill of users [19]. [20] argued that, the dimensions of absorptive capacity improve the accuracy of the purpose of any system, accelerate the innovation and enhance learning within the organization.

Absorptive capacity has a positive impact on users' decision quality in deciding whether to use an IS system [21]. In educational settings, [22] explained that a new IS with innovative and useful features but poor understanding will lead to difficulties in using this system, which is also confirmed by the previous research of [23]. As a result, [22] emphasized that absorptive capacity had a positive relationship with the PU of a system related to student learning. So, three additional hypotheses of this paper are:

H5: Absorptive capacity for understanding has a positive effect on the PU of an e-library.
H6: Absorptive capacity for assimilating has a positive effect on the PU of an e-library.
H7: Absorptive capacity for applying has a positive effect on the PU of an e-library.

Absorptive capacity proved successful not only for existing knowledge but also to exploit newly acquired knowledge to perform regular tasks. Universities have invested resources to develop e-libraries, but if students fail to adopt these systems, the universities may decide not to adopt an e-library in the future [19]. This consequence implies that a lower level of absorptive capacity of assimilation will decrease the confirmation of an e-library. Meaningful learning is a non-stop process that involves linking different information with existing student knowledge and extends learning beyond an educational institution [23]. [22] suggested that if students feel confident in their ability to use e-library resources, it is possible that the e-library will a have high potential to make their learning as comfortable as possible. These considerations lead to the following three hypotheses:

H8: Absorptive capacity for understanding has a positive effect on the confirmation of using an e-library.
H9: Absorptive capacity for assimilating has a positive effect on the confirmation of using an e-library.
H10: Absorptive capacity for applying has a positive effect on the confirmation of using an e-library.

Finally, the integrated research model is shown in Fig. 1

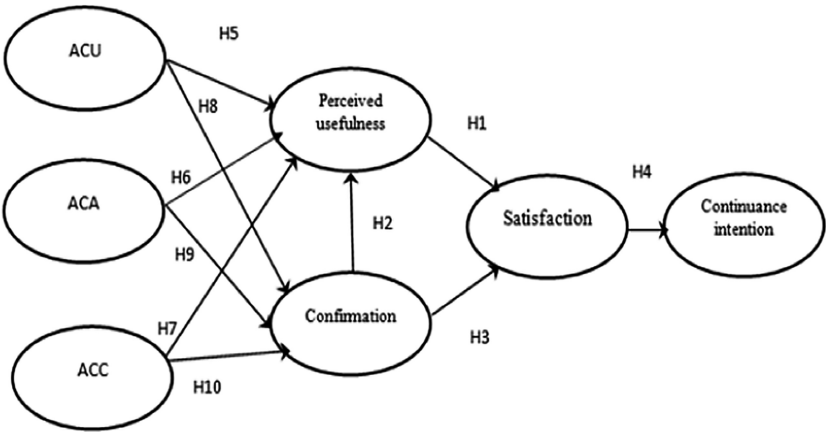

Fig. 1. Proposed research model

3 Research Method

3.1 Data Collection Procedure

The target participants of the study were undergraduate students of DIU from three different campuses. Data was obtained from students who were aware of the e-library provided by DIU and who were registered users of this e-library. Data for this study was collected through a self-administered questionnaire. Research assistants from the project team handed the questionnaires to lecturers who were willing to distribute these questionnaires to their students. Four hundred questionnaires were distributed and 297 were returned with full responses (response rate of 74.25%). The questionnaire consisted of two sections. The first section captured demographic data of the students, while the second section captured information about their absorptive capacity, their level of satisfaction, and their intention to continue using the e-library. The sampling method used in this research was purposive sampling due to two criteria: (1) students must be aware of the e-library provided by the university; (2) Students must visit the system at least once during the course of their studies.

3.2 Measurement

The evaluation metrics in the study were all adapted from published literature. The evaluation metrics for absorptive capacity were adapted from research by [22] PU was adapted from research by from [15], while satisfaction, confirmation and continuance intention were adapted from research by [23].

3.3 Profile of Participants

Demographic information including gender, age and department were collected for the 297 participants of the study (see Table 5). Among the participants, 80.5% were male and 19.5% were female. Most participants (77.7%) were aged between 21 and 24 years old, 21.8% of participants were below 21 years old and 1.5% were aged 25 years old or older.

Table 5. Demographic information

Demographic	Frequency	Percentage
Gender		
Male	239	80.5%
Female	58	19.5%
Age group		
18–20 years	65	21.8%
21–24 years	231	77.7%
25 years and above	1	0.5%

4 Data Analysis and Result

4.1 Measurement Model

To assess the measurement model, two types of validity were examined: firstly the convergent validity and secondly the discriminant validity. The convergent validity of the measurement is usually ascertained by examining the loadings, average variance extracted (AVE), and composite reliability (CR) [24]. The loadings were all higher than 0.7, the composite reliabilities were all higher than 0.7, and the AVE were higher than 0.5, as suggested by [24] (see Table 6). The result of item loadings, AVE and CR are provided in Table 6.

The discriminant validity of the measures, i.e. the degree to which items differentiate among constructs or measure distinct concepts, was examined by following the [25] approach of comparing the correlations between constructs and the square root of the AVE for that construct (see Table 7). All the values on the diagonals were greater than the corresponding row and column values, thus indicating that the measures were discriminant.

Table 6. AVE and CR

Constructs	AVE	CR
ACA	0.763	0.906
ACC	0.673	0.861
ACU	0.584	0.847
CI	0.667	0.889
CON	0.726	0.888
PU	0.649	0.880
SA	0.693	0.900

Table 7. Discriminant validity

	ACA	ACC	ACU	CI	CON	PU	SAT
ACA	**0.873**						
ACC	0.492	**0.821**					
ACU	0.536	0.579	**0.764**				
CI	0.260	0.491	0.455	**0.817**			
CON	0.686	0.626	0.586	0.425	**0.852**		
PU	0.372	0.444	0.443	0.614	0.510	**0.806**	
SAT	0.390	0.409	0.471	0.575	0.526	0.690	**0.832**

4.2 Structural Model

From the final result of the structural model, it was identified that among the ten hypotheses proposed for this study, only H_6 was not supported (see Table 8). The original ECT-IS continuance theory was very strongly supported. PU had a strongly positive relation and large effect size with SAT ($\beta = 0.570$, $f^2 = 0.496$), where confirmation had a positive relation and small effect with both SAT ($\beta = 0.234$, $f^2 = 0.084$) and PU ($\beta = 0.331$, $f^2 = 0.063$). Finally, significant evidence was found for the relation between SAT and continuance intention (CI) of the e-library ($\beta = 0.575$, $f^2 = 0.493$).

Table 8. Hypothesis test result

Hypothesis	Relationship	Beta value	T value	Decision
H1	**PU- > SAT**	0.570	12.179	Supported
H2	**CON- > PU**	0.331	4.935	Supported
H3	**CON- > SAT**	0.234	4.371	Supported
H4	**SAT- > CI**	0.575	14.585	Supported
H5	**ACU- > PU**	0.177	2.873	Supported
H6	**ACA- > PU**	–0.023	0.337	Not Supported
H7	**ACC- > PU**	0.146	2.279	Supported
H8	**ACU- > CON**	0.170	2.922	Supported
H9	**ACA- > CON**	0.443	7.925	Supported
H10	**ACC- > CON**	0.309	4.918	Supported

Absorptive capacity of understanding (ACU) had a positive significant relation with both PU (β = 0.177, f^2 = 0.025) and Confirmation with a small effect size (β = 0.170, f^2 = 0.042). From this result, it was also identified that the relation of absorptive capacity of assimilating (ACA) with PU (β = –0.023, f^2 = 0.000) was not supported, but supported with CON with a medium effect size (β = 0.443, f^2 = 0.323). The relation between absorptive capacity of applying (ACC) and PU was supported, but with a very weak relation and no effect, but with CON, ACC had a strong positive relation and small effect size (β = 0.309, f^2 = 0.147). See final model in Fig. 2.

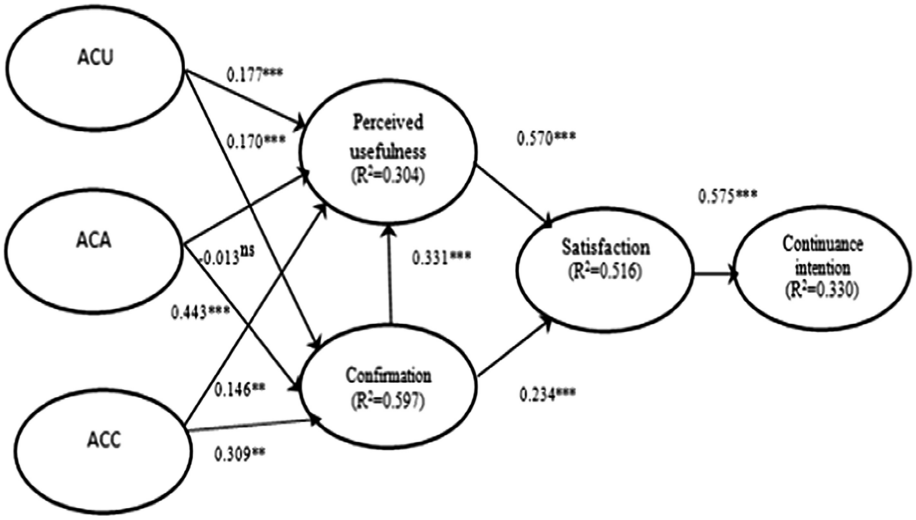

Fig. 2. Final research model with result

5 Discussion

5.1 Relationship Among the Variables Within ECT

This research aimed to understand the role of absorptive capacity in order to measure the continuance intention of students to use an e-library. The resulting research model was conceptualized based on the integration of ECT for IS continuance theory or ECM together with absorptive capacity theory. This research examined the impact of absorptive capacity (understanding, assimilating, and applying) on the PU and confirmation of using an e-library, both of which lead to user satisfaction and continuance intention. The results indicated that PU had a large effect, while confirmation had a small effect on students' satisfaction and satisfaction had a very high impact on students' continuance intention of the e-library. It can be deduced that satisfaction is the key to explaining students' continuance intention of the e-library.

This result also reveals that the ECT-IS continuance theory fits within this context, which is consistent with previous research in educational environments by [15, 16]. Since the variable satisfaction has the highest impact on students' continuance

intention, it implies a need for further research to identify the antecedents that have the highest variance and effect on user satisfaction.

5.2 Impact of Absorptive Capacity on ECT

In the case of absorptive capacity, ACU was a significant predictor of the PU and confirmation in using an e-library. These results confirm the research of [17, 22]. ACC is also a significant predictor for confirmation and PU, which is similar to previous research of [17, 22]. ACC led to a medium effect on confirmation and a very weak effect on PU, which implies that some students believe in the importance of the e-library in reaching their academic goals, but not all students agree. It is assumed that since the participants were pursuing an undergraduate bachelor degree, they may possibly not know how to use e-library resources and depend largely on textbooks. Surprisingly, in this study, the ACA, which focused on students' ability to operate the e-library, was not significant with the PU but was significant with the confirmation of the e-library. This finding contradicts the findings of previous researchers. Absorptive capacity improves users' knowledge, which is critical in the IS environment. The university administration and faculty should provide more scope to learn and operate the e-library. For example, providing a manual on how to use the e-library and/or conducting a demonstration on how to use online resources for classroom studies could also assist in becoming familiar with the e-library [22]. In addition, to improve student perceptions of absorptive capacity in an e-library, appropriate training should be provided to the students, thus increasing their familiarity with the e-library environment.

[26, 27] explained that increased participation in the system by top management leads to a higher assimilation of knowledge within the organization. This notion implies that if teachers and employees of institutions use the e-library to upload resource materials or provide students tasks that require the use of the e-library, then assimilation will increase.

6 Conclusion

The first theoretical contribution of this research was the extension of the ECT-IS continuance theory. The majority of previous research focused on e-library adoption and limited research had aimed to integrate absorptive capacity within their research models. The second theoretical contribution was to evaluate the impact of absorptive capacity on users' perception of the usefulness and confirmation of an e-library. Previous literature mostly investigated absorptive capacity in a mandated environment, where users were required to use the system regardless whether they understood the system or not— for example an enterprise system [17, 26]. The proposed research model will provide scientific insights into using absorptive capacity in a voluntary context.

Further, the final research model will encourage the stakeholders of an e-library (developers, librarians, university administration) to focus on the significant variables and analyze the impact on students' continuance intention, which is vital for the success of any university's e-library. This research examined the motivation for and

understanding of the factors that drive students towards using an e-library. The research also offers a further research area for academics to measure students' intention before investing resources to expand and improve the e-library associated with their organization.

This study provides insight into the factors influencing students' continuance intention of an e-library in relation to the students' absorptive capacity dimensions: understanding the e-library, belief in using the system and belief of applying the e-library to assist in furthering their education. The significant absorptive capacity of understanding, applying, confirmation and satisfaction to continuance intention was outlined. The study contributes to a better understanding of the ECT and how to improve the usage of an e-library. Factors related to the ECT should be emphasized for students to use the e-library. Further investigation and analysis of this research will assist system developers, librarians and university administration to integrate enjoyment factors within the e-library. Research was undertaken to measure students' continuance intention of an e-library at DIU, which used existing library software, Koha, and was linked with rich resources from various academic and research organizations, such as the British Council, Bangladesh Bureau of Statistics (BBS), The Asia Foundation, Bangladesh Bank, and the Center for Policy Dialogue Bangladesh (CPD). Due to the students' lack of use of the e-library resources, this research sought to measure the students' continuance intention of the e-library. The results of this research contribute to existing literature on e-library implementation projects as well as on ECT-IS continuance intention theory in the field of information systems.

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