Effectiveness of Web portals in Agriculture: A supply Side Approach

Saji Gopinath [1]

Abstract

Development of web based information dissemination services is one of the most common applications of Information Technology in the area of Agriculture. Pure information web portals and vortals with elementary transaction capabilities have mushroomed due to the easiness in their construction, hosting and management. However most of these websites, intending to minimise the information handicap that plague farmers and extension workers (especially in Less Developed Countries), are far from achieving this objective. User end factors like lack of internet penetration, poor communication infrastructure, low literacy levels etc. are often cited as reasons for the lack lustre performance of these IT applications. It is ironical that not much attempts have been made in taking care of these factors during the design of websites. In this paper we analyse the supply side effectiveness of popular websites in the area of Agriculture. Our detailed analysis of the technical features of these portals on their content, navigation and context brings out interesting facts about the supply side ineffectiveness. The paper also prescribes the features that is to be considered while designing an "ideal" website for agriculture

Keywords Agricultural Web Portals, Information Dissemination, Web Portal evaluation, User centric Portal Development, WWW

Introduction

The task of web portal design and development should focus on user centric aspects, which differs for different areas of activity. The agricultural web portal forms a specialized region where the developer should bear in mind the customers-side resources like bandwidth, technical knowledge, access devices etc while designing it. Even though a lot of web portals have been developed for use by farmers, little effort has been undertaken to evaluate them on their performance to meet the needs of the end user. In this study 30 popular web portals in the area of agriculture has been evaluated using an automatic site evaluation tool *Bobby* to assess the effectiveness of the sites based on the performance measures from the literature. Depending upon the positioning of the website an ideal order of the various performance parameters is derived for each of the sites and compared with the actual occurrence of the same to assess the need-supply gap in the design.

Good usability is critical to the success of any website. Usability evaluation has traditionally been a slow, labor-intensive process, which makes it difficult to apply to websites. The dynamic nature of the Web also poses problems for usability evaluation. Development times are rapid and changes to websites occur frequently, often without a chance to re-evaluate the entire site. Advances in web-based user interfaces change the user expectations. The geographical and demographic spread

[1] Associate Professor, Indian Institute of Management Kozhikode Calicut 673 571 INDIA saji@iimk.ac.in

of the users also poses a major challenge to the website developers to develop sites that meet varied customer expectations. Website calibration is based on its usability, which is done through a judicious mix of user-centered development and evaluation approaches. Usability testing is an essential and repeated step during the life cycle of a web portal. Even though there are a lot of agricultural web portals in existence, the literature on their evaluation for usability is scanty, indicating the general apathy of web developers to the concerns of the end user. It is important to note that the ill-designed web portals create a lot of problems for themselves. As per a Forrester study, 40% of users do not return to sites at which they have had a negative experience.

This paper is divided into 4 sections. Following this introductory section, the methodology adopted for the whole study is presented in section 2. The various performance parameters considered for the study are illustrated in this section. The computation of a composite performance parameter is also discussed in this section. Section 3 discusses the results of the study. The analyses of the need-supply gap of the sites are presented in this section. The conclusion is presented in section 4

Methodology

For evaluation of the sites it is important to define the performance parameters. Based on detailed literature study (Nielson, 1994;;Scholtz et al., 1998; Fu and Sandhu, 1999;Murray and Durrel, 1999; Shubert and Selz, 1999; Brajnik, 2000; Robert et al., 2001; Hahn et.al., 2001) a set of 10 different evaluation parameters are selected. These include accuracy, accessibility, authority, clarity, coverage, currency (relevancy), links, objectivity, security and services. Table 1 gives the details of each of these parameters. The methodology adopted for measuring each of the parameters is also given in the Table. For selecting the leading websites in agriculture, the ratings of the sites in *Agrisurf,* the world's largest searchable agricultural index, is taken as the criterion. The sites are selected based on a stratified sampling to include pure information sites as well as sites that provide e-commerce capabilities. The list of sites selected for the study is given in Table 2.

Evaluation tool: Bobby

The design parameters are evaluated for each of the sites using a combination of direct and indirect measurements. For direct measurement, an automatic software tool, *Bobby* was used. Bobby is designed to help expose and repair barriers to accessibility and encourage compliance with existing accessibility guidelines. Bobby tests web pages using the guidelines established by the World Wide Web Consortium's (W3C) Web Access Initiative (WAI) as well as Section 508 guidelines from the Architectural and Transportation Barriers Compliance Board (Access Board) of the U.S. Federal Government. With regard to the 10 selected parameters Bobby can be used mainly for checking the accessibility, clarity and links parameters.

Ordering of Design parameters and similarity index:

The parameters Accuracy, Accessibility, Authority, Clarity, Coverage, Currency, Links, Objectivity, Security and Services are given numbers 1 to 10 respectively. The ideal priority order of these design parameters for each of the website is

computed depending on the target user group as well as the intended objective of the site. Based on the evaluation done using Booby, the actual order in which these parameters occur is identified. ASimilarity index is developed by comparing the ideal order with the real order using the following equations. Let {I} denote the set of ideal parameters and {R} denote the set of real parameters. Let 'k' be the parameter.

We have Position Value of k,

$$V_k = 0 \text{ if } I_k = R_k \text{ for } k=1\ldots10$$

$$V_k = 1 \text{ if } I_k \neq R_k$$

$$V_k = 2 \text{ if } (P_{(Ik)} \{I\} - P_{(Rk)} \{I\}) * (P_{(Ik)} \{R\} - P_{(Rk)} \{R\}) > 0$$

$$\therefore \text{ Similarity Index} = {}^{10}\sum_{k-1} V_k$$

If the Similarity index -> 0, then the ideal order as well as the real order becomes the same. Hence we could conclude that the concerned website is a near ideal site when we evaluate in terms of design parameters. Similarly if the Similarity index ->20, then none of the parameters are in correct order or position. Hence we could consider that the site does not do well in terms of evaluation criteria.

Results and Discussion

The websites were studied in detail with regard to the design parameters. The results are compiled and discussed below along with the other technical parameters of these sites The pros and cons are depicted in the result are a comparison of the design parameters and the possible trade related contents. The real and ideal order of a trade site in accordance with these parameters is also substantiated. The real and ideal order of the sites is given in Table 2. Table also gives the similarity index for the sites

Gap Analysis

Based on the similarity index presented above, a gap analysis is conducted for each of the selected sites. This is given in Table 3. The table also gives directions for improving the effectiveness of the sites.

Conclusion

This paper presents a new way of evaluating the effectiveness of the webportals. Even though the paper presents the analysis of only 30 sites, the methodology can be extended for evaluation of agricultural sites during their design stage. The similarity index measure can be a very powerful tool to guide the designer to develop sites from the perspective of the end user. The gap analysis of sites on the basis presented in the paper provides opportunities for improving the effectiveness of the sites.

References

Brajnik, G. (2000) *Automatic web usability evaluation: what needs to be done?*
http://www.tri.sbc.com/hfweb/brajnik/hfweb-brajnik.html

Dan Murray and Kevan Durrell (1999) *Inferring Demographic Attributes of Anonymous Internet Users.* http://viror.wiwi.uni-karlsruhe.de /webmining/ bib/pdf/ Murray1999.pdf

Fu,Y., Sandhu, K. and Shih, M.Y (1999) *Clustering of Web Users Based on Access Patterns* http://www.acm.org/ sigkdd/ proceedings /webkdd99/toconline.htm

Hahn, J. and Kauffman, R.J. (2001) *Evaluating web site performance in Internet-based selling from a business value perspective*
http://misrc.umn.edu/wpaper/default.asp

Ivory,M.Y, Rashmi, Sinha ,R. and Hearst, M.A (2000) *Empirically Validated Web Page Design Metrics*
http://webtango.ischool.washington.edu/ papers/chi2001, 2000

Nielsen, J. (1994) *Ten Usability Heuristics*
http://www.useit.com/ papers/heuristic/heuristic_list.html

Reeder, R.W, Pirolli,P and Card,S.K (2002)
Web Eye Mapperand WebLogger:Tools for Analyzing Eye Tracking Data Collected in Web-use Studies
http://www2.parc.com/istl/groups/uir/pubs/pdf/UIR-R-2001-02-Reeder-CHI2001-WebLoggerEyeMapperDemo.pdf

Scholtz, J. and Laskowski, S. (1998) *Developing Usability Tools and Techniques for Designing and Testing*
Web Sites http://www.research.att.com /conf/hfweb/proceedings/scholtz/index.html

Schubert, P. and Selz, D. (1999) *Web Assessment -Measuring the Effectiveness of Electronic Commerce Sites Going Beyond Traditional Marketing Paradigms*
http://www.e-business.fhbb.ch/.../48bfd8fc16322c48c12569a4003a0fa1/ $FILE/wahicss98.pdf

Tables

Table 1: The design parameters for website design

Parameter	Metric Measured	Methodology
Accuracy	Information Correctness	Is the information based on some statistical studies, books or other reports? Is the information available on any other source like books, CDROM Disks etc? Are the references and sources of information reliable?
Accessibility	Easiness of Information access	Does the site load quickly? Are there programming errors? How does the site respond to heavy traffic? Is there awareness about the existence of site through search engines or other publicity? Is consistent metadata embedded in the pages to improve search engine listing?
Authority	Information credibility	Is the author's qualification and reputation mentioned? How can the author be reached? Are there statements like publisher responsibility, privacy statement etc? Are the references listed? Is the site real or hoax? If an organizational or corporate sponsor is present, is that fact mentioned?
Clarity	Information Lucidity	Does website offer consistent appearance when viewed using different browsers? Is the text neat, legible, free from mistakes and formatted for easy reading? Do the presence of graphics and other elements of creativity distracting user from the content? Are there options for text only, non-frames, non-table view of the site available?
Coverage	Level of information exposure	To what depth are the topics explored? Is there a difference from print or any other media coverage?
Objectivity	Biasness of information	Is the information presented with minimum of bias? To what extend will the information sway to the user? Does the identity of author or sponsor suggest a bias?
Security	Safeness of information	Is a liability statement warning the user of information provided through the links given? Is copyright statements provided whenever necessary? Is an explicit policy on how user's rights are protected, available?
Services	Services offered by the site	Are the services fully operational and if they cost money, are the fees clearly presented? Is there a contact person in the home page and all other significant pages?
Currency	Updating of information	Is the content up to date? Are the following dates mentioned in the website, i.e., Date first created; Date placed on the web; Date last updated? Is there a difference between the date of placing in the web and date last updated? How up to date are the links within the site and outside?
Links	The number of working links	Are all hypertext links working? Is a "What's new" section provided? Is warning statements provided if the links leads to a large document or image? Is indication to restricted access to a link provided? Is there a link to return to home page in all the pages? Is there a search engine within the site? Is there appropriate range of link to Internet resources?

Table 2: The list of sites used for evaluation, the ideal and real order of effectiveness

Site Name	Description	Ideal Order	Actual Order	Similarity Index (0-20)
www.farmassist.net	Information about planting, crop protection, seed treatment etc.	1-3-2-7-10-5-6-8-4-9	1-3-2-5-6-10-4-7-8-9	11
www.calasparagus.com	Information on California Fresh Green Asparagus to consumers, industry, trade and growers	9-6-1-3-2-4-5-8-7-10	1-2-3-5-10-6-9-4-7-8	12
www.dennispolk.com	Agricultural machinery trading occurs here.	3-1-6-4-5-7-8-9-2-10	1-3-5-10-2-6-8-4-7-9	16
www.nre.vic.gov.au	Provides information about sustainable natural resource based industry development	1-3-2-7-10-5-6-8-4-9	1-2-3-4-6-7-9-10-5-8	17
www.batalle.com	Gives information about production and trade of high quality pig breeding stock in Spain	3-1-6-4-5-7-8-9-2-10	1-5-8-10-2-3-4-6-9-7	14
www.hca.net	Holyoke coop services all agricultural and non-agricultural needs.	1-3-2-7-10-5-6-8-4-9	1-3-5-7-9-10-2-4-6-8	12
www.flyingrockranch.com	Information about historic breeds of cattle especially horse	3-1-6-4-5-7-8-9-2-10	2-3-1-4-5-6-7-8-9-10	10
www.centralsoya.com	Information about soy proteins, soy oils, animal feed ingredients and grain merchandising	3-1-6-4-5-7-8-9-2-10	3-1-7-6-4-5-8-9-10-2	12
www.farms.com	Quality information about agriculture and food industry	3-1-6-4-5-7-8-9-2-10	3-1-2-7-6-4-5-8-9-10	11
www.uky.edu	Contains studies in areas related to food derived from animals and agricultural products	1-3-5-6-7-2-4-10-9-8	6-7-1-3-5-8-9-10-2-4	17
www.agritrade.com	A web-based, neutral, market trading forum	9-6-1-3-2-4-5-8-7-10	2-7-10-3-4-5-8-9-1-6	17
www.iowafarmbureau.com	Contains voluntary information to all related to agriculture	1-3-2-7-10-5-6-8-4-9	7-1-3-4-5-6-9-10-2-8	15
www.hc.cc.tx.com	Contains additions and deletions to dairy plants surveyed and approved for USDA	3-1-6-4-5-7-8-9-2-10	3-5-1-4-6-8-9-2-10-7	12
www.ohioline.osu.edu	Contains agricultural information for those who are interested in it.	3-1-6-4-5-7-8-9-2-10	3-1-2-4-5-6-7-8-9-10	7
www.farmersmarketonline.com	Provides "booth space" for farm business.	9-6-1-3-2-5-4-7-8-10	5-7-4-1-2-3-6-8-9-10	13
www.nal.usda.gov	Information on alternative farming	5-6-1-3-8-10-2-7-4-9	1-2-3-7-4-5-6-8-9-10	16

Site Name	Description	Ideal Order	Actual Order	Similarity Index (0-20)
www.agplus.net	Designed to be the information centre on the Internet for the produce industry	1-3-2-7-10-5-6-8-4-9	6-8-2-4-5-7-9-10-1-3	17
www.todaymarket.com	Provides market prices service, daily price information from the most important wholesale markets of USA, Canada, Latin America, Europe and Asia	9-6-3-1-2-5-4-7-8-10	1-6-7-10-3-4-5-8-9-2	15
www.agric.gov.ab.ca	Quality information and visually appealing graphics.	1-3-2-7-10-5-6-8-4-9	1-3-5-7-10-2-4-6-8-9	9
www.agrifoodbiz.com	Biotechnology related site	1-3-5-6-7-2-4-10-9-8	5-1-3-6-7-4-10-9-8-2	13
www.crbtrader.com	Provides market data, charts, future prices etc	9-6-1-3-2-4-5-8-7-10	1-6-3-5-2-4-7-8-9-10	7
www.botcc.com	Contains trading info.	9-6-1-3-2-4-5-8-7-10	2-3-6-1-4-5-7-8-9-10	12
www.commerzfutures.com	Contains trading information including future prices.	9-6-1-3-2-4-5-8-7-10	5-6-1-2-3-4-7-8-9-10	9
www.almanac.com	Contains some historic information.	3-1-6-4-5-7-8-9-2-10	1-2-3-10-4-5-6-7-8-9	14
www.optionsxpress.com	Contains trading information for sophisticated users	9-6-1-3-2-4-5-8-7-10	5-6-7-1-2-3-4-8-9-10	10
www.orionfutures.com	Provides features like full service, discount, online trading futures etc	9-6-1-3-2-4-5-8-7-10	5-6-1-2-3-4-7-8-9-10	9
www.pakissan.com	Contains description about "Pakissan iVan" developed to bridge the digital divide	1-3-2-7-10-5-6-8-4-9	4-5-2-10-1-3-6-7-9-8	14
www.sdnpk.org	Pakistan's first and only development gateway.	3-1-6-4-5-7-8-9-2-10	1-2-10-3-4-5-6-7-9-8	14
www.coab.ca	Contains general agricultural information	3-1-6-4-5-7-8-9-2-10	1-2-3-7-4-5-6-8-9-10	13
www.cva.morehead-st.edu	Contains general agricultural information	3-1-2-5-8-4-6-7-9-10	1-2-3-7-4-5-6-8-9-10	13

Table 3: Need-Design Gap Analysis of the sites

Website	Target Audience	Nature of Target (Resource, capability, special feature)	Typical requirement	Gap Analysis
www.farmassist.net	Farmers	Offers crop management software that is freely downloadable. Information about planting, crop protection, seed treatment etc.	Should give emphasis to authority, accuracy and currency parameters	Close to the new model defined.
www.calasparagus.com	Farmers and Traders.	Agricultural machinery trading takes place here including sales of antique tractors.	Should give emphasis to security, currency and accuracy parameters	Security of transactions and availability of latest information required.
www.dennispolk.com	Farmers and Traders.	Information on California Fresh Green Asparagus to consumers, industry, trade and growers	Should give emphasis to security, currency and accuracy parameters	Concurrency of quality information required.
www.nre.vic.gov.au	Farmers	Gives information about sustainable natural resource based industry development	Should give emphasis to authority, accuracy and currency parameters	More regular updating required
www.batalle.com	Traders	Provides information about production and trade of high quality pig breeding stock in Spain	Should give emphasis to security, currency and authority	More authoritative information needed
www.hca.net	Traders and farmers	Holyoke coop services all agricultural and non-agricultural needs.	Should give emphasis to security, currency and accuracy parameters	Site need to be easily accessible
www.flyingrockranch.com	Farmers	Information about historic breeds of cattle especially horse	Should give emphasis to authority, accuracy and currency parameters	Need more information coverage
www.centralsoya.com	Farmers	Information about soy proteins, soy oils, animal feed ingredients and grain merchandising	Should give emphasis to authority, accuracy and currency parameters	Site needs to be consistent in different browsers
www.farms.com	Farmers, traders, researchers	Quality information about agriculture and food industry	Should give emphasis to accuracy, security, currency parameters	Near to the new model defined
www.uky.edu	Researcher	Contains studies in areas related to food derived from animals and agricultural products	Should give emphasis to accuracy, authority, currency parameters	Fail to provide accurate, updated data

Website	Target Audience	Nature of Target (Resource, capability, special feature)	Typical requirement	Gap Analysis
www.agritrade.com	Traders, farmers	A web-based, neutral, market trading forum	Should give emphasis to security, currency and accuracy parameters	Security of transactions and concurrency of information need to be given importance
www.iowafarmbureau.com	Farmers, Researcher	Contains voluntary information to all related to agriculture	Should give emphasis to accuracy, security, currency parameters	Moving in the right direction
www.hc.cc.tx.com	Researcher	Contains additions and deletions to dairy plants surveyed and approved for USDA	Should give emphasis to accuracy, authority, currency parameters	More concurrent information required. Otherwise fine
www.ohioline.osu.edu	Farmers, researchers	Contains agricultural information for those who are interested in it.	Should give emphasis to accuracy, security, currency parameters	Well balanced site
www.farmersmarketonline.com	Farmers and Traders	Provides "booth space" for farm business.	Should give emphasis to security, currency and accuracy parameters	Need to focus on information quality than quantity
www.nal.usda.gov	Farmers, Traders	Information on alternative farming	Should give emphasis to security, currency and accuracy parameters	More deep matter coverage required
www.agplus.net	Farmers, Traders	Designed to be the information centre on the Internet for the produce industry	Should give emphasis to security, currency and accuracy parameters	More authoritative quality matter needed
www.todaymarket.com	Traders, Farmers	Provides market prices service, daily price information from the most important wholesale markets of USA, Canada, Mexico, Latin America, Europe and Asia	Should give emphasis to security, currency and accuracy parameters	Security aspects need be improved
www.agric.gov.ab.ca	Farmers	Quality information and visually appealing graphics.	Should give emphasis to authority, accuracy and currency parameters	Technically correct site, but more deeper information coverage required
www.agrifoodbiz.com	Farmers, Traders	Biotechnology related site	Should give emphasis to security, currency and accuracy parameters	Highly professional and adhering to standards
www.crbtrader.com	Farmers, Traders	Provides market data, charts, future prices etc	Should give emphasis to security, currency and accuracy parameters	Security aspect need to be checked
www.botcc.com	Traders	Contains trading information.	Should give emphasis to security, currency and authority	Security of transactions need to be ensured

Website	Target Audience	Nature of Target (Resource, capability, special feature)	Typical requirement	Gap Analysis
www.commerzf utures.com	Farmers, Traders	Contains trading information including future prices.	Should give emphasis to security, currency and accuracy parameters	User centric web portal, highly professional
www.almanac.c om	Farmers	Contains some historic information.	Should give emphasis to authority, accuracy and currency Parameters	Not up to the mark in any parameters
www.optionsxp ress.com	Farmers, Traders	Contains trading information for sophisticated users	Should give emphasis to security, currency and accuracy parameters	The site needs to improve in accuracy and accessibility factors.
www.orionfutur es.com	Farmers, Traders	Provides features like full service, discount, online trading futures etc	Should give emphasis to security, currency and accuracy parameters	The site is user centric. However need to concentrate in the reliability factor
www.pakissan.c om	Farmers	Contains description about "Pakissan iVan" developed to bridge the digital divide	Should give emphasis to authority, accuracy and currency parameters	The site is fine in many respects except for the objectivity. Need to be less biased.
www.sdnpk.org	Farmers	Pakistan's first and only development gateway.	Should give emphasis to authority, accuracy and currency parameters	Fail to meet majority of parameters. A redesign may be required.
www.coab.ca	Farmers	Contains general agricultural information	Should give emphasis to authority, accuracy and currency parameters	A site requiring improvement in almost all areas
www.cva.moreh ead-st.edu	Farmers	Contains general agricultural information	Should give emphasis to authority, accuracy and currency parameters	More variety of information needed