Industrial Engineering Journal
ISSN: 0970-2555
Volume : 52, Issue 11, No. 3, November : 2023

A STUDY ON EFFICIATE E-LEARNING SYSTEM WITH REFERENCE TO INVENTIVE WEB BASED TECHNOLOGY

Sunil Kumar Palaskar, Research Scholar, Faculty of Information Technology, ISBM University, Nawapara (Kosmi), Block: Chhura, Dist.: Gariyaband, Chhattisgarh, 493996.
Dr Abha Mahalwar, Assistant Professor, Faculty of Information Technology, ISBM University, Nawapara (Kosmi), Block: Chhura, Dist.: Gariyaband, Chhattisgarh, 493996.

Abstract
A company has an intranet or internet webpage. Although it is incredibly helpful, it has evolved naturally through time and is far from flawless. Many of the articles are wrong or out-of-date, it's difficult to discover stuff, it's difficult to update the website, and it's starting to seem antiquated. What was on the website last week or a year ago? No one can say. Fortunately, web-based technology is expressly created to address these issues. The advantages of web-based technologies are many and diverse.

Keywords:
E-learning, E-learning system, web-based technology.

I. Introduction

In the context of e-Learning tools, the notion that "learning motivation is more vital than technology" is emphasised, while the significance of instructors' current technical abilities is highlighted. Despite students' scepticism about the usefulness of online education, they are ready to engage in real-world activities. With little care for how the information is presented or how the materials themselves seem, educational resources have been developed. The genuine learning environment had a considerable effect on their excitement and involvement in their studies. In view of today's focus on individual choice and the elimination of physical and mental barriers to learning, the expansion of e-Learning platforms will surely become a significant goal for contemporary educational growth. The quantity of digital information accessible is expected to expand in the near future, according to researchers [1]. It is estimated that millions of people have downloaded multimedia content management systems (MCS) through the Internet and other devices such as computers, mobile phones, PDAs and other portable electronic devices in recent years (PDAs). Using natural language to search for and find information has added a new layer to the fundamental notion of multimedia. The combination of advanced multimedia applications into new mobile hardware devices has radically changed the way people live, work, play, and travel.

The Internet's latest innovations have profoundly changed our lives in a number of ways. People may now interact on a worldwide scale and analyse vast amounts of data thanks to these new technologies [2]. There are two revolutionary features: first, it includes basic mechanisms for managing the graphical information material on web pages; second, it allows registered users to change the information network throughout the structure throughout the hypertext knowledge network and collaborative and interactive software[3-5].

As a result of a lack of face-to-face connection, students may lose motivation when using the Internet for education. Despite the fact that the course had already been finished, the student decided to abandon it. A drawback to WBI is the loss of student autonomy, unless an instructor holds students responsible for working against the goal. Students may get dissatisfied with the diminishing authority of their lecturers. Additionally, it is difficult for students to stay focused on their work. Approximately 30 to 50 percent of students who have successfully used a remote learning strategy must inspire their peers to participate in learning activities.. Active participation refers to a learning experience in which the

learner reacts to an interaction, while passive engagement refers to a learning experience in which the student is merely the receiver of knowledge [6-9]. Interaction in a learning experience helps the student become more attentive, responsive, and involved in the task at hand. When it comes to online education nowadays, it's really about creating an environment where students can study and contribute while also having access to the information they need. e-learning is used to describe both of these activities. The term "e-learning" has no agreed-upon meaning. We refer to this kind of learning as e-learning if we can access it through web-enabled devices [10- 11].

II. Methodology

Research design

Choosing an appropriate research design is critical because it symbolises all of the activities involved in gathering data and achieving the research aim. It's best to start with the study subject when selecting a design. Using research design, a researcher might draw out a plan for collecting and assessing data. Semantic web and e-learning adoption is being studied in order to build a better paradigm for the higher education sector.

We used a quantitative approach to determine the present state of the system and the extent to which students and teachers have accepted and used it in order to achieve the aforementioned aim.

Data collection

Students and faculty members at a university are asked to fill out an online survey. The two forms of descriptive surveys are cross-sectional and longitudinal. Using a cross-sectional technique, researchers will examine a wide range of populations simultaneously. These kinds of surveys are helpful in figuring out the connections between different variables. In contrast, longitudinal surveys aim to collect data from the same population throughout time. The survey is more costly as a result of its duration.

Surveys

Surveys collect data from a wide number of participants to get the most accurate results. Surveys, interviews, and phone calls, both online and offline, are used in this method. There are a plethora of survey options available. In a "One Shot" survey, a person or a group of people may be surveyed once and get all the information they need at the same time. The "Before and After Survey" is a throne that people use before and after an event.

E-learning research and tools

Academics in the domains of Intelligent Tutoring Systems (ITS) and Learning Management Systems (LMS) are focusing on interoperability and reuse difficulties as a result of the success of online information access. Efforts to create new learning tools and technology have been brisk:

Brokers of the educational system: Meta-information about teaching and learning is included in each of these systems. In addition to making content providers' resources publicly accessible, a brokerage aspires to combine resource buying, distribution, and billing. ARIADNE, GEM, and EdNA offer a user-friendly interface for classifying and accessing educational resources online. Proposals for a domain CORBA Facility for educational brokering may be found in several different systems, such as GESTALT (CORBAlearn).

The educational software watchdog: Foundations for Collaborative Work were based on the findings of the research (BSCW). BSCW allows for online project management and access to critical documents at any time and from any place. Large corporations, as well as those of a more modest scale, will gain. It's more suited for e-Business than e-Learning BSCW.

III. Results and Discussions

Data acquisition and analysis

When a real-time application is implemented, the typical data collecting procedure comprises a number of tedious and time-consuming processes. All of the students' log data was collected over the course's length on the e-learning site. A total of 57 students enrolled on the platform and briefly used the Android course. Throughout the length of the online course, use of the portal by the students who visited it was monitored and recorded in World Wide Web Consortium (W3C Extended) log files. Additionally, each learner's access frequency and time spent on the components are recorded, recognised, and kept.

Log Data Capturing

W3C Extended format was used to record the log data. The log fields are separated by a whitespace in this format, which is versatile and extremely adaptable. The "Date" and "Time" fields are expressed in Greenwich Mean Time (GMT) time, and a dash (-) is used to signify a field null value. From the web log file that was acquired, the following characteristics were found:

- Client IP Address: 192.101.61.2
- Client Resolved IP Address: client_abcd7
- Authenticated Username: AMS.user
- Request Date: 2010-09-12
- Request Time: 09:30:18
- Client to Server Request Method: GET
- Request URI: /admin/images/bottomleft.pdf
- Status Code (or Server Response Code): 200
- Bytes Sent from Server to Client: 500
- Cookie String: %BIGipServerwww_webcache_pool=1443321748.19460.0000; ORA_UCM_AGID=%2fMP%2f8M7%3etSHPV%40%2fS%3f%3fDh3VHO
- Referrer: http://www.coursera.com/ml/content.html
- Time Taken (to serve the request): 24537 (seconds)
- User Agent: Mozilla/4.5 [en] (WinNT; I)

Log Data Analysis

For analysis, the data from the web log must be converted into a common format. Several preprocessing tasks must be completed for it. Some of the activities include data cleansing, session and log identification. Pre-analysis using various algorithmic techniques must be completed before turning the data in the web log into standard format. This is helpful for seeing trends and determining if the data that was recorded is accurate or not.The actions/use of the learning components and the material that the learner accesses on the portal are all included in an e-learning session. By gathering log data that includes the activities as per timestamp in the specific session, the LS of a learner is studied and determined. The duration and sequencing of the acts in such sessions set them apart from other collected sessions. The sessions of the common learners should be aligned depending on how similar they are in order to merge common patterns.

Industrial Engineering Journal
ISSN: 0970-2555
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This analysis is fully explained in the section that follows.

Algorithm 1 Time-spent by the learner in one Session

INPUT: A finite set of Learners L = L_1, L_2,.....,L_N and Sessions S =S_1, S_2,.....,S_Q

OUTPUT: $TFile_j$ = Time-spent on particular file in one session and Total $Duration_i$ = Total time spent on a particular file in all sessions by Learner L_i

initialize $End_{Time} \leftarrow 0$, $Start_{Time} \leftarrow 0$, $TotalDuration_i \leftarrow 0$, $TotalSession_{Time_i} \leftarrow 0$

for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
  for *each Session* S_j where $j \leftarrow 1$ **to** Q **do**
    if *"File" is accessed* **then**
      $Start_{Time} \leftarrow t$
      {t is the system time at Learner clicked}
    end if
    if L_i *is clicked back button* || L_i *clicked other link* || L_i *idle for threshold time* **then**
      $End_{Time} \leftarrow t'$
      {t' is the system time at Learner unclicked}
    end if
    $TFile_j \leftarrow End_{Time} - Start_{Time}$
  end for
  $TotalDuration_i \leftarrow TotalDuration_i + TFile_j$
end for

Algorithm 2 Time-spent by the learner on a Particular File in all the Sessions

INPUT: A finite set of Learners L = L_1, L_2,.....,L_N and Sessions S =S_1, S_2,.....,S_Q

OUTPUT: $TFile_j$ = Time-spent on particular file in one session and Total $Duration_i$ = Total time spent on a particular file in all sessions by Learner L_i

initialize $End_{Time} \leftarrow 0$, $Start_{Time} \leftarrow 0$, $TotalDuration_i \leftarrow 0$, $TotalSession_{Time_i} \leftarrow 0$

for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
  for *each Session* S_j where $j \leftarrow 1$ **to** Q **do**
    if *"File" is accessed* **then**
      $Start_{Time} \leftarrow t$
      {t is the system time at Learner clicked}
    end if
    if L_i *is clicked back button* || L_i *clicked other link* || L_i *idle for threshold time* **then**
      $End_{Time} \leftarrow t'$
      {t' is the system time at Learner unclicked}
    end if
    $TFile_j \leftarrow End_{Time} - Start_{Time}$
  end for
  $TotalDuration_i \leftarrow TotalDuration_i + TFile_j$
end for

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Algorithm 3 Frequency of a Particular File on Portal

INPUT: A finite set of Learners L = $L_1, L_2, \ldots, L_N$ File F =$F_1, F_2, \ldots, F_X$ and Sessions S =$S_1, S_2, \ldots, S_Q$

OUTPUT: F_{ib} = No. of times one Learner accessed particular $File_k$ in all sessions

$FiileCount_k$ = No. of times all the Learners accessed particular $File_b$

initialize $F_{ib} \leftarrow 0, F_{ijb} \leftarrow 0, FileCount_b \leftarrow 0$
for *each File* F_b where $b \leftarrow 1$ **to** X **do**
  for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
    for *each Session* S_j where $j \leftarrow 1$ **to** Q **do**
      if *File* F_b *is accessed* **then**
        $F_{ijb} \leftarrow F_{ijb} + 1$
      end if
    end for
    $F_{ib} \leftarrow F_{ib} + F_{ijb}$
  end for
end for
for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
  $FileCount_k \leftarrow FileCount_k + F_{ib}$
end for

Algorithm 4 Frequency of a Particular Type of File Accessed by Learners

INPUT: A finite set of Learners L = $L_1, L_2, \ldots, L_N$ and Sessions S =$S_1, S_2, \ldots, S_Q$

OUTPUT: Frequency of accessing particular type of file

initialize $FileType \leftarrow NULL, Freq_{PDF} \leftarrow 0, Freq_{PPT} \leftarrow 0, Freq_{MP4} \leftarrow 0$
for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
  for *each Session* S_j where $j \leftarrow 1$ **to** Q **do**
    if *"File" is accessed* **then**
      get $FileType$
      switch $FileType$
      case "pdf" :
      $Freq_{PDF} \leftarrow Freq_{PDF} + 1$
      break
      case "ppt" :
      $Freq_{PPT} \leftarrow Freq_{PPT} + 1$
      break
      case "$mp4$" :
      $Freq_{MP4} \leftarrow Freq_{MP4} + 1$
      break
      end switch
    end if
  end for
end for

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Algorithm 5 Frequency of Learners Accessed a Particular Topic

INPUT: A finite set of Learners L = $L_1, L_2, \ldots, L_N$ Topics T = $T_1, T_2, \ldots, T_M$ and Sessions S = $S_1, S_2, \ldots, S_Q$
OUTPUT: T_{ik} = No. of times one Learner accessed particular $Topic_k$ in all sessions $TopicCount_k$ = No. of times all the Learners accessed particular $Topic_k$
initialize $T_{ik} \leftarrow 0, T_{ijk} \leftarrow 0, TopicCount_k \leftarrow 0$
for *each Topic* T_k where $k \leftarrow 1$ **to** M **do**
  for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
    for *each Session* S_j where $j \leftarrow 1$ **to** Q **do**
      if *Topic* T_k *is accessed* **then**
        $T_{ijk} \leftarrow T_{ijk} + 1$
      end if
    end for
    $T_{ik} \leftarrow T_{ik} + T_{ijk}$
  end for
end for
for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
  $TopicCount_k \leftarrow TopicCount_k + T_{ik}$
end for

Algorithm 6 Frequency of Learners Accessed a Particular Page on Portal

INPUT: A finite set of Learners L = $L_1, L_2, \ldots, L_N$ Pages P = $P_1, P_2, \ldots, P_R$ and Sessions S = $S_1, S_2, \ldots, S_Q$
OUTPUT: P_{ik} = No. of times one Learner accessed particular $Page_k$ in all sessions
$PageCount_k$ = No. of times all the Learners accessed particular $Page_k$
initialize $P_{ik} \leftarrow 0, P_{ijk} \leftarrow 0, PageCount_k \leftarrow 0$
for *each Page* P_k where $k \leftarrow 1$ **to** R **do**
  for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
    for *each Session* S_j where $j \leftarrow 1$ **to** Q **do**
      if *Page* P_k *is accessed* **then**
        $P_{ijk} \leftarrow P_{ijk} + 1$
      end if
    end for
    $P_{ik} \leftarrow P_{ik} + P_{ijk}$
  end for
end for
for *each Learner* L_i where $i \leftarrow 1$ **to** N **do**
  $PageCount_k \leftarrow PageCount_k + P_{ik}$
end for

Session Identification of Learners

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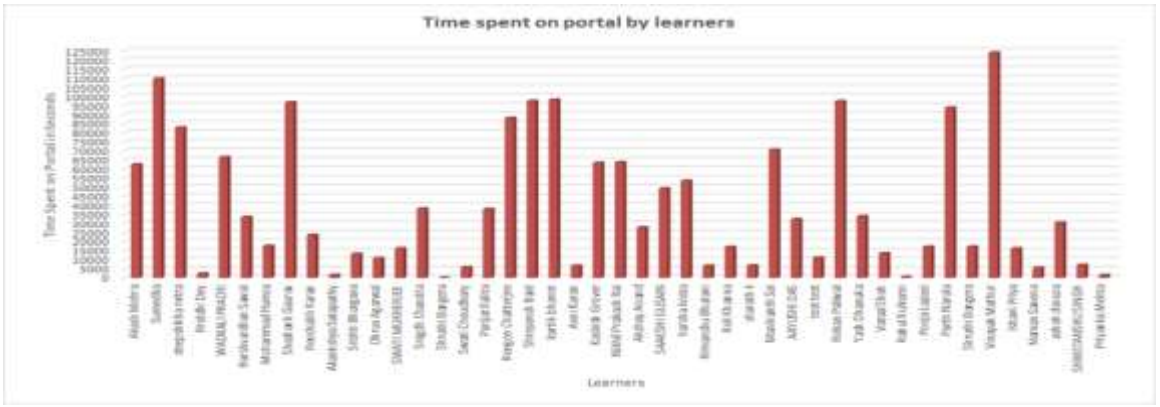

Figure 1: Identification of Learners' Session

Each learner's total time spent in all of their documented sessions is shown in Figure 1. The session duration is shown here in seconds. Each learner's session is defined as the period of time between their log-in and log-out times on the portal. Some sessions are lengthy because the learners take their time reading through the portal's information. There are certain sessions, however, that are brief in terms of duration. Short sessions are times when some students have just recently entered into the learning management system and have not yet accessed any learning items. Both the long and short sessions are shown on the graph. According to the amount of time spent throughout the course, each student gets more than one session. Based on the session ids and session length for each learner, this study helps to determine the sequence for preprocessing.

- Frequency and Time-spent on a Particular File

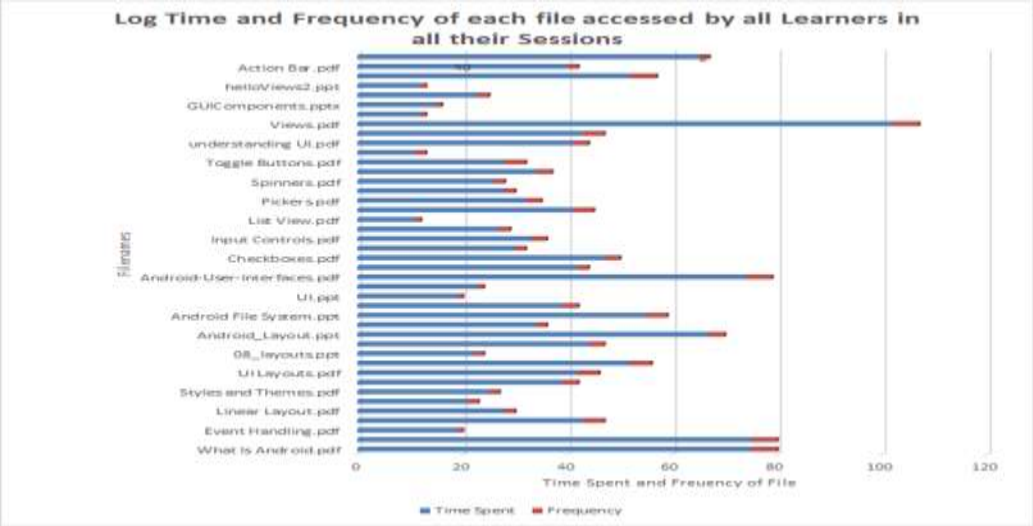

Figure 2: Frequency and Time-spent on Particular File

Similar and non-similar sequences based on mssdm

The 2197 produced sequences from the XML files are used in the experiment. The resulting sequences are mapped into the matrix form to carry out the method since they are distinct in length and order. The MSSDM method takes into account all distance measurements and calculates the threshold by averaging them all. 0.595385 has been determined as the final threshold value. Sequences that have values below the threshold are regarded as similar, whereas sequences that have values beyond the threshold are regarded as non-similar. The number of similar and dissimilar sequences, together with the learner ids connected to comparable sequences, are shown in Table 1. The learner IDs linked to the non-similar sequences are not shown in the table. Additionally, students with similar sequences are clustered using a fuzzy clustering technique, and students with dissimilar sequences are taken into account when offering learning advice on how to access the components.

Table 1: Similar and Non-Similar Sequences

Number of Similar Sequences	Number of Non-Similar Sequences	Number of Learner Ids Associated with Similar Sequences
1235	962	42

Regardless of the length or order of the sequences, the distance between them is taken into account to find related sequences. The learner profile is subsequently clustered using all the related sequences. When determining the weights to be allocated for each sequence, time spent and frequency are taken into account. Sequences that are not comparable are not taken into account for further grouping. By examining the non-similar sequences independently, an appropriate learning route may be offered.

Learner Profiles using MFM Algorithm

By using a fuzzy membership function, comparable sequences are grouped. Table 2 displays three groups of students.

Table 2: Clusters of Learners

Number of Learner Ids Between 0 to 0.3 (Short) Membership Values	Number of Learner Ids Between 0.3 to 0.7 (Medium) Membership Values	Number of Learner Ids Between 0.7 to 0.10 (Long) Membership Values
17	28	11

The MFM technique is used to cluster the comparable sequences of around 42 learners. Short clusters are made up of 17 students, medium clusters are made up of 28 students, and long clusters are made up of 11 students. Learners have spent more time on some components in certain sessions while spending less time on others. Since there are more learner ids overall than there are total learners, some of these learner ids are present in several clusters. In order to map the learning components according to the FSLSM and categorise these student ids into the eight learner categories specified by the FSLSM, Three Clusters Were Established.

Analysis of algorithms

Clustering using FCM and RFCM Algorithms

FCM and RFCM algorithms are used to cluster the comparable sequences. The comparison of the two approaches is shown in Table 3. The Table shows that the RFCM provides lower and border clusters. Lower and border members must be included in order to identify the cluster's members. The number of members in RFCM and FCM is about equal.

Table 3: Clustered Sequences using FCM and RFCM Algorithms

Classification of Clusters	Fuzzy C Means	Rough Fuzzy C Means		
		Lower	Boundary	Total
Active Cluster	214	159	61	220
Reflective Cluster	145	107	47	154
Sensing Cluster	139	116	23	139
Intuitive Cluster	164	102	69	171
Visual Cluster	257	226	13	239
Verbal Cluster	134	62	59	121

Sequential Cluster	145	110	38	148
Global Cluster	154	90	56	146

Applying the Jaccard Index and XB Index allows for the evaluation of the quality of clusters. Table 4 displays the findings. The XB Index value should be at or near zero for the highest level of engagement.

Table 4: Jaccard and XB Index Values

Algorithm	XB Index	Jaccard Index
Rough Fuzzy C Means	0.02591	0.781
Fuzzy C Means	0.02616	0.729

IV. Conclusion

Following the study, we believe that the Semantic Web will have an influence on study areas such as software agents and web services as well as information technology and knowledge engineering. The Semantic Web's main objective is to provide much of the information that we now manage on the web to software agents. Despite its numerous accomplishments, the Semantic Web still has a long way to go before its goal becomes a reality..

References

[1]Kumar, V., Morris George and Joseph Pancras (2008), "Cross-buying in Retailing: Drivers and Consequences," Journal of Retailing, 84 (1), 15-27.
[2]Kumar,v., Kiran Karande andWemer J. Reinartz (2008), "The Impact of Internal and External Reference Prices on Brand Choice: The Moderating Role of Contextual Variables," Journal of Retailing, 74 (3), 401-26.
[3]Sobel, R.S. and Dean, A.M. (2006), "Has Wal-Mart buried mom and pop?: the impact of Wal-Mart on self-employment and small establishments in the United States", available at: www.be.wvu.edu/ divecon/econ/ sobelAValMart/ Walmart.pdf (accessed 23 February 2007).
[4]Teller, C, Kotzab, H. and Grant, D.B. (2006), "The consumer direct services revolution in grocery retailing: an exploratory investigation". Managing Service Quality, Vol. 16 No. 1, pp. 78-96.
[5]Thakkar,M. and Bhatt, M. (2007), "Mom & pop in reliance family". The Economic Times, Kolkata edition, 23 February, p. 4.
[6]Sunita Sikri and Dipti Wadhwa (2012). Growth and Challenges of Retail Industry in India: An Analysis.
[7]Rajan Girdhar. (2011). Organized Retailing in Rural India: The Key Elements of Success For Retailers Opportunities And Challenges. International Journal of Business Management & Research (IJBMR). 1(2): 68-89. © TJPRC Pvt. Ltd.
[8]Rajagopal. (2011). Determinants of Shopping Behavior of Urban Consumers
[9]Tripathi, S. and Sinha, P.K. (2008). Choice of a Retail Store and Retail Store Format: A Hierarchical Logit Model. Indian Institute of Management Ahmadabad, W.P. No. **04(03)**: 1-22.
[10] Ravi Kiran and Deepika Jhamb. (2011). A Strategic Frame work for Consumer Preferences towards Emerging Retail Formats.
[11] Krishan Kumar. (2010). Study of Rural Consumer Behavior towards Rural Retail Stores.