PH.WQT: A WEB QUALITY MODEL FOR WEBSITES OF PUNJABI AND HINDI NEWSPAPERS

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Abstract—In this research, a systematic and quantitative engineering-based approach is followed by applying well-known international standards and guidelines to develop a web quality model (PH.WQT- Punjabi and Hindi Website Quality Tester) to measure external quality for web-sites of Punjabi and Hindi newspapers. Correspondingly, the model can be used for websites developed in other languages also. The research is valuable to researchers and practitioners interested in designing, implementing and managing websites of newspapers. Also, by implementing PH.WQT analysis and comparisons among web sites of newspapers can be performed in a consistent way.

Keywords—Newspapers, External Quality, PH.WQT, Indian Languages, Punjabi and Hindi, Quality model, Websites of Newspapers.

I. INTRODUCTION

Recently, lots of websites are being developed in regional languages for maximal exposure to the regional public. Punjabi is an Indo-Aryan language [1] spoken by 130 million native speakers worldwide, making it the 10th most widely spoken language [2] in the world. Hindi is the official language of nine states and five Union Territories of India; Fiji Islands being one of the four countries of the world where Hindi is spoken [3].

In this research, a web quality model named “Punjabi and Hindi Website Quality Tester: PH.WQT” following well-known international standards and guidelines. The PH.WQT can be used to measure the external quality and to evaluate and compare the quality of web-sites developed in Punjabi and Hindi.

The paper is structured as follows. Following the introduction, related literature is presented and analyzed in Section 2. Section 3 discusses about the data collection. In Section 4, a Quality model has been proposed for websites of Punjabi and Hindi Newspapers based on ISO/IEC 25010[4]. Finally, Section 4 presents conclusion and future work.

II. RELATED WORK

Ben et al. [5] makes an attempt to propose a framework for measuring quality attributes of web based application systems. They basically presents a framework on how web based systems can be measured. Quality Compliance Framework (QCF) consists of components like quality measurement (the quality achievement in terms of a percentage value that indicates the degree of an overall quality compliance of the system), quality goal/factor (a high level quality factor of a system quality), sub-goal/criteria (a lower level quality goal that breaks down its parent goal to more measurable goals and quality attributes (metrics) a measurable unit of quality in QCF).

Alvora Rocha [6] proposes a high level structure for a global quality evaluation of websites. The structure is based on three dimensions (contents, services and technical), characteristics, sub-characteristics and attributes
and identifies methods for the quality evaluation. Alvora Rocha proposed that analyzers can classify websites contents quality/services quality in a 5 point Likert Scale. Alvora Rocha analyzes the technical quality evaluation based on the ISO 9126 model.

Americo Rio and Fernando Brito introduces a web quality model [7] by keeping the existing top characteristics standardised by ISO 9126. The web quality model is organized as: Efficiency (includes aspects related to size and load times), Functionality (includes navigation, forms and other aspects related to the functionality offered by the site), Maintainability (includes aspects related to the number of items to maintain e.g. scripts, styles used, tables), Portability (includes aspects related to page layout, use of HTML standards, etc.) Reliability: includes aspects related to the validation and links status and Usability (includes aspects related to accessibility, multimedia and textual contents).

Ghazwa Malak [8] presents a probabilistic approach for building web quality models and the associated assessment method. Using GQM approach they illustrated the important quality characteristics of navigability design. Based on the proposed model they conduct an experimental study with 20 subjects and 40 web pages. Results show that the scores given by the used model were strongly correlated with navigability as perceived and experienced by the users.

Dominguez-Mayo et al. [9] discusses about the importance of Model Driven Web Engineering (MDWE) with reference to Quality Evaluation criteria, Software metrics and Quality models. A quality model for Usability characteristic is proposed with a set of quality attributes. Furthermore, the relationship is made between the attributes and sub-characteristics of Usability.

Calero et al. [10] defined the web quality model, a cube with three dimensions Web Features (Navigation, Content, Presentation), Quality characteristics (Functionality, Reliability, Usability, Efficiency, Portability and Maintainability) and Life Cycle Processes (Development, Operation, Maintenance, Effort and Reuse). The authors present an extensive list of 385 metrics, compiled from 60 papers, and classify them within the proposed quality model. Some of those metrics are capable of automation, others are not. The metrics are also classified according to granularity level, theoretical validation and empirical validation.

Oreste Signore [11] proposes a five dimension quality model for web applications. The model discusses the relation among external and internal characteristics. The quality model constitutes: correctness, presentation, content, navigation and interaction. Although the model description is very detailed, regarding the way each characteristic can be measured. Yet this model does not provide evidence that data collection actually takes place.

III. PH.WQT: PUNJABI AND HINDI WEBSITE QUALITY TESTER (NEWSPAPERDOMAIN)

Software Engineering has a widely adopted quality model, the ISO/IEC 9126 revised by ISO 25010 and several researchers in Web Engineering have adopted it as a basis for their quality models. In this research also same is followed.

As proved by Americo et al. in their research paper [7] the quality indicators are domain dependent and thus the quality model should be in two parts: global (domain independent) and domain dependent. Hence, the web quality model developed PH.WQT (Punjabi and Hindi Website Quality Tester) consists of two parts global and domain specific. Further, domain specific includes three areas of domain i.e. Academic, Newspaper and Government websites. A global web quality model (domain independent) has been developed and discussed in research paper [12] for websites developed in Punjabi and Hindi. The global web
quality model is represented by hierarchical two-level tree structure which consists of five top-level characteristics i.e. functional suitability, operability, reliability, security and performance efficiency. The model consists of two parts. First includes the attributes that are to be tested manually and the other part can be automated. For automated testing five free open source testing tools have been proposed. The model consists of more than hundred attributes that have been defined and a metric is chosen for each indicator. The quality model can be used to measure the external quality and to evaluate and compare the quality of websites developed in Punjabi and Hindi. The model can be implemented for websites developed in other languages also. The quality attributes for academic domain have been discussed in research paper [13]. Newspaper domain dependent attributes have been discussed in this research paper and Government domain will be discussed in next research paper.

Forty Newspaper domain dependent attributes have been proposed based on the characteristics mentioned in ISO 25010 guidelines. The model consists of the two attributes that have been proposed by other researchers and thirty eight new have been proposed. Table I shows the list of the proposed attributes. Figure 3.1 shows the template where Attribute Name specifies the name proposed for the attribute. Characteristic specifies the name of the characteristic that is mentioned in ISO 25010. Attribute definition describe the details of the attribute. Proposed Evaluation Aspects express the recommended results. Algorithm Used depicts the proposed measurement value; the proposed value lies between 0 and 1. Scale indicates whether the metric of the attribute is numeric or numerical.

Scale type signifies the scale of the metric whether nominal, ordinal, interval or ratio. Reference portrays whether the attribute has been referred from any research paper or not. The attributes have been illustrated in appendix.

**TABLE I. NEWSPAPER DOMAIN ATTRIBUTES**

<table>
<thead>
<tr>
<th>Attribute Name</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Position</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Display Time</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Gold_Silver_Rates</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Sensex</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>NIFTY</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Google_Plus</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Link_Each_News</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Currency_Exchange_Punj_Currency_Convertor</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Sunrise_Sunset</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Weather</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Temperature</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>I Like this</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>E mail news to friend/Share</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Location of Advertisements</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Contact Advertisements</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Twitter</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Blog</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>E-Paper</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>E-paper_Cities_NP</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Previous E-Paper</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>E-Paper for particular day Calendar Option</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>Duration_Old</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>GOTO Page No.</td>
<td>Functional Suitability</td>
</tr>
<tr>
<td>City_Select_label</td>
<td>Functional Suitability</td>
</tr>
</tbody>
</table>

![Fig. 1. Template for Attributes](image)
As mentioned in the appendix, the attribute values are to be interpreted according to the proposed metrics. Table II shows a glimpse of the testing of Newspaper domain attributes. Each attribute’s maximum value is 1.0 and the metric chosen is in the range from 0.0 to 1.0.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Functional Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calendar</td>
<td></td>
</tr>
<tr>
<td>Download PDF</td>
<td></td>
</tr>
<tr>
<td>Astrology</td>
<td></td>
</tr>
<tr>
<td>RSS</td>
<td></td>
</tr>
<tr>
<td>Submit your News</td>
<td></td>
</tr>
<tr>
<td>E-mail newspaper subscription</td>
<td></td>
</tr>
<tr>
<td>Print the news</td>
<td></td>
</tr>
<tr>
<td>Entertaining Stuff</td>
<td></td>
</tr>
<tr>
<td>Date Font Face/Size</td>
<td>Operability</td>
</tr>
<tr>
<td>Date Font Face Colour /Contrast with background</td>
<td>Operability</td>
</tr>
<tr>
<td>Time Position</td>
<td>Operability</td>
</tr>
<tr>
<td>Poll_Day</td>
<td>Operability</td>
</tr>
<tr>
<td>E-Paper Label</td>
<td>Operability</td>
</tr>
<tr>
<td>Page No labels</td>
<td>Operability</td>
</tr>
<tr>
<td>Thumbnails_Pages</td>
<td>Operability</td>
</tr>
<tr>
<td>Thumbnails_Cities</td>
<td>Operability</td>
</tr>
</tbody>
</table>

### IV. Conclusion

The major challenge faced in this research is that the web is continually evolving, with ever changing contents, functions and services. Moreover, with time, the importance of characteristics vary e.g. earlier accessibility was considered more important characteristic but nowadays usability is given more importance. However, the research will be valuable to researchers and practitioners interested in designing, implementing and managing academic websites developed in Punjabi and Hindi as well as in other languages. Also, analysis and comparisons among Websites of Newspapers could be performed in a consistent way.

Finally, the proposed quality model can be useful not only as a frame of reference to evaluate existing web sites and fix errors, but also can be helpful in improving their quality through re-engineering.

Now, in the next step the data will be collected by implementing PH.WQT for the Websites of Punjabi and Hindi Newspapers. Subsequently, quality will be measured quantitatively and qualitative analysis will be done.

### References


Appendix

i) Attribute Name: E-mail/Share news to friend
Characteristic: Functional Suitability
Attribute Definition: Facility for sending email/sharing news with friends.
Proposed Evaluation Aspects: Facility for sending email/sharing news with friends should be provided by the website.
Algorithm Used: If facility for sending email/sharing news with friends is provided by the website then E-mail/Share news to friend=1, if not then E-mail/Share news to friend=0. Scale: Numeric; Scale Type: Ratio; Reference: No.

ii) Attribute Name: Location of Advertisements
Characteristic: Functional Suitability
Attribute Definition: Location of the advertisements on the website.
Proposed Evaluation Aspects: Advertisements should not be an obstacle to read news from the website.
Algorithm Used: If the advertisements are displayed on the top of the screen then Location of Advertisements=0, if the advertisements are displayed on the right side of the screen then Location of Advertisements=0.5 and if the advertisements are displayed on the bottom of the screen then Location of Advertisements=1.0.
Scale: Numerical; Scale Type: Ratio; Reference: No.

iii) Attribute Name: E-Paper
Characteristic: Functional Suitability
Attribute Definition: Availability of E-paper on the website.
Proposed Evaluation Aspects: E-paper should be available on the website.
Algorithm Used: If E-paper is available on the website then E-paper=1, if not then E-paper=0. Scale: Numeric; Scale Type: Ratio; Reference: No.

iv) Attribute Name: E-Paper Label
Characteristic: Operability
Attribute Definition: Location of label of e-paper. Proposed Evaluation Aspects: Location of label of e-paper should be such that it is easily locatable. Algorithm Used: If location of label of e-paper is Top then E-Paper Label=1.0, if location of label of e-paper is bottom without scrolling then E-Paper Label=0.50 and if location of label of e-paper is in some menu/Bottom after scrolling then E-Paper Label=0. Scale: Numeric; Scale Type: Ratio; Reference: No.

v) Attribute Name: Submit your News

Characteristic: Functional Suitability Attribute Definition: Facility of submitting news. Proposed Evaluation Aspects: Facility of submitting news should be provided by the website. Algorithm Used: If facility of submitting news is provided by the website then Submit your News=1, if not then Submit your News=0. Scale: Numeric; Scale Type: Ratio; Reference: No.