Website Quality Assessment Model (WQAM) for Developing Efficient E-Learning Framework- A Novel Approach

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Abstract— **The prodigious growth of internet as an environment for learning has led to the development of enormous sites to offer knowledge to the novices in an efficient manner. However, evaluating the quality of those sites is a substantial task. With that concern, this paper attempts to evaluate the quality measures for enhancing the site design and contents of an e-learning framework, as it relates to information retrieval over the internet. Moreover, the proposal explores two main processes. Firstly, evaluating a website quality with the defined high-level quality metrics such as accuracy, feasibility, utility and propriety using Website Quality Assessment Model (WQAM) and secondly, developing an e-learning framework with improved quality. Specifically, the quality metrics are analyzed with the feedback compliance obtained through a Questionnaire Sample (QS). By which, the area of the website that requires improvement can be identified and then, a new e-learning framework has been developed with the incorporation of those enhancements.**

Keyword- Feedback compliance, QS, website quality assessment, accuracy, feasibility, utility and propriety.

I. INTRODUCTION

In recent years, Website development has been done at a rapid pace for wide ranges of applications in different domains such as government, education, entertainment, business and health. Millions of websites are available today, but a small percentage of those reach far above the ground level in gratifying the user's need. While analyzing, some of the reasons causative for this problem are pertinent to the rapid progression in web technologies, the simple usage of web-oriented languages and the forbearance of browsers to exhibit incorrect code. Additionally, other reasons may contribute to the problems such as the background of designers and developers for website design. Despite the reality many websites lack in quality and does not satisfy the user requirements; the reliance to use sites for different prospects such as finding information, online shopping, communicating with people or accomplishing other different tasks has amplified. Moreover, it is also been noted that existing websites in variant domains have become application-oriented and merely not document-oriented. As a result, there is an increase in complex development of system designs. Subsequently, there are rising concerns and confrontations on website design, implementation and assessment techniques.

Further, it is analyzed that one of the domains where websites are widely used nowadays is the academic domain for the purpose of information distribution, e-learning, etc. Focusing on that analysis, the main goal of this paper is to assess the quality of an academic website with some criteria and develop an efficient e-learning environment with certain improvements. Evaluating the quality of a website helps to estimate whether the website is attaining its intended purpose for learners. Besides, the assessment results can help to predict the parts of the website that needs improvement.

While discussing about the quality assessment criteria, a set of quality parameters is required that defines what is expected from the site characteristics. The set of website characteristics and the relationship among them is considered as the base for forming a quality assessment model. Moreover, to evaluate the quality of websites, it is necessary to analyze which quality parameters to take into account, which kind of evaluation procedure to utilize and which viewpoints of users are to be considered for the evaluation purpose [10].

Fig 1: Common Criteria for Site Quality Evaluation

Figure 1 reveals some of the quality parameters for effectively determine the site's quality. The evaluators perform the measurement and rating process based on those criteria. The sub-categories for those defined criteria can also be incorporated for site evaluation process as in [9]. There are three different quality approaches in general:

1. External Quality
2. Internal Quality
3. Quality in use

On that, the process merely concentrates on quality in use that reveals the user point view in using the site while performing the task for a particular context. Since the external quality is used during the normal testing procedures and the internal quality is used to evaluate the site specification properties. In all-purpose, quality evaluation approaches suffer from the following limitations that are to be considered [15].

- Defines very general criteria, rather than specific
- Qualitative criteria are mainly considered
- Defined criteria are not orthogonal
- Granularity definition

The proposed methodology involves in developing the WQAM for effectively analyzing the quality of a specific e-learning site with the quality parameters such as accuracy, feasibility, utility and propriety that covers all the assessment criteria, significantly. The major core for assessment is the user's feedback. On account of that, the site is being assessed whether it satisfies the novice requirements utterly. Figure 2 presents the generic transparency framework for academic site evaluation, wherein the feedback compliance of a site is the substantial task. Generally, the feedback is obtained from teachers and students through a questionnaire. The sample has been made with some queries based on the high-level quality metrics. Furthermore, it is also vital that the site content should be clearly worded, updates and receptive to feedback. It has been observed from the given transparency framework that the site assessment process is a cyclic one since the user expectations and requirements are still growing. And also, it is explicitly termed that the site contents and design should be improved periodically to satisfy the novices with best knowledge.

On that concern, after the accomplishment of evaluation process, the efficient website development process has been invoked with the proposed approach for resolving and improving the site characteristics. The developed e-learning environment will also be examined with the quality evaluation procedure for substantiation.

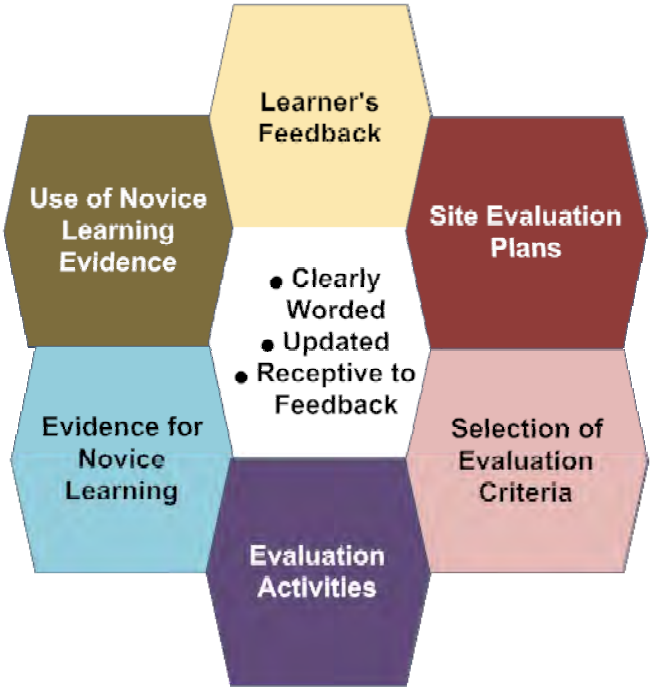

Fig 2: Generic Transparency framework for Academic site Evaluation

The remaining part of this paper is organized as follows. Section 2 provides a deliberation on the related work. Section 3 presents the system architecture and design with an implementation of the affirmed system. Section 4 presents the experimental results and Section 5 concludes the paper with pointers to future work.

II. RELATED WORKS

Since websites quality assessment remains an unsettled affair, the research on this field is still remains an ongoing process by proposal of distinctive approaches. Quality Evaluation Model (QEM) was proposed in [14] to assess the website quality in the functional basis of a Web Information System (WIS) lifecycle. The analysis was made with three different types of visitors such as students, academic personnel and research sponsors. They have just provided the results of the examination. In [11], a model called 2QCV3Q was developed with classic rhetorical principles and provided guidelines for further improvements in website design. For developing the evaluation model, they considered some fundamental aspects given below:

- Quality of a site is dependent on both process and final products
- User satisfaction
- Feedback generation

The paper concluded with some suggestions to the developers for its redesign. There was a discussion about the implications of comprehension strategies for critically assessing the content on the website [6]. In further analysis, the paper [5] described some of the significant process of e-learning system and Learning and Content Management system (LCMS) that supports e-learning. The authors also specified some data collection and question formation methods. Multiple dimensions of user satisfaction were analyzed with a framework in [13]. The process used for the quality indicators synthesis holds principles and tools from multiple parameter analysis and it was based on a value-focused method, where the problem parameters were represented in the form of value functions. The methodology comprised the following three steps.

1. Specification of the evaluation system
2. Definition of synthesis model
3. Analysis of evaluation results

The e-government website accessibilities were analyzed in [1], wherein the users of the sites are categorized into four sections namely, government, universities, institutions and companies. Moreover, the approach worked under five stages. Stage 1 involved in procedure testing, whereas stage 2 was for testing the site with special functional tools and stage 3 invoked for testing hypothesis. The tools used in stage 1 and 2 were examined to find whether it was language-specific. Exploring the cause behind the lack of usability was the work of stage 5. Thus, the paper only focused on a certain criteria called usability to assess the site.

Another paper [8] provided a general evaluation theory for web-based e-government services. They analyzed task characteristics, site characteristics and individual characteristics for providing better suggestion for further development. With a different dimension, a paper [18] developed a model called IQIP i.e. Identify, quantify,

implement and perfect for information quality assessment in World Wide Web. Moreover, the paper attempted to summarize the result state on information quality as well as most common criteria to evaluate the information quality in the context of its use. They directed their research on website evaluation in all aspects along with content as their future work. Following that in [12], a discussion had been made for website evaluation. The paper comprised a model based accuracy and usability assessment and framed the following equation for site evaluation.

$$G_i = \sum_{j=1}^{n} a_j x_{ji}$$

Where i and j represents user and criterion, a_j stands the ponderation of each criterion, whereas x_{ji} represents the punctuation given by each criterion.

For efficient website assessment, a structural and theoretical foundation of LORI i.e. Learning Object Review Instrument was presented in [20]. The process was to balance the evaluation validity with efficiency of the assessment process. Mainly, the paper focused on assessing the quality of multimedia learning process. In a specific manner, the authors of [4] analyzed the airline website's quality. The results of the evaluation process provided guidelines and suggestions not only to users, but also to the developers and designers of airline websites. The suggestions were directed to further improvements.

With the rapid growth of internet, companies involve in achieving significant advancements through e-business. Since there is an increase in the dependency of web technology, the quality of the site should be much well and assessed periodically or on demand with the dimensions of criteria such as content quality, design quality, organization quality and user-friendly quality [7]. The paper produced a comprehensive framework for assessing the quality of any website irrespective of its type. In tertiary education, discussion forums support the novices to gain knowledge and share from each other. On that note, the paper [3] developed a framework to assess the quality of online discussion forums. The quality analysis was made with three basic criteria namely, content, interaction and objective measures. In further developments, the evaluations have to be made with diverse dimensions of e-learning.

In [19], different kinds of tools such as W3C Link Checker, W3C Markup Validation Service, Webpage Analyzer and Website Extractor are used to analyze the components of website. Moreover, the paper focused on the evaluation parameters such as download time, website size, broken links, etc. The paper worked on the way to identify all possible errors in the design of a site with some other specific references. In a different view, the paper [2] analyzed the site with quality perspectives such as web navigability, web usability, web accessibility, web searching and information retrieval. Furthermore, the process is utilized for different approaches such as marketing and e-commerce [17].

The paper [16] has measured the quantifiable metrics of quality for some websites of academic domain. The aggregation of external qualities such as usability, functionality, reliability and efficiency had been carried out with Logical Scoring of Preferences (LSP) method. The global aggregation of the above stated attributes was performed to rank the websites. By the results of ranking, the suggestions would be given for low ranked sites.

III. PROPOSED WORK

The main objective of this work is to develop a comprehensive and measurable framework for evaluating the quality of an e-learning website in order to afford straight-forward criteria for further improvements of website design and implementation. Furthermore, we also aim to develop an efficient improved e-learning framework. A multi-phase approach has been adopted, which includes a broad range of literature survey, review of leading sites, success factors identification from research literatures and also using our own knowledge in the field. After profound and comprehensive review of distinctive evaluation methods and their elements, which are involved in different service over the Internet, we propose Website Quality Assessment Model (WQAM). The model is more comprehensive and comprises all dimensions and elements in order to evaluate an e-learning site. The high-level quality parameters of the proposed criteria are accuracy, feasibility, utility and propriety.

Moreover, the proposed framework attempts to assimilate experience and knowledge from different sources. Major thing is to identify measurable features and criterions that currently comprise a successful website. With that concern, Questionnaire Sample (QS) is framed for feedback compliance. The sample is completely based on the four high-level quality metric stated earlier. Using the feedback, the quality of the existing e-learning site is assessed and a path for website improvement is identified. The afforded guidelines will be invoked while creating the new website. Figure 3 depicts the hierarchy of the high-level quality metrics and the criterions for each quality metrics. The website that satisfies all these criterions is said to be a perfect site, in such case no need of further correction or improvements, where as periodical updation is required.

Apparently, the elementary process of the proposed work is to acquire the feedback of an academic site, which is obtained from the user by the results of QS. Following that, the data will be organized for compatibility. The organized feedback will be given for the WQAM for assessment of the site.

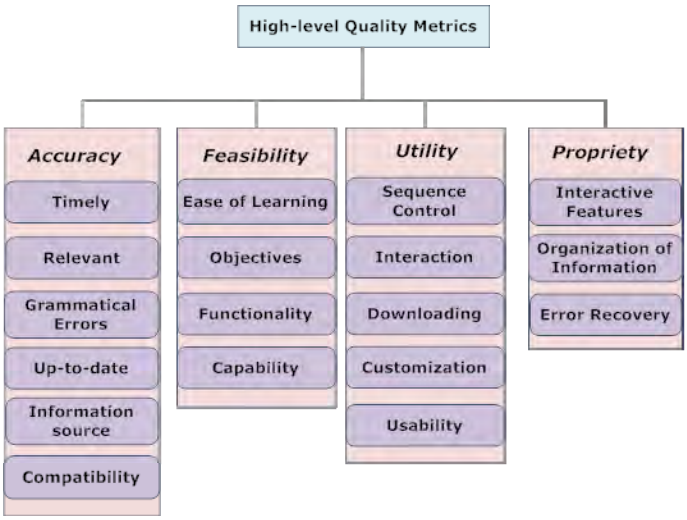

Fig 3: Hierarchy of High-level Quality Metrics

A. Website Quality Assessment Model (WQAM)

The WQAM is accomplished with those high-level quality metrics stated above. The process has been done with two phases:

1. Preliminary Assessment Phase
2. Evaluation Results Analysis Phase

After the assessment process, a check list will be obtained, which comprises of substantial criterion of specified metrics.

1) Preliminary Assessment Phase

The preliminary Assessment phase involves analysis of the website based on the high-level quality metrics namely, accuracy, feasibility, utility and propriety. The examination is made with the overall content of the site and also with specified category oriented manner, like topic or domain.

A. Accuracy:

The accuracy of factual information helps to judge the credibility of the site. Accuracy of information can also offer evidences to possible bias in the source under processing. The information given in the site should be more precise and should not have any spelling or grammatical errors. Some of the criterions come under accuracy are described below:

Timely:

It denotes the currency of website's information and shows how much it is up-to-date. It is also examined that how often the website is updated.

Relevant:

The website's information should be complete, comprehensive and provide the relevant level of details to the search query. In other words, it is stated that the information should be more informative and value added according to its novices and fits to their needs.

Information Source:

Information source will be provided to the learners with frequently updated content. A distinctive scenario of use of information source is that a content provider issues a feed link on their site by which an end user can enroll with an aggregator program running on their own machines. When instructed, the aggregator commands all the servers belonging to its source list if they have any new content either makes a note of it or downloads the new content.

B. Feasibility

The website has to be more feasible to accomplish the task of novices. The criterions under feasibility are as follows:

Ease of Learning:

This is a criterion for testing how simple the content for better understanding of learners.

Objectives:

It states whether the course procedures and assignments support the course objectives.

Functionality & Capability:

The criterion focuses on the analysis that the site has all the functionalities and capabilities that are expected by the learners.

C. Utility

Utility is defined as a measure of website's functionality. While designing a website, it is also necessary to determine what users will suppose to find and what tools they will require to accomplish tasks. The checklist comprises the following criterion under utility.

Sequence Control:

It checks whether the site provides flexible sequence control or not.

Interaction:

Standard e-learning site must have the interaction factors that help the users to post their doubts and comments about a specified topic or about the site.

Customization:

Customization is defined as the process of tailoring the content of the academic website according to the performance and requirements of specific users.

Usability:

The website must be facile to use, operate, understand, locate information or navigate to other pages. It is uncomplicated to find the website using external websites and it is obvious to the user that new information is updated to the website.

D. Propriety

Propriety is termed as the capability to update their sites themselves. Hence, this meant developing a user-friendly interface for users to do it through. The metric comprises the following domains. Its main motive is to replace the face-face learning.

Organization of information:

The information that is displayed on the site should be well-organized in a way such that the user can access and understand the information easily.

Error Recovery:

The website should also be capable to recover from errors easily and quickly. It is also vital for a website to display the error message when there is an internal error occurred while processing.

2) Evaluation Result Analysis Phase

Consider that the Experts Questionnaire Sample comprises N number of questions based on the high-level quality metrics explained above, it is given as,

$$Question\ Sample\ (QS) = \{QS_1, QS_2, \dots, QS_N\}$$

Each QS will be having three options such as agree, disagree and neutral. Let a, b and c be the default values (dv) given for the options agree, disagree and neutral respectively. While analyzing the feedback of an existing e-learning site, the number of agree, disagree and neutral values for each QS is counted and termed as $n_1, n_2\ and\ n_3$. Those values will be multiplied with its corresponding dv, by equation 1.

$$Count\ of\ Option\ (COP) = (QS_1, QS_2, \dots, QS_N)\begin{cases}\prod(a, n_1)\\ \prod(b, n_2)\\ \prod(c, n_3)\end{cases} \quad (1)$$

The obtained results will be given as,

$$\{(a_1, b_1, c_1), (a_2, b_2, c_2), \dots, (a_N, b_N, C_N)\}$$

With those values, the overall probability value of each QS is evaluated by the equation 2, by using Poisson distribution.

$$QS_{prob} = e^{-(\sum_{i=1}^{N}(a_k, b_k, c_k))} * (\sum_{i=1}^{N}(a_k, b_k, c_k))^a \quad (2)$$

Clustering of QS is then obtained by the results of above equation based on the quality metrics. That is, the question samples will be clustered on the basis of accuracy, feasibility, utility and propriety and it is described as follows:

$$C_{Acc} = \{QS_{Acc1}, QS_{Acc2}, \dots QS_{AccN}\}$$
$$C_{Fea} = \{QS_{Fea1}, QS_{Fea2}, \dots QS_{FeaN}\}$$
$$C_{Util} = \{QS_{Util1}, QS_{Util2}, \dots QS_{UtilN}\}$$
$$C_{Pro} = \{QS_{Pro1}, QS_{Pro2}, \dots QS_{ProN}\}$$

After clustering, the quality range for each metric has to be determined.

Before evaluating quality range, threshold value will be assigned for all the four metrics, which could be the median of QS_{prob} value of each. Since the threshold value is significant to find whether there is any need for modification or enhancement in the existing e-learning website.

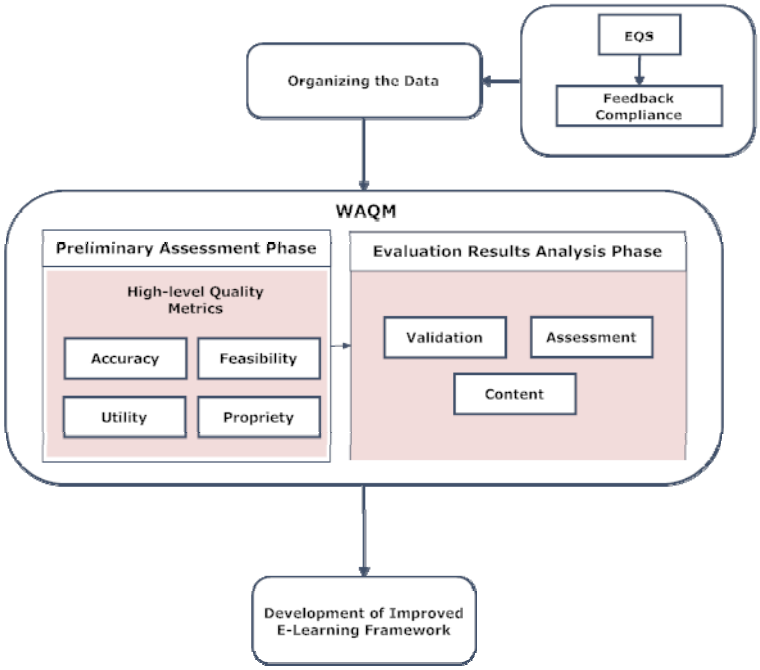

Fig 4: Overall Flow of the Proposed Work

The quality range for each metric is evaluated by the following equations.

$$Quality\ Range\ (QR)_{Acc} = \sum QS_{prob}(QS_{Acc1}, QS_{Acc2}, \dots QS_{AccN}) \quad (3)$$

$$Quality\ Range\ (QR)_{Fea} = \sum QS_{prob}(QS_{Fea1}, QS_{Fea2}, \dots QS_{FeaN}) \quad (4)$$

$$Quality\ Range\ (QR)_{Util} = \sum QS_{prob}(QS_{Util1}, QS_{Util2}, \dots QS_{UtilN}) \quad (5)$$

$$Quality\ Range\ (QR)_{Pro} = \sum QS_{prob}(QS_{Pro1}, QS_{Pro2}, \dots QS_{ProN}) \quad (6)$$

The results of each metric will be compared with the threshold values. If it is lesser than the threshold, modification is needed in that particular metric; else there is no need of modification. With those accomplishments, the overall satisfaction of the site is obtained.

B) Development of Improved E-Learning Framework

By comparing the results of (3), (4), (5) and (6) with the predefined threshold values, the suggestions and guidelines will be obtained about the site enhancement or modification. With those suggestions, if the quality range of accuracy is lesser than the threshold, that part will be concentrated and enhanced. Regarding accuracy, the grammatical errors and broken links are to be rectified and corrected, and the site information should be maintained up-to-date. The next metrics is the feasibility, which has been improved with easy learning functionalities and capabilities of the site. Flexible sequence control options and user interactions are to be invoked to improve the quality range of utility. Following that, clear organization of data has to be done and error recovery mechanisms have to be included to amend the quality range of the high-level metric called propriety.

Including all those modifications in the development of improved e-learning environment, a better site is provided for the novice to gain the best knowledge in their required fields. Figure 4 demonstrates the overall flow of the proposed work.

Pseudo Code:
Input: Feedback of an Existing e-Learning Site
Output: Quality Range
Begin: Load Feedback
For each Question Sample QS
1. Analyze Count
   a. Agree
   b. Disagree
   c. Neutral
2. Determine COP
3. Evaluate QS_{Prob}

End
Cluster QS
a. Accuracy
b. Feasibility
c. Utility
d. Propriety

For each cluster C
1. Determine Quality Range QR
2. Check Threshold for modification

End
Develop Improved E-Learning framework
End

The pseudo code for the proposed WQAM for assessing the quality of an existing e-learning site and developing a new improved site to satisfy the novices in a great manner is given above.

IV. EXPERIMENTAL RESULTS

In order to provide evidence for the efficiency of the proposed work, we analyzed the quality of an existing e-learning site and obtained the feedback of the users. The feedback is acquired from the QS (given in Annexure 1), which is framed based on the high-level quality metrics: accuracy, feasibility, utility and propriety. Deeply, the preliminary assessment phase has taken place as in section 3.1.1 and the criterion based analysis of each metric is made. Then, the second phase of evaluation process is being accomplished in two stages of calculations. The first stage involves in the overall quality range evaluation based on the metrics defined. The calculation procedure is given in section 3.1.2, whereas the second stage of evaluation is for topic wise examination. That is, the content of website is examined for each topic given.

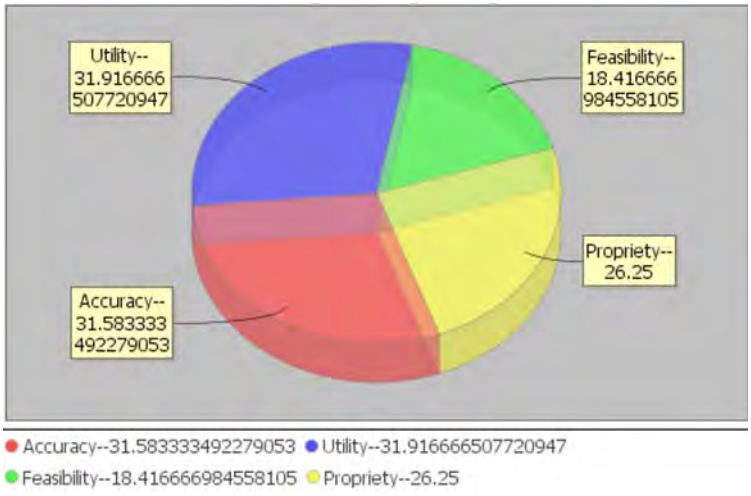

Fig 5: Quality Range for Overall Analysis (Existing Site)

The above Figure 5 exemplifies the quality range obtained by the equations (3), (4), (5) and (6) and for first stage of quality evaluation. The threshold values obtained here for accuracy, feasibility, utility and propriety has been given in Table 1. If the QR of a metric is greater than the threshold, there is no need of modification based on that particular metric on the site. If the QR is between 20 and 30, there is a need of partial

modification. But if obtained QR value for a metric is lesser than 20, entire modification is needed in the content or design of the site to improve its quality.

TABLE I
Threshold value for Overall quality range examination

Accuracy/ Feasibility/ Utility/ Propriety		
Threshold Value		
No Modification	Partial Modification	Entire Modification
QR > 30	*20 < QR > 30*	*QR < 20*

By examining the quality range of overall analysis by the threshold values in such a manner given in the above table, it is resulted as follows shown in Figure 6.

Fig 6: Enhancement Analysis

The second stage of evaluation involves in topic wise quality range evaluation in similar procedure of previous evaluation for further analyzing the content and design of an existing site.

The Figure 7 presented below depicts the results obtained from the pair wise analysis process.

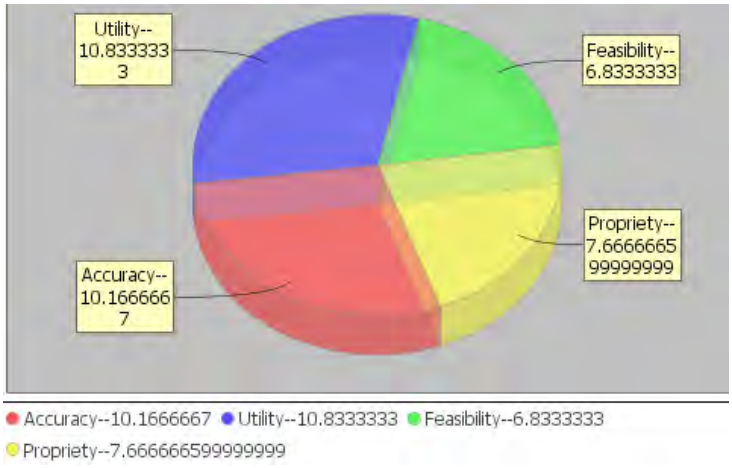

Fig 7: Quality Range for Topic wise Analysis (Existing Site)

In similar way, the threshold values obtained for the metrics in topic wise manner is given in Table 2.

TABLE II
Threshold value for Topic wise quality range examination

Accuracy/ Feasibility/ Utility/ Propriety		
Threshold Value		
No Modification	Partial Modification	Entire Modification
QR > 10	*7 < QR > 10*	*QR < 7*

It is apparent from the above table and figure that the site needs improvement in feasibility and propriety metrics. Thus, the quality of the existing e-learning site is assessed. With those results a new e-learning environment is developed. For that process, we mainly concentrate on the enhancement of the feasibility and propriety metrics.

For substantiating that the developed site is an enhanced and refined one than the previously examined site, we analyzed its feedback in the same manner described above. Figure 8 shows the quality range of overall analysis for each metric of the refined site.

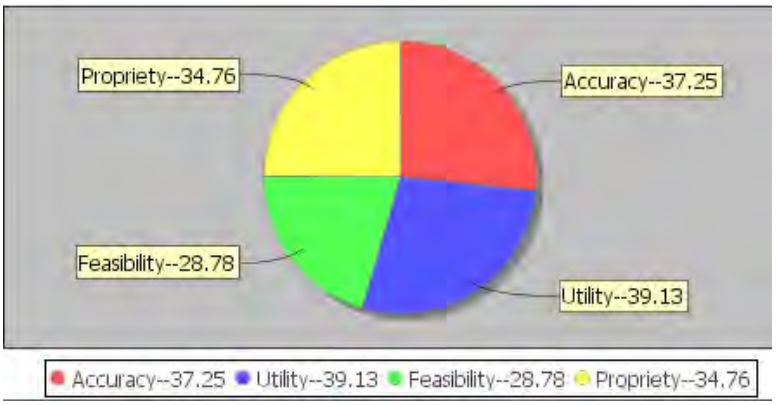

Fig 8: Quality Range (Refined Site)

It is obvious from the figure that the refined site is improved in the aspects of feasibility and propriety considerably and attained the defined threshold. The Figure 9 reveals the comparison between the existing and the refined site.

Fig 9: comparison between Existing and Refined Site

The comparison among the site is based on the four high-level quality metrics: accuracy, utility, feasibility and propriety. The comparison chart exemplifies that the newly developed site by taking the suggestions obtained from WQAM process is having much improved accuracy over the content, utility, feasibility and propriety.

V. Conclusion and Future Work

Recently, the internet shows an expeditious growth in providing e-learning services. This explosion has led the need of assessment criteria to measure features related to the quality of website. With that concern, we contribute this work on developing Website Quality Assessment Model (WQAM) for site's quality evaluation on the basis of four high-level quality metrics such as accuracy, feasibility, utility and propriety. The QS has been framed for acquiring the user's feedback about an existing e-learning site and fed up for assessment process. The assessment process has been accomplished with two phases of evaluation: Preliminary Assessment Phase and Evaluation Results Analysis Phase. With the suggestions obtained from the assessment process, a new improved e-learning environment is developed to satisfy the novices with their best quality of content and design. The experimental results show that we have accomplished our motive in an efficacious manner.

Though the results obtained here are encouraging, future exploration is still necessary. With respect to future enhancements, this work is open for distinctive research areas where beneficial contributions can be done.

REFERENCES

[1] Abdulmohsen Abanumy, Ali Al-Badi and Pam Mayhew, "e-Government Website Accessibility: In-Depth Evaluation of Saudi Arabia and Oman," The Electronic Journal of e-Government, Vol. 3 Issue. 3, pp. 99-106.

[2] Arvinder Kaur and Diksha Dani, "The Systematic Review of Web Measurement," International Journal of Computer Science & Engineering Survey (IJCSES), 2011, Vol. 2, Issue. 3, pp. 59- 73.

[3] Dip Nandi, Shanton Chang and Sandrine Balbo, "A conceptual framework for assessing interaction quality in online discussion forums," In the Proceedings of 26th ASCILITE conference, 2009, pp. 665- 673.

[4] George Apostolou, and Anastasios A. Economides, "Airlines websites evaluation around the world," In the Proceedings of SPRINGER Communications in Computer and Information Science (CCIS), 2008, Vol. 19, pp. 611- 617.

[5] Janet Wesson, "Usability Issues for Ecommerce and E-learning: a Developing Country Perspective," In the Proceedings of International Workshop on Utility, Usability and Complexity of Emergent IS, 2003.

[6] Julie L. Coiro, "Rethinking Comprehension Strategies, to better prepare students for critically evaluating content on the internet," The Nera Journal, 2003, Vol. 39, Issue. 2, pp. 29- 34.

[7] Layla Hasan and Emad Abuelrub, "Assessing the Quality of Web Sites," Journal of Applied Computing and Informatics, 2011, Vol. 9, Issue. 1, pp. 11- 29.

[8] Lili Wang, Stuart Bretschneider and Jon Gant, "Evaluating Web-based e-government services with a citizen-centric approach," In the Proceedings of the 38th Hawaii International Conference on System Sciences, 2005.

[9] Liliana Dobrica, "Considerations about Cities Websites Evaluation," In the Proceedings of IADIS International Conference e-Society, 2007, pp. 47-54.

[10] Luis Olsina*[a], Daniela Godoy[a], Guillermo Lafuente[a] &Gustavo Rossi[b] , "Assessing the Quality of Academic Websites: a Case Study," Journal of New Review of Hypermedia and Multimedia, 1999, Vol. 5, Issue. 1, pp. 81- 103.

[11] Luisa Mich, Mariangela Franch, and Stefano Nicolini, "Evaluating and Designing the Quality of Web Sites, "Journal of IEEE Multimedia, 2003, Vol. 10, Issue. 1, pp. 34-43.

[12] Manuela Aparício, Pedro Faria Lopes and Maria Joaquina Barrulas, "Website Evaluation: Discussion for a Model Proposal," In the proceedings of IADIS International Conference WWW/Internet, 2006, Vol. 7, Issue. 2, pp. 260- 265.

[13] Nikos Manouselis and Demetrios Sampson, "Multiple Dimensions of User Satisfaction as Quality Criteria for Web Portals," In the proceedings of IADIS Conference, 2004.

[14] Olsina. L, D. Godoy, G.J. Lafuente and G. Rossi, "Specifying Quality Characteristics and Attributes for Websites," In the Proceedings of SPRINGER WEB ENGINEERING, 2001, Vol. 2016/2001, pp. 266-278.

[15] Oreste Signore, "A Comprehensive Model for Web Sites Quality," In the Proceedings of the 2005 Seventh IEEE International Symposium on Web Site Evolution (WSE'05), 2005, pp. 30- 36.

[16] Ritu Shrivastava, R.K. Pandey and M. Kumar, "Ranking of Academic Web-sites on the Basis of External Quality Measurement," Journal of Emerging Trends in Computing and Information Sciences, 2012, Vol. 3, Issue. 4, pp. 547- 553.

[17] Saurabh Mishra and Madhvendra Misra, "An Assessment Of Roi In Online Perspective Leading To A Critical Review And Framework Development Towards Standardization Of Roi Practices," Journal of Internet Banking and Commerce, 2012, vol. 17, Issue. 1.

[18] Shirlee-ann Knight and Janice Burn, "Developing a Framework for Assessing Information Quality on the World Wide Web," Informing Science Journal, 2005, Vol. 8, Issue. 5, pp. 159- 172.

[19] Sreedhar.G, A.A.Chari and V.V.Venkata Ramana, "Evaluating Qualitative Measures for Effective Website Design," International Journal on Computer Science and Engineering, 2010, Vol. 2, Issue. 1, pp. 61- 68.

[20] Tracey L. Leacock and John C. Nesbit, "A Framework for Evaluating the Quality of Multimedia Learning Resources," Journal of Educational Technology & Society, 2007, Vol. 10, Issue. 2, pp. 44- 59.