Original Research

Review and Analysis a Managerial Model for E-Learning System of Islamic Azad University in Perspectives of Optimality, Privacy and Data Protection

Afshin Zivi [*,1]
Shahab Rezaian [2]
Narges Shahhoseini [3]

Abstract

Considerable percentage of graduate training centers including universities use web-based communication technologies to provide educational services to their students, and the important thing in this IT-related area is that we can provide methods to optimize and secure it despite conversion of capital of most organizations and institutions to "knowledge" and "information". The objective of this research is providing solutions to be able to greatly reduce and eliminate these weaknesses as much as possible and provide an integrated system with optimum performance with adequate security and reliability. In this research, a questionnaire was used to collect information about E-learning system and its analysis. Over 200 undergraduates and graduate students' voluntary participated in this questionnaire. The results obtained from the analysis of volunteers' answers indicate that the topic of security and efficiency of e-learning system requires a new approach and monitoring and evaluating its performance. The obtained results and carried out studies indicate that there is a tendency towards applying security policies and creating a suitable platform for system optimization and the proposed mechanisms are largely supportable according to obtained data and a significant number of gaps and weaknesses can be covered.

1 | Computer and Information Technology Department, Parand Islamic Azad University, Tehran, Iran
2 | Advanced Informatics School, Universiti Teknologi Malaysia, jalan Semarak, KL, Malaysia, 54100
3 | Information Technology Group, Engineering Department, Islamic Azad University e-campus, Tehran, Iran
* | Corresponding author: afshinzivi@outlook.com

1. Introduction

In this study, e-learning has been defined as a method which supports and improves teaching and education through media and digital communication technologies. It should be noted with regard to e-learning assessment literature or similar technologies that there are many different approaches about these studies. A beneficial framework has been created in 1997 by Oliver which provides a comprehensive guide to assess the use of learning technologies [1].

Naturally, the position of safety and efficiency of system performance is special the field of assessment which is focused less compared to other features of these systems and there are fewer studies about it. For example, studies such as the study of Mr. Graham atwell in 2006 in the field of e-learning systems assessment state the overall approaches and methods to improve learning method and method of transferring the concepts between learner and teacher. Of course, this study has significantly referred to the effectiveness of e-learning system but it is not reliable and cannot be referred to by consideration of the topic of privacy and security along with efficiency and integrity in evolution of e-learning system [2].

Thus, according to the above, the necessity of assessment of e-learning system and in general e-learning becomes more prominent than in the past with regard to security issues and coverage of gaps in this area as well as the issue of the integrity and efficiency of this type of learning system.

2. Review of Literature

2.1. Traditional Learning

Learning process has tended too much toward teacher-centered learning in the last few centuries. In fact, the emphasis on student-centered learning was raised in 2000 [3]. Student-centered learning does not mean that all teachers should stop teaching and it rather means the use of prejudge concept as basis at the time when students are consciously and systematically guided towards deep understanding. Here, prejudge concept is the same practical and functional concepts which have been assigned to students based on experiments and practical tasks and transfer the intended concept to the mind of student experimentally and through the student himself. Learning theory offers a theoretical model of human learning process. There are generally two main theories about this topic which have had effect on studies related to learning. Before 1960, Behaviorism theory was considered to be the leading theory in the field. After that, Constructivist theory became very important [4]; the basic idea of behaviorism theory is that a person learns when he/she reacts to motivation. This definition has been raised as the concept of learning here learning is defined as a change in behavior [5]. Constructivist Theory has been raised based on psychological principles which evaluates processes within the human such as thinking, memory and …, in the process of Constructivist learning, the learner creates information through personal experience and then selects, interprets and analyzes it using prior knowledge [4].

2.1.1. Styles and Techniques of Traditional Learning

Learning styles and techniques have been created and raised based on psychological research results about information processing, dynamic learning and data structures. The learner directly prefers certain kinds of information and a clear procedure for practical application of information while achieving quality learning process compared to other learners. The division of learning styles and techniques is done based on previous definition (Table 1) [6].

2.2. E-learning

Distance Learning is a method of teaching in which students and teachers are not in one place and these two communicate with each other via communication media. The First generation of distance learning methods met the expected interaction via phone, email and video conferencing, we currently live in the second generation of this type of learning in which the concept of online learning using information technology is being exploited [7].

Table 1. Family of Learning Styles [6]

Genetic and other constitutionally based learning styles and preferences including the four modalities VAKT		
Author(s)	*Assessment Tool*	*Year Introduced*
Dunn and Dunn	Learning Style Questionnaire(LSQ)	1979
	Learning Style Inventory(LSI)	1975
	Building Excellence Survey (BES)	2003
Gregorc	Gregorc Mind Styles Delineator (MSD)	1977
Cognitive structure		
Riding	Cognitive Styles Analysis (CSA)	1991
Stable personality type		
Apter	Motivational Style Profile (MSP)	1988
Jackson	Learning Style Profiler (LSP)	2002
Myers-Briggs	Myers-Briggs Type Indicator (MBTI)	1962
Flexibly stable learning preferences		
Allison & Hayes	Cognitive Style Index (CSI)	1996
Hermann	Brain Dominance Instrument (HBDI)	1995
Honey and Mumford	Learning Styles Questionnaire(LSQ)	1982
Felder and Silverman	Index of Learning Styles (ILS)	1996
Kolb	Learning Style Inventory (LSI)	1976
	LSI Version 3	1999
Learning approaches and strategies		
Entwistle	Approaches to Study Inventory (ASI)	1979
	Revised Approaches to Study Inventory (RASI)	1995
	Approaches and Study Skills Inventory for Students (ASSIST)	2000
Sternberg	Thinking Styles	1998
Vermunt	Inventory of Learning Styles (ILS)	1996

Online learning is a method of learning which processes related to it occur in the network. This process can occur over the Internet or internal network of a school or university [8,9]. Ally stated in 2004 that at least several synonyms can be considered for online learning: E-learning, Internet learning, distributed learning, Network based learning and distance learning. So we can say that in the online learning, the learner is in a distance from the teacher or professor and the learner should use some communication technologies in order to use materials and learning tools or lecture notes and derivatives of it [10].

2.2.1. E-Learning Systems

E-learning systems have several names which do not differ in terms of meaning, these names are as follows: Virtual Learning Environment, Learning Management System, Course Management System, Learning Content Management System, Managed Learning Environment, Learning Support System, and Learning Platform. The name of VLE or Virtual Learning Environment is often used in European countries while the name of CMS or Course Management System is generally used in the United States. Also the name which I mostly used in Iran is LMS or Learning Management System [11].

Virtual Learning Environment (VLE) is in fact computer software which enables us to use multimedia content in a simple platform via LAN or Internet. Essential learning tools can be used for online learning with the help of a virtual learning environment; these essential learning tools are: Text, graphics and motionless images, sound, music, video and animated graphics and multimedia content. Virtual learning environments or VLE include: Users, courses and

managing and maintaining files. This type of learning environment supports several different levels of users: Students, teachers, and administrators. There several types of virtual learning environments, some of which are commercial and some of which open-source. The most famous VLE software include Blackboard, Moodle, WebCT and Adobe Connect. [11].

2.3. Adobe Connect

Adobe Connect is a web-based conferencing system with numerous features which provides the ability of using online meetings, training and webinar and any person can access the provided content using any browser. Adobe Connect Enterprise system consists of a core named Adobe Connect Enterprise Server and 4 other applications [12].

The core of Adobe Connect Enterprise Server provides scalability for individual servers or Cluster environments. These clustered environments provide expansion with reliable redundancy for thousands of students Adobe Connect Enterprise software has been designed as an open platform and can be integrated and developed with other systems through a complete set of APIs. The 4 software that interact with the central core to improve system performance, are as follows:

- Adobe Acrobat Connect Professional software allows users to manage meetings, events and seminars while the master or host can show multimedia or a screen for users or play audio or video of participants in Real-Time.
- Adobe Presenter software is considered to be a Plug-in for Microsoft PowerPoint which allows users to create prototypes of e-learning, e-learning content and on-demand presentations. Completed presentations are known as Aviation Industry CBT Committee and Sharable Content Object Reference Model.
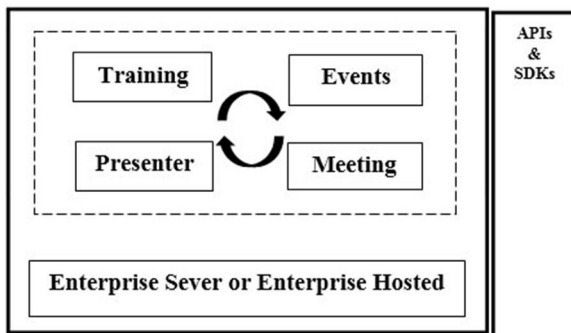

Figure 1. Adobe connect enterprise performance

- Adobe Connect Events allows users to manage full life cycle of events from recoding events to reminding and generating reports
- Adobe Connect Enterprise Manager is a web-based application which allows users to manage Information and content related to user accounts. This Software manage presentations as a primary interface when users create meetings, create e training courses and customize their programs [12].

Adobe Connect Server software is considered to be a multi-layered and multi-level server regardless of the logic functions such as: presentation, application processing and data management through independent processes [12].

Table 2. Functional Tiers of Adobe Connect Server Software [12]

Functional Tier	Technology
Web Server	Apache
Application Server	Apache Tomcat
Streaming Server	Adobe Media Server
Database	Microsoft SQL Server
HTML Authoring, Publishing	Adobe CQ Server
Analytics	Adobe Site Catalyst
Media Transcoding	Oracle Java

3. Methodology

Methodology will be classified into 4 phases to conduct this research. The first phase is generally based on the second chapter of research which is "literature review" which generally states features and structures of the related literature. We can provide a realistic and logical solutions and assessment model with the help of this information. In the second phase, the assessment model of e-learning system is presented based on provided studies and researches. Based on ISO 27001 standard, assessment model of organization is extremely important in providing solutions and concepts for business continuity in the organization and reduction of risks. In the third phase, the tools and processes necessary to receive information from system and analyzing data through reliable methods are raised in order to have a desirable level for Reliability of assessment model before the final exploitation. Ultimately, in the fourth phase, tool or assessment model can be implemented based on

structure of learning system after performing the desired process.

3.1. Defining the Assessment Model

Designing Assessment Model has been carried out based on three assessment characteristics from the perspectives of individuals, time of assessment as well as areas in the assessment. Eventually, success assessment model of the e-learning system. In this study, assessment of e-learning system has been considered from the perspective of system users and experts in system. The largest group of users to work with e-learning system are in fact students. Also, assessment from the perspective of the authorities is important. Thus, the system users in this study are two groups of students and officials who have good scientific level compared to other users [13,14].

The true value of an e-learning system which is a subset of information systems is determined after a few months or a few years after implementation. In fact, the value of e-learning system is determined when Officials and administrators effectively use the system in various realistic scenarios or users of the system use it properly and identify the strengths and weaknesses of the system. Thus, the time of assessment has also been considered in this research to assess e-learning system [14].

In this e-learning system, implementation has occurred since 2006, thus, this assessment has happened almost nine years after implementation. According to the proposed assessment model, areas of assessment including students' communication with system, efficiency and integrity of the system and privacy have been raised in creation of an optimal learning system.

3.2. Variables Used in Assessment

According to the type of intended information system, variables to receive information were placed in several groups in these two questionnaires. The groups of personal information of students, these variables determine the method of system assessment because users of the system are considered as the main source of information and knowing the profile of the respondents is crucial in the assessment [13]. The next variable in relation to the assessment of respondents is raised in educational works, this variable has a significant effect on making decision about the raised mechanism because the efficiency and productivity of

system is not always connected with the inner workings of the system and users have an important role in this interaction. The variable of System Assessment is also in the third part of students' questionnaire which evaluates the system from different aspects [13,15] (generally functional area).

3.3. The Reliability of the Questionnaire

The research questionnaire must be developed based on the aims, hypotheses and questions of the research. The first step for this matter is evaluation of similar studies and look at their questionnaires [15]. After development of the questionnaire which takes place with author's knowledge and experience and evaluation of research resources, the questionnaire should be tested practically or theoretically. One of the methods to test questionnaire is providing it to a number of experts on the main subject. In this method, the purpose of such research is explained to the individuals in order to resolve any doubt regarding the completion of the questionnaire. In this method, individuals are asked to express their comments and feedback to improve the questionnaire. This step is usually called pretest [15]. Measurement of Cronbach's alpha is among the most popular methods for measuring reliability of questionnaires which is used to check the reliability or trustworthiness of questionnaires. In this method, process of evaluation and correction of questionnaires is carried out theoretically and by several experts. The questionnaire is initially give to several experienced teachers and they are asked to provide their comments and suggestions after studying. The next step is preformation of the final test on the questionnaire.

3.3.1. Measuring the Reliability of the Questionnaire

The mentioned questionnaire was given to 205 undergraduate and graduate students after analyzing questionnaire and evaluating it. Then, the data were entered in SPSS software and the Cronbach's alpha has been calculated using this software as follows. The Cronbach's alpha of designed questionnaire with 205 samples was 0.708 which shows good validity and reliability of the questionnaire. Thus, the questionnaire has a good stability since its Cronbach's alpha is greater than 0.7. It should be noted that the reliability of this questionnaires was test operationally but the results are validated despite the risks in this area.

3.4. Statistical Unit, Time and Method

Undergraduate and graduate students of the intended e-learning system form the sampling unit. In fact, students have the greatest interaction and engagement with e-learning system. There are approximately 11,000 students in the whole University and selecting more than 200 samples from the target population is quite logical, especially since volunteers were selected from both undergraduate and graduate students. This plays an important effect to get more precise results because the teaching methods are different undergraduate and graduate courses.

The duration of this the questionnaire was 15 days. This questionnaire was made available to all categories of students during this time so that this assessment information has the greatest accuracy. Sampling is the method used in this study. Stratified sampling method was used in this study to fit the community.

4. Experimental Results

The intended questionnaire was prepared in two parts, the first part of the questionnaire is related to demographic information and its second part includes questions related to the evaluation of learning management system (LMS). The provided questions were analyzed using SPSS software and different factors on the degree of trust and various analyzes were applied to achieve reliable results. Also, 205 volunteers participated in the questionnaire. It should be noted that all respondents of the questionnaire completely volunteered to participate in this study and not money was given or taken to or from any of them for r answering questions [14].

According to Figure 2 50.24% of respondents were male and 49.76% of them were female. This gender balance is considered to be one of the best forms and makes the perspective of both sides to be applied to the system with a correct ratio. It was also determined based on the obtained that that the range of education level of respondents varies from diploma to Master's degree. This indicates that online learning system of Islamic Azad University almost has supporters from all levels who have turned into this system to pursue further education and even Graduate Studies.
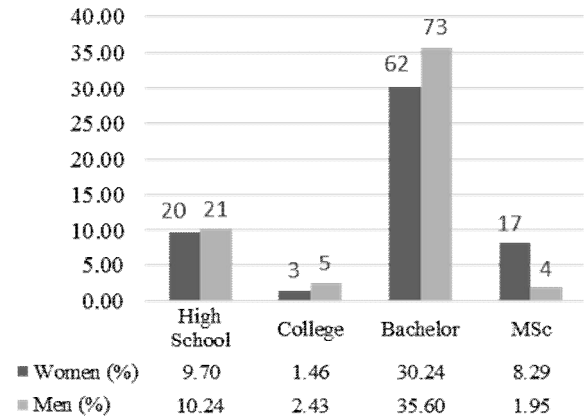

Figure 2. Total number of Students according to sex

The percentage of male and female participants in terms of educational degree has been shown in figure 2. Based on the data in this figure, the studied e learning system is more popular among people with a bachelor's degree and master's degree.

In case of the employment status of the respondents, almost all of the students were employed and most of them were working full-time (figure 3).
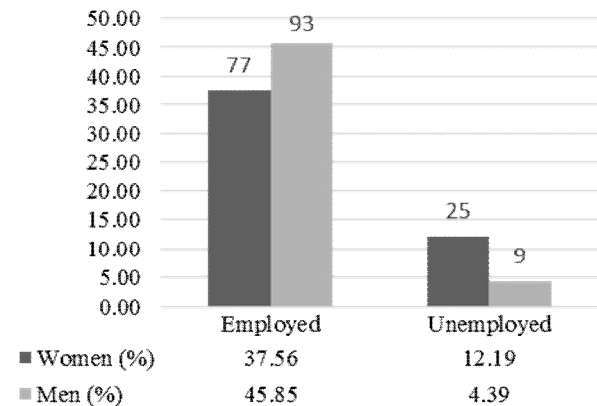

Figure 3. The Job Status of Students according to sex

Status of access to the Internet has been provided in figure 4. This is greatly important since it has been raised on materials related to LMS.
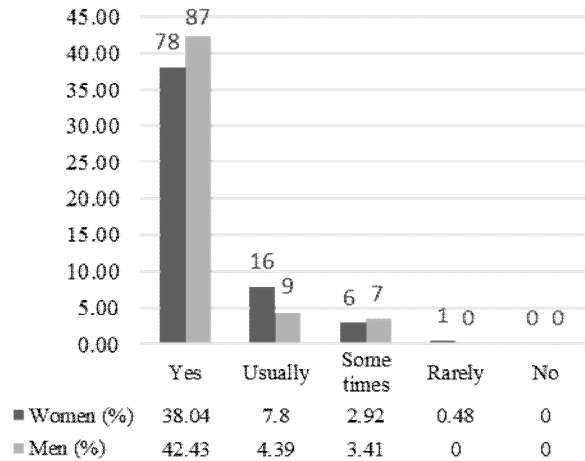
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Figure 4. The Status of Internet Access for Students

As it can be seen in figure 4, 92.66% of students have a good relation with the Internet. Based on the evaluation of Šumak et al, users of the system particularly students have a key role in determining the success of an e-learning system and this is considered to be one of the strengths of this learning system since people can use most of the features of system and the feedback of students in such situations is very important because they can evaluate the system and determine its strengths and weaknesses in these circumstances [8]. Following responses were provided by the respondents in connection with the review of the cooperation and help of others to solve problems and related issues.
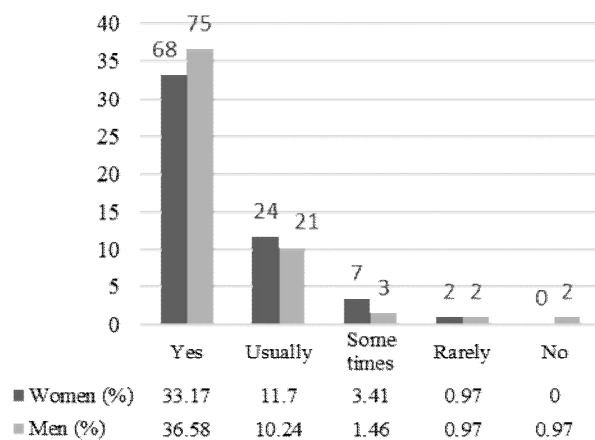

Figure 5. The Request of Students to help when different Problems are happening

According to information obtained from this question, this result suggests that most users of e-

learning system need support and help at the time of occurrence of technical problems associated with the system (91.69%). Complexities and technical problems in such systems are generally predictable and therefore the presence of a dominant and experienced support team is essential. One of the key questions which is focused on is the level of communication between users and the system (figure 6).
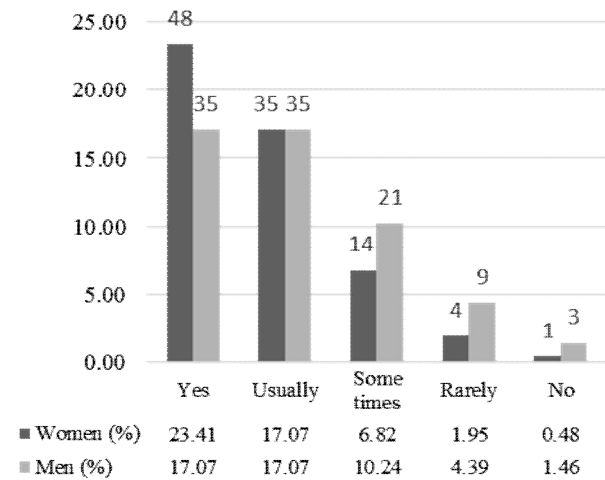

Figure 6. Examination of Communication of Students with LMS System

Figure 6 states that almost 75% (exact value: 74.62%) of students interact with the LMS system most of the times and this shows that this system has an acceptable level of ease of use as well as factors of content attractiveness and has had significant progress in the past 5 years.

As previously mentioned, such a problem can yet be considered a risky situation. This is a proven test and existence of advanced GUIs which are generally from web-based software are susceptible to internal and external attacks. For example, more than 90% of vulnerability of Windows operating system is related to its graphical user interface and a comparison between Windows Server 2012 in the Standard and Datacenter Edition with Core Edition showed that the Core Edition has greater stability and security. With respect to such issues, security of such sites is considered to be an important issue. Also, approximately 25% of websites in the world use WordPress software.

Level of students' expectations of the system is one of the key questions and generally expresses whether the system is what students expect or some

parameters and measures should be improved? Figure 7 shows this level of expectation.
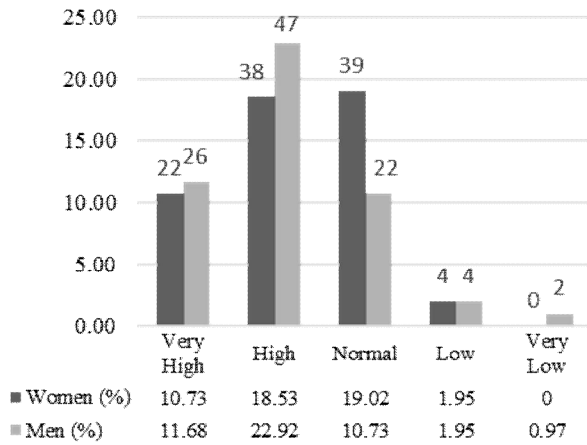

Figure 7. Examination of Expectation levels of students from the e-learning System

Figure 8 states that the studied system requires improvements in technology and systematic development and this is very evident with respect to TAM assessment [8]. Based on the study of King and He, TAM Technology Assessment model is one of the most widely used models for content development and new technologies. This model is widely used in the field of e-learning system management from the perspective of the adoption of new technologies and it can be used to improve the system and synchronization of LMS level with the expectation of students [8,16]. Also, the level of student satisfaction with LMS system has been as follows.
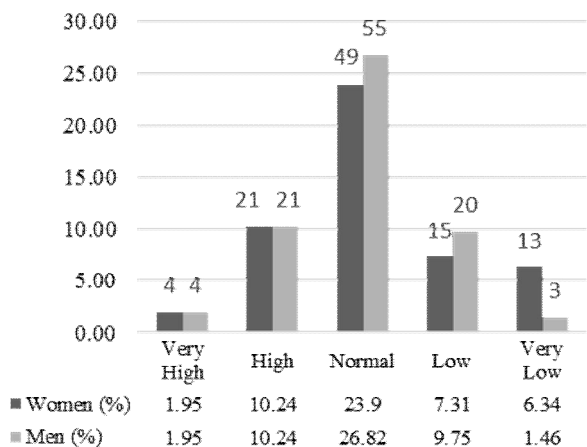

Figure 8. Examination of Student's Satisfaction from the supporting team when different problems are happening

According to figure 8, the level of student satisfaction is below the optimal level. This is perfectly linked with Figure 8 and according to the description above, TAM model can be used but by consideration of Literature evaluation of the technical information systems to improve e-learning system and make it close to students' expectations and satisfaction levels of them, Security mechanisms such as: authentication algorithms, data encryption, integration and protection of data using the same algorithms and algorithms that require modeling seem to be essential [8,16,17].

It is determined based on figure 8 that performance of Support team is at a medium level and this is not satisfactory for a virtual learning system.

Figure 9 shows support and the percentage of student satisfaction when faced with different problems.
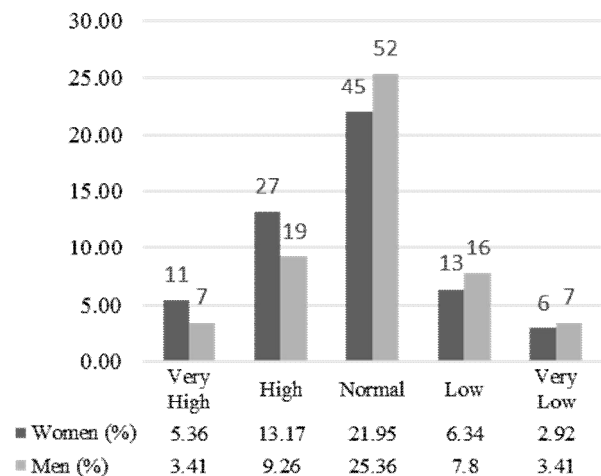
Figure 9. Examination of Student's Satisfaction from the e-learning system

One of the things that is very important in the virtual world and it focused on in a virtual university is Privacy. This issue is related to issues such as integration and efficiency as well as performance of system in addition to maintaining the security aspect of student's data [17,18].

We will observe by evaluation of figure 10 that the Privacy situation is at a medium level but as mentioned before, the responses of students on technical issue are partly related to their experience in the system. Thus,

improvement of privacy is required in such circumstances.

Figure 10. Examination of privacy levels from Students perspective

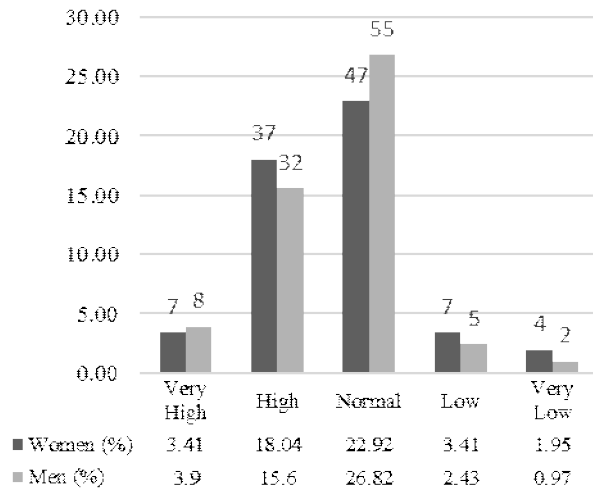|	Very High	High	Normal	Low	Very Low
Women (%)	3.41	18.04	22.92	3.41	1.95
Men (%)	3.9	15.6	26.82	2.43	0.97

Each system is examined from two different aspects. The aspect of performance evaluation from the perspective of students or users of the system provides a practical view from the system which is highly effective in improving system performance. On the other hand, we need to be technically familiar with the system to find efficient solutions and interview with the leaders of the system is one of the best ways to get technical information from the systems. Technical Information of System have been presented in table 3 which have been obtained from interviews with three of the main authorities of e-learning system.

Discussion

Even though most e-learning software systems offer a number of solutions for distance education, Security and privacy are still ignored for the most parts. Figure 11 shows the method of operation of commonly used functions in e-learning systems [19].
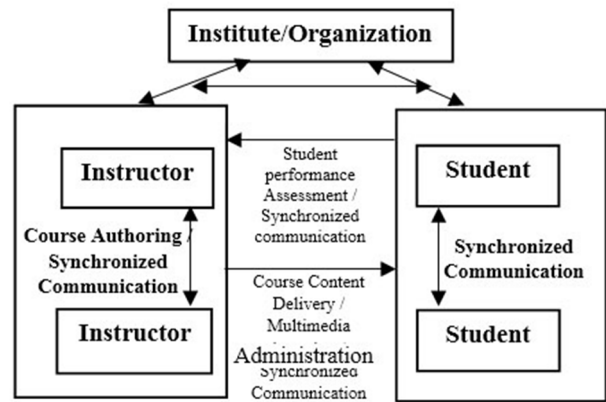
Figure 11. Available function in distance learning

Table 3. Technical Information about the e-learning system

Examined Parameters	Current Status
Current Status of System	Operational
Programming Languages used in System	External Automation Software (Sida): Delphi Internal Automation Software: C#.net Main Portal: PHP Based on WordPress Structures LMS : PHP
Programming Structures used in System	CRM :OOP Communication of Services: Service-Oriented Training Programs: Procedural
User Interface	Web UI
Database	LMS: MySQL Automation and Adobe Connect System: SQL Server Main Portal: SQL Server
Change and Development Capability	Control and Reporting Systems
Server-Side Operating System used in system	Automation: Windows Server 2012 Adobe Connect: Windows Server 2008 LMS and Website: Linux CentOS 6.0
System Architecture	n-Tier (Client/Server)

Media used to connect to the Internet	Optic Fiber
Technology used to connect to the Internal Network and Internet	Internal Network: MPLS Internet: Nano Station
Internet Bandwidth (Send/Receive)	60/180 Mbps
Protocol used to connect to Automation Software	HTTP
Protocol used to connect to LMS Site	HTTP
Firewall used in the System	MikroTik

5.1. Authentication

It is important for both students and teacher to be able to authenticate each other before remotely carrying out educational activities. Authentication is a basic need and a basic course for performance management of distance learning [19].

Student Username must be authenticated at the time of login. We must make sure that student which has gained access to the system is the same considered person. Authentication with username and password should be sufficient because these 2 items are not entirely secret in online courses and content of university course. If there is a need for stronger authentication, two methods of PKI (Public Key Infrastructure) and digital signature may be adequate and can be used. However, the implementation of any of the aforementioned methods for the system makes this approach costly compared to conventional approaches such as username and password and the Community-Based Competence Certification using Pretty Good Privacy may be used as an alternative approach. Fortunately, popular security protocol which may be used without PKI is Secure Socket Layer security method. Secure tunnels created by SSL method makes information to be transferred without being understood and tracked [19].

Ensuring the identification of teachers is very important because a teacher has access to wide aspects of an online learning system such as Course content, student information and records of student performance. There are other methods such as verification of Educational Degree for Verification of teachers out of online learning system. Teachers also have different level of access compared to lab instructors and students. In a same way that user authentication using SSL, can provide a secure connection to a computer or communication device with e-learning system at the time of authentication by username and password, it can be also effective in this case. Due to the fact that the number of teachers is constant for practical reason, Organizations may use a general key approach for their authentication. Also role-based access control can be used to secure access based on roles and responsibilities of teacher [19].

5.2. Privacy

Some data in e-learning environments are confidential and should not be disclosed by others. Thus, the need for privacy is necessary for some data [19]. Applications which have functions for assessment of student performance such as writing courses and student assessment software need to collect learn performance information of students when they are searching for content. These applications need this information to automatically generate personalized training files for students based on their performance even though this may be considered as an invasion of privacy of students. In this case, the system operator may need the agreement of student for collection of personal information according to privacy laws.

Learning service provider must have a privacy policy which states which information must be collected. This information must be used for what purpose, who long those will be kept, whether this information is shared with others or not and if they are shared, how are those protected. Also, service provider may use a description language such as P3P (Platform for Privacy Preferences) to describe and explain its use politics. This solution is relatively limited because it only tells the method of function of learning services and provides no comments about creating individualistic settings for students in virtual learning environment. In ideal form, the more flexible approach for policy is separate privacy policy for each student which states students tend to share which personal or private information and want to raise those under what conditions in case of sharing.

As a provider of distance education system, university can negotiate with the students and reach an agreement on collection of their learning performance information [19].

Students should be able to personally communicate with the teacher in the classroom; they must also be assured that their discussion will remain private. SSL method can be used to create a secure channel between the student and the teacher. All communication flows through this channel can be encrypted which makes privacy on the network possible.

5.3. Data Integrity

Data Integrity must be kept in results in order to conclude reliable exams and quizzes [19]. In traditional education, exams are answered in the classroom, Teachers are physically present to supervise students during test while online exams in distance education should be held differently. In this case the teacher does not have the physical presence to monitor students' works during the test. For example: It is possible that students try to send someone else instead of himself to answer the test. Also, attackers may see, steal or change student responses to test files during transit or storage.

Taking a short video of the student by the camera during the exam seems to be the first solution to ensure that the student is answering the exam but the solution which is usually done for this issue to ensure that the student is answering the exam is the presence of a human observer. Unfortunately, this solution reduces the flexibility of distance learning. Another approach which may be effective is students joined authentication using biometric methods. This promising approach is in fact monitoring student activities; these activities may be student's behavior and movements which are evaluated through video image processing or method of their typing which can be evaluated by the time of their typing or their errors during type. Patterns for such activities are different in each person. Monitoring typing and its comparison over time can be a more useful approach to assess the student's chances of impersonation. Of course, biometric data should be kept private and biometric signatures must be protected from damage or theft.

Protection of privacy and the integrity of data when transferring a test file may be provided by SSL method. However, a review factor must review the responses using students' electronic signature and review factor be also applied in addition to student's signature. These methods provide End-to-End communications integrity. Exam answers may be protected when they are stored by symmetric encryption algorithms (e.g. AES or Advanced Encryption Standard, Triple DES or Data Encryption Standard). However, special care must be exercised at the time of distribution of secret keys. One solution is protection of symmetric keys using asymmetric keys (using methods such as PKI, PGP or RSA) [19].

5.4. Biometric techniques for privacy and data protection

Biometric methods are methods which use psychological traits and behavior of a person for authentication [20]. These new procedures are now being used in many organizations in form of scanners, Readers or other biometric methods [20]. There are two biometric feature in theory and in application modes: one aspects refer to this fact that a person must have physical contact with the biometric system for authentication and identification such as Fingerprint. Another aspect of this matter refers to this fact that there is no need for direct contact with the biometric system such as facial or voice recognition and etc. [20]. A new theory is that both direct and indirect methods must be used for greater security. In fact, if we want to have an ideal biometric system, we can say that an ideal biometric system should have the following characteristics: it must be permanent and immutable; process of collecting personal information must be impalpable and be done by tools that have the lowest levels of physical collision. A system with such features will be fully automatic and thus, the speed of the system and its performance in terms of real-time operation will be much better [21]. Figure 12 shows the performance of a biometric authentication system and also Features of biometric systems have been evaluated in Table 4.

Table 4. biometric authentication system

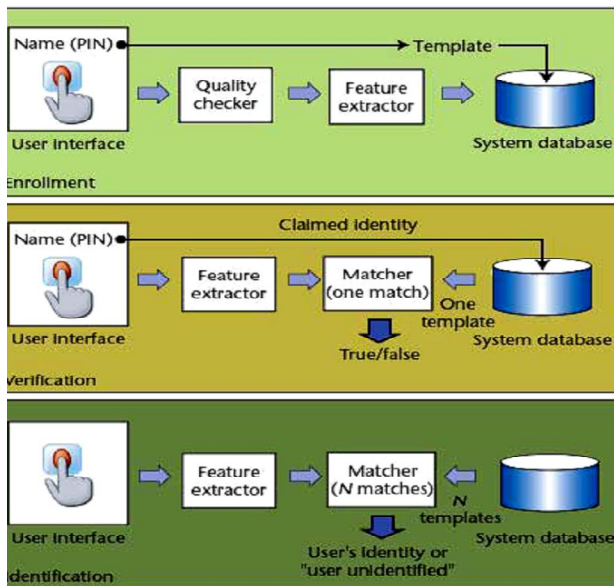| Features	Universality	Permanence	Collectability	Acceptability	Features	Durability	circumvention
Fingerprint	M	H	M	M	H	H	M
DNA	H	H	L	L	H	H	L
Iris Pattern	H	H	M	L	H	H	L
Retina	H	M	L	L	H	M	L
Ear	M	H	M	H	M	H	M
Face	H	L	H	H	L	M	H
Thermogram	H	H	H	H	M	L	L
Gait	M	L	H	H	L	L	M
Hand Geometry	M	M	H	M	M	M	M
Palm-Vein Pattern	M	M	M	M	M	M	L
Keystroke Dynamics	L	L	M	M	L	L	M
Smell	H	H	L	M	L	H	L
Signature	L	L	H	H	L	L	H
Voice	M	L	M	H	L	L	H

Figure 12: Enrollment, Verification and Identification [22]

5.5. Possible Solutions Using Biometric Methods

Security evaluates ways and means of implementing data integrity and protection policies for organizations including Electronic learning systems [23]. Words privacy and integrity are extremely important; how can we make sure that authenticated users may have altered the data. Also. The issue of granting access is vital. Most users have access problems when working with biometric systems which in itself makes biometric systems somewhat unsustainable but this system can be used along with for example cards in order to check whether the user has passed this level or not. We believe that biometric systems are not used enough despite the fact that those are expected to be used more by consideration of theoretical features of this type of authentication systems.

IEEE p1484 has been raised for exchanges related to learning technology with security and privacy. This standard has been published by Standards Committee of IEEE Learning Technology [23].

Table 5: Features related to Security in IEEE P1484 Standard [23]

Model	Feature	Model	Feature
Session-View Security Model	D	Non-Repudiation Model	I
Security parameter Negotiation model	D	Repudiation Model	I
Security Extension Model	D	Privacy Model	N
Access Control Model	D	Confidentiality Model	N
Identification Model	I	Encryption Model	N
Authentication Model	O	Data Integrity Model	N
De-Identification Model	O	Validation of Certificates	N
Authorization Model	I	Digital Signature Model	N
Delegation Model	I		

D – Defined: the model and/or requirements are defined or provided

I – Implementation-dependent: the detailed methods are depended on detail implementations.

O – Outside the scope: the methods outside the standard.

N – Non-specified: the standard doesn't specify the model and requirements.

Table 6: Biometric Features from the other point of view [24]

Features	Universality	Permanence	Attainment	Acceptability	Features	Durability	circumvention
Fingerprint	M	H	M	M	H	H	M
DNA	H	H	L	L	H	H	L
Iris Pattern	H	H	M	L	H	H	L
Retina	H	M	L	L	H	M	L
Ear	M	H	M	H	M	H	M
Face	H	L	H	H	L	M	H
Thermogram	H	H	H	H	M	L	L
Gait	M	L	H	H	L	L	M
Hand Geometry	M	M	H	M	M	M	M
Palm-Vein Pattern	M	M	M	M	M	M	L
Keystroke Dynamics	L	L	M	M	L	L	M
Smell	H	H	L	M	L	H	L
Signature	L	L	H	H	L	L	H
Voice	M	L	M	H	L	L	H

These two methods are more reliable and more durable in the field of biometric methods with regard to considered parameters. In addition, the ability to bypass them is lower compared to other methods of authentication and identification and are considered as a good option to implement online learning systems but method of their implementation is another issue because this implementation should be in a way that it does not reduce the flexibility of online learning

system and we do not face decline in performance after its implementation.

According to Table 4, since the "acceptability" is not critical and the "bypass" aspect should be low, we can reconsider the table and it will be determined that Multi-mode biometric systems such as Iris Pattern and Retina are good options to meet the desired goals and it's not only Fingerprint system which can be used in the field. Both of these methods which are Iris Pattern and Retina are without contact with the user and there is low possibility to bypass them and these make them good options for or use in online learning systems [24].

5.6. Complete Study Model to Optimize the System

A model was created according to studies and analysis of the results of questionnaire about e-learning system using which the intended system can be improved in terms of security and performance which is shown in Figure 13.
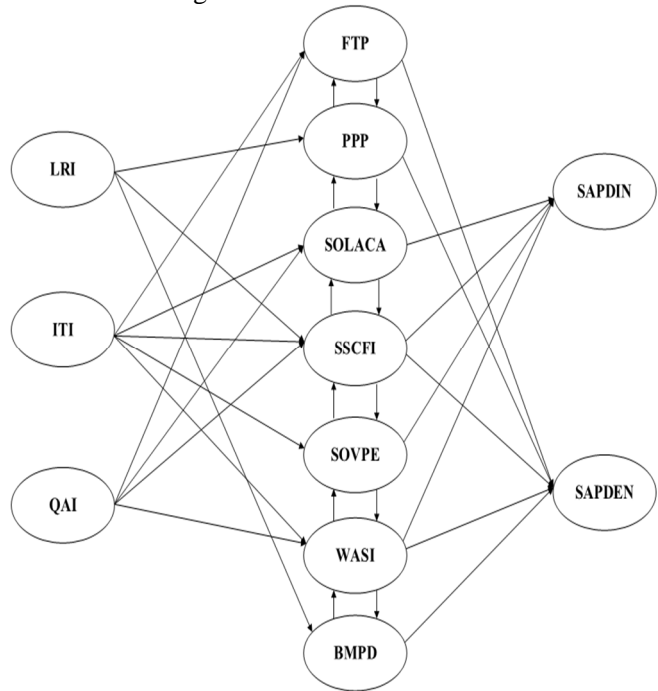

Figure 13: Final Study Model

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Table 7: Abbreviations of Final Study Model

Abbreviation	Definition
LRI	Literature Review Information
ITI	Interview for Technical Information
QAI	Questionnaire Analysis Information
FTP	Fault Tolerance and Performance
PPP	Privacy Policies (P3P)
SOLACA	Securing and Optimizing LMS by Appropriate Codes and Algorithms
SSCFI	SSL Security Channel for Fundamental Improvement
SOVPE	Securing and Optimizing Vital system apps by Plug-ins and Extensions
WASI	Web Application Security Improvement
BMPD	Biometric Methods for Privacy and Data protection
SAPDIN	Security Algorithm for Privacy and Data protection in Internal Network
SAPDEN	Security Algorithm for Privacy and Data protection in External Network

Conclusion and Future Works

It was determined based on carried out researches and studies that the studied e-learning system generally provides an acceptable performance but the results show that this system requires measures in order to improve its productivity and efficiency. The results obtained from the questionnaire stated that the system requires new perception and several strategies in order to meet the satisfaction of the main users which are students. According to the final model, this purpose can be achieved by using a proper policy about the method of software update and optimized and updated codes as well as proper extensions. Also the main part of the solution states that use of a proper algorithm or implementation of above objectives in external and internal networks is absolutely vital. Design, implementation and application of the two-key algorithm are very important and necessary for implementation of aimed optimization, integration and security of the studied virtual training system.

Naturally, the subject of evaluation of presented algorithms creates another discussion in the field of immunization, optimization and integration which is the world of algorithms and communication networks

from technical and security aspects. The solution presented in this study and creation of its groundwork and foundation made the process of design, implementation and operation of this action plan possible which can be considered as one of the tasks to complete the process of securing and optimizing e-learning system in most organizations because the main structure and approach to the issue of virtual learning is almost identical with respect to the raised standards.

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