Doi :10.30473/IDEJ.2023.66989.1140 **ISSN:** 2588-4476

Iranian Distance Education Journal

Vol. 6, No. 2, Summer-Autumn 2024 (P 15-26), Payame Noor University

Review Article

Presentation of student retention pattern in e-learning environment (Case study) of Payame Noor University

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Received: 202٤/0٧/22 **Accepted:** 2024/١٠/22

Abstract

The present study was done with the aim of presenting student retention pattern in e-learning environment of Payame Noor University. This research was carried out using an exploratory (qualitative-quantitative) method. In the qualitative section, the Meta-Synthesis Research method was used to infer the pattern. Using qualitative method, the literature investigation and survey of experts through Delphi method were developed to a set of the dimensions and components affecting the electronics student retention. And the primary pattern was designed with 5 dimensions and 14 components. Then, in a quantitative section, a survey research method was used to validate the pattern and confirm it, and a questionnaire was used for collecting required data. The results of data collection after adjustment and tabling were analyzed by statistical tests (exploratory and confirmatory factor analysis (. To confirm the content validity of the research tool the researcher used the experts and also to determine the validity of the tool measurement construct, she/he used confirmatory factor analysis. All of the questions' variables were fitted with factor load. The reliability of the tool was confirmed by the Cronbach's alpha coefficient. According to research findings, the components and final dimensions of student retention pattern in the e-learning environment were identified and classified in 5 dimensions including learner, quality of educational services, teacher, environment, technology, and 14 components including psychological characteristics, previous experiences, academic background, computer management skills, interaction, course design, organizational support, teacher's knowledge, teacher's skills, teacher's attitude, supportive environment, job commitment, quality of technology and Internet quality.

Keywords

pattern, retention, electronic environment.

Introduction

Nowadays, universities are under increasing pressure to offer effective educational programs and deliver impactful results. While decades ago students were inclined to enroll in a specific university and graduate from it, conditions have changed. Most students are now mobile or do not have enough time to attend traditional universities. E-learning institutions strive to attract these students, along with organizational control over their educational experiences and curriculum. Moreover, these institutions are obliged to be accountable to students, employers, government organizations, and the relevant sectors for the performance evaluation of their graduates. Given that most people are concerned about the increasing costs of higher education, e-learning institutions try to minimize costs, maximize the market, and retain their customers while satisfying their critics. In fact, customer retention is a significant issue for e-learning institutions after the applicants' registration.

Every year, the number of institutions offering e-learning courses and the number of e-learning courses offered within these institutions increases [1]. The efforts and experiences

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related to this type of learning are highly regarded worldwide. In Iran, most universities are also extensively using this technology. Furthermore, some of them have taken steps to accept distance education students.

Despite the increasing popularity of e-learning and its ability to attract the attention of most students, studies show that the dropout rate for online courses has been steadily and significantly increasing compared to traditional courses [2,3,4]. This has raised significant concerns about the issue of student retention in the e-learning path. Research has shown that student retention, due to the complexity and multidimensionality of the subject matter, can be influenced by various factors in the e-learning environment.

Tinto [5] emphasized the impact of two factors, academic and social integration, on retention in his model of dropout in traditional and e-learning courses. Morris, Wu, and Fenggan [6] highlighted several studies that focused on learner characteristics in their theoretical analysis of retention. These characteristics include age (Ker [2]), gender, educational background [7], social and academic integration [8], locus of control and financial aid [9], and intrinsic motivation to continue learning [10 [11].

Additionally, San et al. [12] emphasized the learner, teacher, course and class, technology, design, and environment factors and concluded that learner dissatisfaction leads to e-learning failure and will inevitably result in the learner dropping out of the course.

Choi and Khan [13] concluded that social presence, gender, previous experience with e-learning, relevant educational experiences, previous academic achievement, instructor attention and care, all have an impact on the performance of e-learners. Exynos et al. [14] stated that familiarity with technology, age, gender, and previous experiences in related fields (such as familiarity with how to use a computer) are related to the ability to estimate the time needed to complete academic tasks and the level of difficulty of working with computers. Dupin-Bryant [15] found a correlation between previous experience and computer training and completing online courses. According to Lee et al. [16], Morris, Woo, and Fingon [6], Parker [17], internal locus of control is not only a strong predictor of learner retention but also predicts learner satisfaction [18,19].

Research in the field of flow experiences also suggests that optimizing online guidance, which is a feature of flow experiences, can prolong online sessions for users [20,21] and improve learning performance and positive effects [22,23,24]. Lee, Jung, and Chen [25] concluded in their study that perceived usefulness and perceived enjoyment have a significant and direct impact on individuals' inclination and intention to use e-learning services. Venkatesh and Broun [26] also demonstrated that pleasurable outcomes such as pleasantness, enjoyment, happiness, well-being, all serve as internal motivators for technology acceptance. In Lin, Wu, and Tsai's study [27] and Sheng et al.'s study [28], perceived enjoyment was also shown to have a significant contribution to users' intention to use e-learning.

With the increasing competition among various universities, especially Payame Noor University, which is currently seeking to attract and retain more students through the implementation of online courses, each university is striving to attract more applicants to benefit both the applicants and the government. Therefore, attention and focus on this issue is one of the most important and fundamental matters in universities, research centers, and especially the Payame Noor electronic education system. Accordingly, this research aims to present a model for student retention, through which officials and stakeholders of the electronic education system and Payame Noor universities can plan the necessary educational programs to increase the number of students and improve the course completion rate among students.

Research Objective:
The objective of this study is to present a retention model for students in an electronic learning environment at Payam Noor University.

Research Question:
Based on previous studies, the current research aims to address the following question:

What model can be proposed for retaining students in the electronic learning environment of Payam Noor University?

Research Methodology
The present study belongs to the category of applied research, which has been conducted in a descriptive, quantitative, and qualitative manner. In the qualitative section, first, the concepts and theoretical foundations of the relevant studies conducted on the subject of the study were placed, and this made it possible to identify the dimensions and influential components of the durability of students' knowledge in the e-learning environment (according to tables 2 and 3). After collecting the above data, a researcher-made questionnaire was prepared and made available to the target population (students) to test the model.

The statistical population of the research includes 6000 e-learning students of Payam Noor universities who were studying at one of the 19 educational poles of this university and using the electronic services of Payam Noor University. Among the 19 e-learning poles of Payam Noor, Tehran e-learning pole was selected, and then among the e-learning poles of Tehran, the west and north poles of Tehran were chosen. According to the Cochran formula, an appropriate sample size of 361 people was estimated, which was selected as 380 people considering the sample dropout. Finally, 360 questionnaires were completed. The validity of the questionnaire was confirmed according to the experts' and stakeholders' opinions. Cronbach's alpha method was used to determine the reliability, and the range of alpha values was calculated as shown in table 1, indicating the desired reliability of the research tool. Confirmatory factor analysis and Pearson correlation matrix were analyzed using SPSS version 19 and Lisrel software.

Table 1. The range of alpha values of Cronbach's alpha method.

Dimensions	Alpha value	
Learner	0/83	
Quality of educational services	0/82	
Environment	0/84	
Instructor	0/83	
Technology	0/83	

Research Findings:
The logical model extracted in the qualitative stage of the research was tested using t-tests and factor analysis, yielding the following results:

Table 2. Results of the first round of Delphi testing to examine dimensions.

Variable	Mean	SD	t	Sig
Learner	4/43	2/21	4/23	0/001
Quality of educational services	3/90	2/02	4/03	0/004
Environment	3/78	2/20	3/08	0/016
Instructor	3/94	1/23	3/95	0/010
Technology	1/16	1/78	4/82	0/001

For this round, the Kendall's coefficient of concordance was found to be 0.29 and the Kruskal-Wallis test was equal to 67.8 with 4 degrees of freedom and a significance level of 0.001. Based on the information in Table 2 and the high values of Kendall's coefficient and the insignificance of the difference between the mean ranks, there is a consensus among panel members (consisting of 6 experienced experts in electronic education in the first stage and 30 experts in the second stage) and the obtained dimensions have been approved by the experts. Accordingly, based on these dimensions, the pattern components were formulated and in the second round, the components and indicators are examined by experts.

Table 3. Results of the Second Round of the Delphi Test to Examine Research Components

Variable	Mean	SD	t	Sig
Educational background	3/77	1/21	6/02	0/001
Previous experiences	4/82	1/19	7/77	0/001
Computer & management skills	3/45	1/34	8/65	0/001
Psychological characteristics	3/36	1/27	4/32	0/001
Course design	3/81	1/23	4/54	0/001
Institutional supports	3/65	1/10	5/87	0/001
Interactions	3/78	1/08	6/67	0/001
Work commitments	3/74	1/04	7/01	0/001
Supportive environments	3/71	1/42	3/93	0/003
Instructor knowledge	3/73	1/42	4/45	0/001
Instructor attitude	3/21	0/93	4/23	0/001
Instructor skill	3/14	1/69	4/45	0/008
Technology quality	3/48	1/08	4/67	0/001
Internet quality	3/78	1/23	3/04	0/001

For this round, the Kendall's coefficient of concordance was 34/0 and the Kaisquare was 34/32 with a degree of freedom of 13 and a significance level of 0.001. Therefore, considering the high Kendall's coefficient of concordance and the lack of significant difference between the mean ranks, there is an agreement among the panel members, and therefore the questionnaire was validated. Additionally, the results obtained from this Delphi round indicate that all examined components had a mean greater than 3 and a t-statistic greater than 2, suggesting that the consensus among panel members validated the components examined for use in the main questionnaire.

For conducting the principal component analysis, the oblique rotation method (varimax) was used. After several runs of factor analysis using various rotation methods to extract suitable factors based on their number and content, and taking into account indicators such as the sample adequacy index (KMO = 0.969), Bartlett's test of sphericity (Bartlett = 32,333.376, $p < 0.001$), eigenvalues, percentage of explained variance, and loadings greater than 0.3, it was determined that the questionnaire consisted of 14 factors. These 14 factors explain approximately 67.73% of the variance.

Table 4. Final Factor Analysis Characteristics for Extracting Factors

Factor	Total	%of Variance	Cumulative %
1	5/97	15/71	15/71
2	4/08	4/37	20/08
3	4/05	4/41	24/49
4	4/03	4/37	2894
5	4/01	4/28	33/22

6	3/99	4/24	37/46
7	3/93	4/18	41/64
8	3/87	4/01	45/65
9	3/85	3/95	49/60
10	3/82	3/87	53/47
11	3/76	3/68	5715
12	3/69	3/61	60/67
13	3/63	3/54	64/30
14	3/59	3/48	67/73

The special values of 14 major factors are greater than one, and the percentage of common variance coverage among variables for these 14 factors together explains 67.73% of the total variance of the variables. In addition, the initial output also shows that the determinant value of the correlation matrix is a non-zero number, indicating that based on these data, we can be confident in extracting factors.

Table 5. Principal Dimension Matrix after Varimax Rotation

Dimensions	Factor 1 (Factors Affecting etention)
Learner	.713
Quality of educational services	.674
Instructor	.668
Environment	.643
Technology	.624

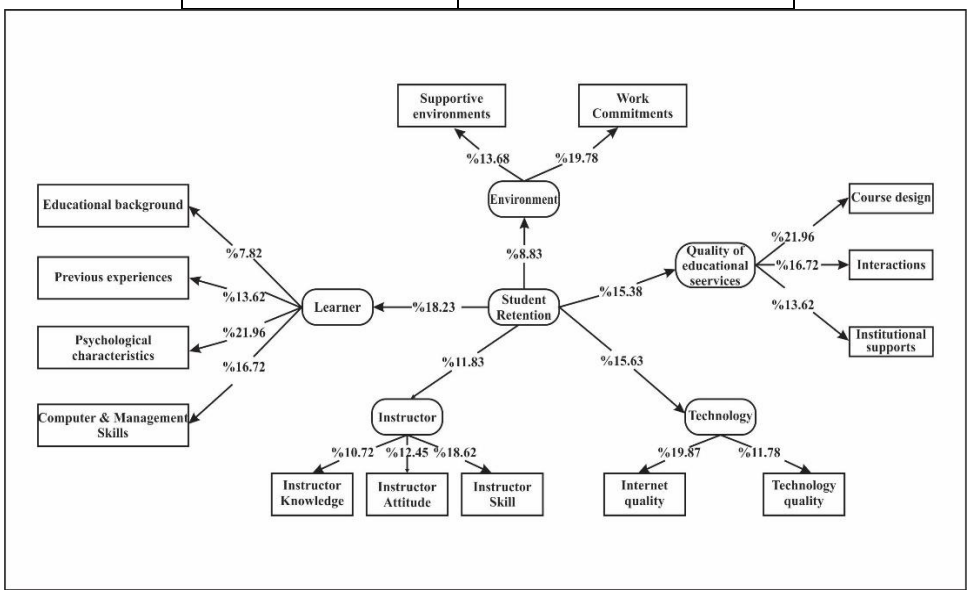

Figure1. The final model of student retention in the electronic learning environment of Payame Noor University.

Findings:
In this study, the pattern of students' retention in e-learning environments was presented in Payame Noor University. As mentioned, based on the literature review, experts' opinions, and after conducting statistical tests (exploratory and confirmatory factor analysis) in 5 dimensions, 14 components, and 57 effective indicators in the retention of students in the e-learning environment of Payame Noor University were identified and classified. Learner dimension had the most significant role in students' retention with a factor loading of 0.71, followed by the quality of educational services (0.67), instructor (0.66), environment (0.64), and technology (0.62) dimensions. This means that the learner factor has the most significant impact on students' retention in e-learning in Payame Noor University, while the technology factor has the least impact.

According to the confirmatory factor analysis of the third-order research, 14 components were identified, including psychological characteristics of students (0.814), prior experiences (0.819), previous background (0.802), management and computer skills (0.819), interaction (0.738), course design (0.723), organizational support (0.721), instructor knowledge (0.739), instructor skills (0.739), instructor attitude (0.710), supportive environment (0.711), work commitment (0.729), technology quality (0.685), and internet quality (0.68).

The research findings related to the factor analysis of the components indicate that in the learner dimension, psychological characteristics (0.814), in the quality of educational services dimension, interaction with a factor loading of (0.738), in the environment dimension, supportive environment with a factor loading of (0.722), in the instructor dimension, instructor skills with a factor loading of (0.729), and in the technology dimension, technology quality with a factor loading of (0.685) had the most significant roles. The model fit indices also showed that the research model has a suitable fit. Finally, the proposed model provides a framework for the retention of students in e-learning environments that can be useful for educational planners and administrators.

Dimension of the learning dimension
The results of this research show that the learning dimension has the highest agent load, and in this study, four components have been identified in this dimension. The following is a presentation of various studies on these components in order of priority.
Psychological characteristics: In the psychological characteristics component, more indicators have been examined in this and previous studies. In numerous studies, significant correlations have been shown between psychological characteristics such as locus of control [14,6], motivation [26,27,28,29], self-efficacy [28,30], satisfaction [30,31], learners' attitudes towards the course, and their relationships with coaches and peers [4], as well as learners' retention in e-learning. Locus of control refers to an individual's understanding of the course or obtained results. For example, individuals with an internal locus of control believe that their personal behaviors lead to outcomes or returns. Conversely, individuals with an external locus of control believe that other individuals, the environment, or unexpected events lead to outcomes or returns. Internal locus of control has been identified by Morris and colleagues [6] and Parker [14] as a positive indicator of a student's retention in e-learning or successful completion of a course.

Previous Experiences: Students who have previous experience in a training course are more likely to succeed in their next training course, according to Louie [3]. It has been found by Chiyong and Khan [28], Dupin-Bryant [32], and Axonos et al. [33] in their studies that the number of completed previous e-learning courses is an important indicator affecting the dropout rate.

Academic Background: Academic background, which is defined as the academic performance and educational talent of the student, was reported to have an impact on student retention in the present study. Students who received lower grades in their previous academic periods were found to have higher dropout rates compared to those who received higher grades. Chiyong and Khan [28] and Dupin-Bryant [32] evaluated the impact of students' previous scientific activities during several completed training courses and found that this indicator has a positive correlation with students' retention in e-learning courses. These research findings indicate that students' academic background affects their decision to enroll in e-learning courses, as well as their scientific activities and retention in these courses. In other words, students with poor academic talent and background are more likely to enroll in e-learning courses, but their retention in these courses is low.

Management and Computer Skills: Consistent with the findings of this study, Castles [29], Asperin [26], Ivankova and Stick [27], and Holder [30] found in their studies that management and computer skills have a significant impact on learner retention. In the studies of Hong [34], Roca et al. [35], Pi-Teh and Li [36], and Liaw et al. [37], it was also found that computer literacy and self-efficacy are among the factors affecting the retention of learners in e-learning courses.

Dimension of the quality of educational services

In the present study, factors related to the design and implementation of the training course, as well as institutional support and interaction, were identified as effective components in the retention of students in the e-learning environment.

Course design: Ivanova and Stick [27], Perry et al. [37], Bosch et al. [38], and Barbara et al. [39] are in line with the results of this study and have concluded in their own studies that the quality of the course (good structure, interactivity, attention to the learner's needs, flexibility, group activities, learning style, and appropriate course content) is influential in student satisfaction and retention.

Research shows that the number of students enrolled in e-learning courses is rapidly increasing. This increase makes it essential to study the design and evaluation of courses from various dimensions [40]. If e-learning courses are well-designed and provide the characteristics that are important and valuable to students, their learning from these courses will increase. However, if students have a negative attitude towards course design, they will not accept it, and their desire to attend these courses will decrease [41]. Ivanova and Stick [27] believe that considering the educational content relevant to the needs of the student and the student's learning style is a key factor in designing a course that has a significant impact on a student's decision to stay or leave e-learning courses. Perry et al. [37] also concluded that a well-designed training course can reduce the dropout rate of students from e-learning courses.

Institutional support: In this study, we found that good support systems increase the retention of students in e-learning courses. In several studies, a significant correlation was found between administrative support [42], economic infrastructure support for learners [43, 27], etc.

Transactions: Consistent with the findings of Ivanova and Stick [27] and Buchi et al. [38], a significant correlation was found between communication in the academic environment and the level of student dropout from e-learning. If appropriate and timely feedback is provided to students in the e-learning environment and students are supported to engage in the activity,

the level of student retention in e-learning increases. Buchi et al. [38] also stated that group activities contribute to the high retention of students in web-based educational programs. However, Pigliapoco and Beghelli [44] examined the impact of peer relationships on students' decisions to withdraw from e-learning and concluded that there is no significant relationship between peer communication and dropout rate.

Dimension of the instructor

In e-learning environments, the instructor plays an important and influential role and is involved in the instructional design process, identifying learning objectives, methods, and learning tools. As Yang [40] argued, adapting content to learners' needs, creating motivation in learners for better performance, facilitating the content provided by the instructor, delivering a rich course, creating effective communication with students, having a lesson plan and curriculum suitable for online sessions, and committing to learners' learning are among the seven core elements of successful teaching in the electronic environment. Therefore, it is obvious that instructors play the main role in teaching and facilitating activities in e-learning, and instructors must be able to effectively implement active and learner-centered learning in line with theories and teaching models in the electronic environment and use various technologies to achieve course goals. In addition, they should follow a coherent content delivery process through motivational strategies in electronic environments. In this study, three components of knowledge, skill, and attitude of instructors were identified, which had an impact on the retention of students' knowledge in the Peyam Noor e-learning environment.

Knowledge: Regarding the instructor's knowledge, the results of this study are consistent with Pritchard [12]. Gash [45] also considered basic knowledge about technology and specific knowledge about educational and multimedia software necessary for instructor qualifications in e-learning environments. Alvarez [46] also emphasizes in his study the acquisition of knowledge by electronic instructors in providing support services to multimedia students. From Smith's [47] perspective, the mentor should be a lifelong learner and constantly improve his or her skills and knowledge.

Skill: In several studies, the teacher's skill in using computer software and the internet [48], quality of expression and speech [49], and timely responsiveness [50,51] have been cited as influential factors in student satisfaction and retention. Arbaugh [50] and Norman and colleagues [51] have shown in their studies that timely responsiveness by the instructor can have a significant impact on satisfaction. Therefore, if a teacher is able to respond promptly to the issues and needs of learners, student satisfaction will improve without delay [50,51].

Attitude: Regarding the attitude of the instructor towards e-learning, the results of this study are consistent with the findings of Smith [47], Pekala and others [44], and Webster and Hackley [53].

Dimension of the Environment

In this study, two components (supportive learning environments, commitment) were identified in this dimension.

Supportive learning environments: The level of support that students receive from their surroundings is an important indicator of their retention in e-learning. Family, employers, and colleagues can provide positive support to help students succeed in e-learning. These supports include emotional support [27, 30], financial assistance [9, 6], and comfortable study

conditions [29, 26]. If students do not receive support from others in dealing with life's unexpected problems and events, the likelihood of their dropping out increases [29, 53, 37].

Commitment: Consistent with the results of this study, Kamp [54], Pakham and others [55], Pari and others [37], Pirkeis and others [56], and Tello [3] also concluded in their studies that most students who enroll in e-learning courses are part-time or full-time employees who spend their time and energy on work and studying. Full-time employment, high work hours, or changes in work responsibilities increase the likelihood of students dropping out

Dimensions of the Technology

In this study, two components (technology quality, internet quality) were identified in this dimension. The results of this study are in line with the findings of Webster and Hackley [52] and Pickley et al. [44] who concluded that technology quality and internet quality significantly affect the quality of learning and learner retention in e-learning.

Technology quality: Researchers in various studies have mentioned factors such as ease of use of technology [57,49,12,44], usefulness [57,50], flexibility [57,50,34], and easy accessibility [57,50,12,49] as influential factors on learner satisfaction and retention in e-learning environments.

Internet quality: In terms of internet infrastructure quality, features such as internet speed [49,58], and uninterrupted sound or connection [58] have been mentioned as influential factors on learner retention.

Conclusion

According to the findings of the study, the components and final dimensions of the model of student retention in the e-learning environment of Payame Noor University were identified and classified into 5 dimensions and 14 components.

Conflicts of Interest

According to the authors, there is no conflict of interest in this study.

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