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D. L. Wood

A. G. Kanfer

J. Michaels

See next page for additional authors

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Abstract

StratSoy, a state-of-the-art Web-based information system, has an "Ask an Expert" (AE) feature that allows Web site browsers to question experts in 13 areas including Soy and Human Health (SHH). The objectives of this research were to: a) assess the use of the SHH AE feature; b) examine respondent attitudes about soy-related topics to help guide development of a Frequently Asked Questions (FAQ) section; and c) improve the information dissemination process on the Web site based on the results of this research. Study participants were 50 Web site users and 48 people who were unfamiliar with the site. The results of the study indicated topic areas of interest and additional Web site features desired by the respondents. The findings identified specific areas that may be targeted to improve the Web site.

Authors

D. L. Wood, A. G. Kanfer, J. Michaels, S. Thompson, S. A. Morris, and C. M. Hasler

Evaluation of the Relevance of a Web-Based "Ask an Expert" Feature: StratSoy and Soy and Human Health Queries

D.L. Wool, A.G. Kanfer,
J. Michaels, S. Thompson,
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Photo
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Deborah L. Wool, MS recently graduated with a Master's Degree in Nutritional Sciences from the University of Illinois at Urbana-Champaign (UIUC). Alaina G. Kanfer, Ph.D., is a Research Scientist at the National Center for Supercomputing Applications at UIUC, and Joshua Michaels is presently a freshman majoring in Computer Science and Mathematics at UIUC. Sarahelen Thompson, Ph.D., is a Professor of Agricultural and Consumer Economics at UIU. Scott A. Morris, Ph.D., is an Associate Professor of Food Science and Agricultural Engineering at UIUC, and Clare M. Hasler, Ph.D., is the Executive Director of the Functional Foods for Health Program (UIUC and University of Illinois at Chicago). Research was funded by a grant from the Illinois Soybean Program Operating Board.

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StratSoy (Strategic Soybean System - <http://www.ag.uiuc.edu/~stratsoy/new/>), which is funded in part by the United Soybean Board (USB), is a state-of-the-art, Web-based information and communications system created in 1994 by researchers at the University of Illinois at Urbana-Champaign (UIUC) in cooperation with Texas A&M University. The overall goal of StratSoy is to promote informed decision making by the United States soybean industry in order to improve its effectiveness, efficiency and profitability. A vast amount of information related to soybean production, marketing and use is posted on the StratSoy system and is available to all StratSoy users.

Use of StratSoy has increased dramatically from about 700,000 hits to the Web site in 1997 to almost 1,300,000 in 1998 (StratSoy, 1999). The system is used by soybean producers, consumers, policy makers and researchers, among others. StratSoy is visited by an increasing number of users from around the world, with visits from over 130 countries (Thompson & Khanna, 1998). The wealth of information that can be found on StratSoy includes news from the USB, the National Soybean Research Laboratory and state association offices; market information; agricultural legislation updates; weather data and maps; soybean genome information; and discussion groups (StratSoy, 1999).

Web users can use the StratSoy "Ask an Expert" (AE) feature (now under the heading of "Soybean Answers" on the Web site) to submit a question to experts in 13 different areas including grain market analysis, soybean utilization, field crop diseases, seed quality information, soybean production/management, and soy and human health (SHH) (StratSoy, 1999). Discussion group question-and-answer exchanges are

archived via bulletin board postings, and users can receive all questions and answers via E-mail by subscribing to a mailing list.

The SHH AE section is among the most heavily used topic areas/discussion groups. Of the number of messages exchanged in discussion groups from October 1997 to September 1998, the SHH section had the highest (1303) followed by Swine Management & Nutrition (845), Soybean Utilization (668), Grain Marketing (636), Soybean Production (408), and Farm Business Management & Marketing (224) (Thompson & Khanna, 1998). Interest in the SHH AE section is likely due to the explosion of interest in the role of soy in human health within the last decade (Messina & Erdman, 1995; Messina & Erdman, 1998).

The objectives of this research were to assess the use of the SHH AE feature through analysis of the demographics of those visiting the Web site and other information gathered from two surveys, examine respondent attitudes about soy-related topics to help guide the development of a "frequently asked questions" section (FAQ) and improve the information dissemination process on the Web site based on the results of this research. In essence, this research represents an example of how to use an Internet-based communications system to disseminate scientific information on soy and human health and how to improve that system based on users' feedback.

Method

Two Web-based surveys were designed to address the research objectives: (1) a Web site User [WU] survey for individuals who were already familiar with the StratSoy Web site and; (2) a Web site Non-User [WNU] survey intended for people who were totally unfamiliar with the Web site. The WNU group consisted of men and women who had participated in soyfoods clinical trials at the University of Illinois. The surveys were set up on the Internet at two separate URLs and the password for access to the surveys were included in the E-mail/letter sent to potential respondents (see below).

Survey design and data collection

The WU Survey consisted of three parts containing a total of 51 questions. Part 1 consisted of questions related to demographics. Part 2 addressed StratSoy use and evaluation, and

Part 3 addressed general dietary information and the consumption of soyfoods. The WNU survey consisted of 31 questions and was identical to the WU survey regarding demographics and dietary information but contained fewer questions regarding the StratSoy Web site. Questions concerning dietary changes made in response to StratSoy use were omitted.

The WU group consisted of individuals who asked the expert a question (705), plus those who subscribed to the discussion group at the time (164), or had previously subscribed (26), for a total population of 895. Since the only information available for the WU group were E-mail addresses, this was the method of contact. The E-mail sent to this group explained the research being done, and requested that individuals participate by going to a Web site on the Internet and filling out the survey. Three weeks were given to complete the survey and five random \$100 prizes were provided as an incentive for those completing the entire survey.

The WNU population consisted of 81 postmenopausal women who participated in a clinical trial investigating the effect of soy on bone density (Potter, Baum, Teng, Stillman, Shay, & Erdman, 1998), plus 84 men who had participated in a clinical trial regarding the minimal amount of soy protein needed to lower cholesterol (Teixeira, Potter, Weigel, Hannum, Erdman, & Hasler, in press). Both clinical trials were conducted at the University of Illinois at Urbana-Champaign. E-mail addresses were available for the majority of the men and none of the women. Thus, contact was made via both E-mail and regular mail. Participants were first-time Web site visitors only. Those respondents without access to a computer filled out the Web survey (with staff assistance if necessary) in Program office.

Statistics

Statistical analyses were calculated using SPSS® (SPSS, 1998) and SAS® (SAS, 1989) software. The Maximum Likelihood Method was used because of the testing of more than one variable (Freund, 1997); Wald's test was performed to test whether the parameter estimates were significantly different from zero (Wald, 1943). Stepwise selection was used to reduce the number of variables in the model; and the Goodness of Fit Test was done to determine whether the model fit the data (Stokes, Davis, & Koch, 1995). The sign of the

parameter estimates (which shows a positive or negative relationship between the dependent and independent variables) was reported along with the p values from Wald's test ($p \leq .05$ was considered statistically significant). The Wilcoxon 2 Sample Test (non-parametric) was used to compare the scores (or ranks) of two independent groups and test whether the distribution of the scores (ranks) was equal or unequal. Since the data sampling was not randomly drawn, due to the nature of the Web site and the access to information about respondents, it would be prudent not to extrapolate the data found in this study to a general population, though the method would have relevance and use for specific sites.

Selection and writing of FAQs

An FAQ section was added to the Web site during the course of this study, both to facilitate the dissemination of SHH information and to decrease the number of repeat questions submitted to the AE feature. The following FAQ topics were those deemed to be of most concern to the WU group and were chosen based on the number of questions submitted to the AE feature as well as the latest research findings regarding soy and human health: Breast Cancer, Cholesterol, Colon Cancer, Haelan, Isoflavones, Lecithin, Menopause, Osteoporosis, Practical Tips, Prostate Cancer, Recipes, Soy Allergy, Soy Infant Formula, Soy Protein Quality, Soy Safety, and Soyfoods. Analysis of the number of hits to individual FAQs (which were set up as fact sheets) was conducted using information in the StratSoy Statistics Page (StratSoy, 1999). Analysis of the number of times responses referred to individual FAQs after their implementation was done by analyzing the text of responses to submitted questions.

Results

Of the 895 E-mails sent out, 164 were sent to E-mail addresses which were found to be no longer valid (more than one attempt was made to send the E-mail) and therefore the original message was presumed to have never been received. A total of 731 remaining users should have received the original letter. Of these, 50 users completed the surveys for a final response (messages sent/surveys completed) rate of 6.84%. Of the 165 E-mails/letters sent out to the WNU group, eight were invalid addresses, reducing the total to 157. A total of 48 surveys were completed for a response rate of 30.57%.

Survey responses for the Web site evaluation are shown in Tables 1 and 2. Data from identical question results are compared between the WNU and WU groups in Table 1, and the additional data that were collected from the WU group are presented in Table 2.

Table 1 Survey Responses Part 2: Webpage	
WNU	WU
44% office access to Internet 30% home access	49% home access to Internet 44% office access
73% never visited before because had never heard of website	All participants were explicitly directed to the website
94% would ask a question of the expert if they had one	74% have asked the expert a question in the past
85% would look in archives first before asking the expert their question	62% looked in archives before asking the expert their question
Positive aspects: easy to use; vast amount of information; AE feature	Positive aspects: vast amount of information; AE feature
Negative aspects: too slow; lack of organization; too much information	Negative aspects: lack of organization; too slow; no practical information
Suggestions: organize by subject; more practical information; FAQ; add search engine	Suggestions: better organization; faster server; more practical information
78% think FAQ would greatly improve website	86% think nutritional analysis of soyfoods would greatly improve website
73% think searchable database would	84% think searchable database would

Three separate regression analyses were performed on the variable "Use of the Website" because of the way the survey

Table 2 Additional StratSoy Evaluation by Website Users from The WU Group

Found the site by search/links	82%
Have visited the site more than once	70%
Visit the site once a day	8%
Visit once or twice a week	13%
Visit once or twice a month	48%
Visit once or twice a year	20%
Spend less than 5 minutes at the site	10%
Spend 5 to 10 minutes	31%
Spend 10 to 15 minutes	28%
Spend 15 to 20 minutes	18%
Spend more than 20 minutes	13%
Have not visited the site more than once because too busy	53%
Have not visited because did not find the information useful	0%
Have never subscribed to the site	61%
Have not subscribed because did not know they could subscribe	68%
Subscribe to get all Q&A	50%
Subscribe to avoid visiting the website daily	32%
Stopped subscribing to not flood In Box	27%
Have looked through archives	66%
Those who did not look through archives said because too time consuming	37%
Have asked one question	53%
Have asked two questions	31%
Who never asked a question did not have a question to ask	47%
Said question was answered by looking in archives	20%

questions regarding soy consumption were set up. Question 41 concerning soy use was a yes/no question; questions 42-44 were answered only by soy users; and question 45 was answered only by those who do not use soy. Thus, the first regression analysis was conducted minus questions 42-45; the second regression analysis was performed without questions 41 and 45; and the third analysis was done excluding questions 41-44. As shown in Table 3, the first regression found that the best set of variables to predict "Use of the Website" were soy consumption, age, interest in menopause, interest in cholesterol, and interest in osteoporosis. The second regres-

sion identified age, interest in osteoporosis, and use of soy because it is a good source of calcium, while the third regression found age, interest in breast cancer and interest in cholesterol to be the best group of variables.

Table 3 Step-Wise Logistic Regression Analyses - Use of Website

Regression		Parameter Estimate	Set of Variables*
1	+	Soy Consumption	.0006
	+	Age	.0001
	+	Interest in Menopause	.0029
	-	Interest in Cholesterol	.0017
	+	Interest in Osteoporosis	.0300
2	+	Age	.0011
	+	Interest in Osteoporosis	.0077
	-	Soy as Source of Calcium	.0083
3	+	Age	.0001
	+	Interest in Breast Cancer	.0001
	-	Interest in Cholesterol	.0127

* Independent variables: gender, ethnicity, age, education level, income level, soy consumption/frequency, disease interests with regard to soy, diet, and motives for consuming or not consuming soy.

Statistically significant differences between the two groups with regard to the above mentioned variables are presented in Table 4. The WNU group was significantly older (p .001), consumed less soy (p .001), soy milk (p .001), tempeh (p .05) and tofu (p .001), and had less interest in menopause compared to the WU group (p .001).

Ranking was done of the outside links most frequently used to access the SHH AE feature during the month of January in 1997, 1998 and 1999, by using the data in the referrer log on the StratSoy Statistics Page (StratSoy, 1999) (Table 5). Analysis does not include searches done using various search

Table 4 Differences Between Two Groups[†]

Variable	WNU	WU
Age	4.85 (older)	3.93(younger)**
Consumption of:		
Soy (General, yes/no)	40% yes	83% yes**
Soy Milk	4.24 (lower)	2.60 (higher)**
Tempeh	4.94 (lower)	3.98 (higher)*
Tofu	4.11 (lower)	2.49 (higher)**
Soy Interest Area:		
Menopause	3.15 (less)	2.12 (more)**

[†] numbers are averages
^{*}p ≤.05, ^{**}p ≤.001, analysis done using Wilcoxon Test

engines such as Yahoo!®, Altavista®, Lycos®, Excite® and Infoseek®, only individual searches. Overall, most people access the site primarily by using these search engines. During both 1997 and 1998, the greatest number of people accessing the Web site from a direct link at another site came from the Web page entitled "Soy Phytoestrogens: Effects on Physiology and Health" from the Departments of Animal Science, Food and Nutrition; and Physiology at Southern Illinois University at Carbondale (SIU) (<http://www.siu.edu/~tw3a/cfarsoy.htm>), followed by a link from a page entitled "Soy Goodness" (sponsored by For-Mor International, a dietary supplement company, <http://www2.ari.net/home3/health/>). In 1999, the most frequently used single link was from a Yahoo!® search on Cholesterol followed by the SIU page. The next eight links for 1999 are shown in Table 4.

Use of the web site

Many people subscribe to the StratSoy SHH Web site in order to receive all of the questions and answers by E-mail. The number of subscribers is currently approximately 175, and has increased slightly over the past two years (see Table 6). StratSoy users can currently subscribe to six out of the 13 AE discussion groups. The total number of subscribers to each discussion group is listed in Table 5. "Market Analysis" (237) has the highest number of subscribers followed by "Soybean Production" (232) and "Soy and Human Health" (176).

Table 5 Links Most Frequently Used to Access Website*
1997 and 1998
<ol style="list-style-type: none"> 1) Soy Phytoestrogens: Effects on Physiology and Health" from the Departments of Animal Science, Food and Nutrition; and Physiology at Southern Illinois University (SIU) at Carbondale (http://www.siu.edu/~tw3a/cfarsoy.htm) 2) "Soy Goodness", sponsored by For-Mor International, a dietary supplement company (http://www2.ari.net/home3/health/)
1999
<ol style="list-style-type: none"> 1) Yahoo!® - Cholesterol 2) SIU webpage (see above) 3) Yahoo!® - Endometriosis 4) Yahoo!® -Promensil 5) "Menopause-On-Line" (http://www.menopause-online.com/soy.htm) 6) "U.S. Soyfoods Directory" (http://www.soyfoods.com/telephone.html) 7) Yahoo!® - Phytoestrogens 8) Yahoo!® - Homocysteine 9) Yahoo!® - Breast Implants 10) "SoyEveryDay", soy product from Reliv International (http://www.soyeveryday.com/)
* in order of most frequent use

FAQs (or topic areas of interest)

The topics of the FAQs were chosen based on the quantity of questions submitted to the AE feature, and on research findings regarding soy and human health. A significant number of survey respondents indicated that adding a FAQ section would greatly improve the Web site. More specifically, 78%, and 70% of the WNU group and the WU group, respectively, thought that a FAQ would improve the Web site (see Table 7).

Two FAQs, "Menopause" and "Osteoporosis", were posted in June, 1998. Another four ("Soy Protein Quality", "Soyfoods", "Recipes" and "Allergy") were added in August

Table 6 *Number of Subscribers to AE Lists on StratSoy (June 1999)*

Topic Area	Number
Farm Business Management	94
Natural Resources	112
Soybean Utilization	157
Soy and Human Health	176
Soybean Production	232
Market Analysis	237

Subscribers to SHH, Date	Number
November 1997	141
April 1998	127
August 1998	132
June 1999	176

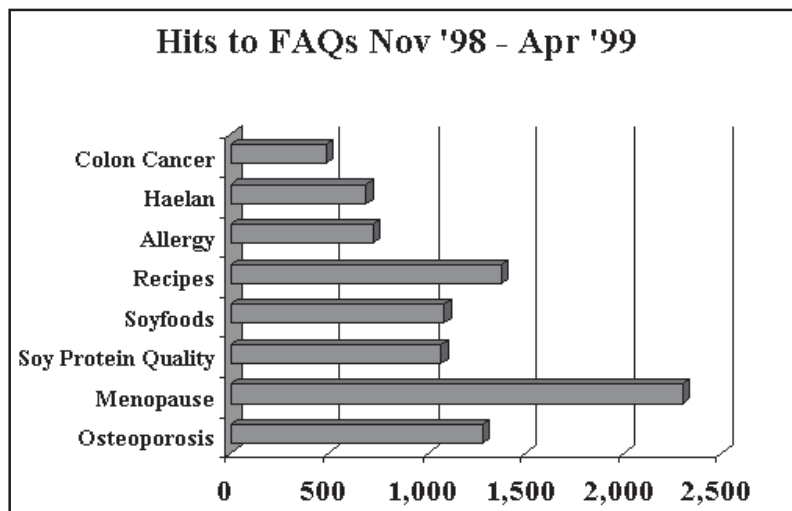
Table 7 *Suggestions for Improving the Website* and Reasons for Visiting the Website*

Suggestion	WNU	WU
To have a brief informational section on individual soy products/diseases	67.4	73.7
To have a FAQ section	77.8	70.2
To have a searchable database	73.4	84.0
To add the complete nutritional analysis of various soyfoods	63.1	85.8
Reason		WU
To learn more about nutritional content of soyfoods		74.0
To learn how to prepare soyfoods		41.8
To learn more about the role of soy in enhancing health		85.7
I am curious about what questions people are asking		48.2
To ask the expert a question		60.7

* percentage of those that think each of the following would greatly improve the website
--

with the final addition of "Haelan" and "Colon Cancer" by November, 1998. The remaining eight were posted in the Fall of 1999. The number of hits to these FAQs during a six-month period following their posting is shown in Figure 1; menopause had the highest number of hits (2307) followed by recipes (1377) and osteoporosis (1284). Colon cancer had the lowest number of hits (488). As soon as the FAQs were posted, the expert was able to refer to them in answering questions.

Figure 1



Improvement of Web site

Specific survey questions addressed the issue of improvement to the Web site. As shown in Table 7, the first choice for the WU group was to add the complete nutritional analysis of various soyfoods, while more of the WNU group thought having a FAQ section would best improve the site. Having a searchable database was the second choice for both groups. In addition to mentioning the four possibilities listed in Table 7 for improving the Web site, other suggestions given by many survey respondents included: a) adding more practical information for incorporating soy into the daily diet; b) increasing the speed of movement within the Web site (speed of server response); and c) improving information organization (perhaps by categorizing by subject matter, or by deleting repetitious questions). Both the WU and WNU groups responded to questions about negative attributes of the site, listing a general

lack of organization, while the WNU group also commented that there was too much information and the WU group mentioned the lack of practical information.

In order to improve the Web site, one must consider the motives for people visiting the site in the first place (Table 7). Not surprisingly, the major reason the WU group visited the Web site was "to learn more about the role of soy in enhancing health" (85.7%) . A high number of the WU group (74.0%) also said "to learn more about nutritional content of soyfoods" was a very important motive. Learning how to prepare soyfoods was of least importance to the WU group visiting the Web site.

Discussion

The lower response rate for the WU group compared to the WNU group might be the result of several factors. First, the length of the WU survey (16 pages compared to 10 pages for the WNU group) may have deterred potential respondents. Second, there may have been a higher response rate in the WNU group because they had all previously participated in soy food clinical trials at the University of Illinois and thus were possibly more interested in participating in research affiliated with the university. Finally, in order not to deter potential respondents of both groups (because of the personalized nature of the questions), the demographics section of the surveys would have been better placed as the final section instead of the first.

The higher number of subscribers to the AE features of Market Analysis and Soybean Production (Table 6) may reflect those individuals whose jobs are related to these two topics and who therefore rely more heavily on the information provided on a daily basis for work-related matters. Information provided to those who subscribe to the SHH feature may be used on a more personal level and is probably not as crucial to daily work performance compared to the top two subscriber groups.

The FAQs were designed to increase the information available at the Web site, and to simplify the AE response process by reducing the number of repetitive questions asked, or facilitating the answering of questions. Even though the use of the FAQs in this regard by the expert has not reached its full potential, the month of July, 1998 is an example where the expert referred to the FAQs in her answer to every question

asked concerning both osteoporosis and menopause.

For FAQs that were posted on the Web site from November 1998 to April 1999, menopause had the most hits followed by osteoporosis (Figure 1). This reflects the interest of the WU group as well as interests of general visitors to the Web site as shown by the number of hits to existing FAQs (Wool, Kanfer, Michaels, Thompson, & Hasler, manuscript submitted for publication). Two out of the top ten links to the Web site in 1999 were menopause-related (Table 5) which mirrors the fact that the menopause FAQ had the highest number of hits and menopause was the number two topic of questions asked of the expert.

When asked to list the negative aspects of the site, both groups listed the server as being too slow. Slow server response was also identified as problematic in 61% of the respondents to the Georgia Institute of Technology Annual Survey on Users of the World Wide Web (Graphics Visualization and Usability Center [GVU] Survey) (Kehoe, Pitkow, Sutton, Aggarwal, & Rogers, 1999). Increasing the speed of the server would increase the use of the archives and eliminate the frustration expressed by both groups. Since most (66%) of the WU group have looked through the archives and 62% looked before asking the expert a question, a reorganization of the archives, perhaps by subject matter or implementing a search engine, would increase the usefulness of the vast amount of information located there. Since only 39% of the WU group subscribed and 67% of those who had not subscribed said that one reason for not subscribing was that they did not know that they could, this information perhaps could be made more available to the WU group.

Conclusions

The evaluation of the use of the StratSoy SHH AE feature has provided information regarding who the Web site users are, what their needs are, and better ways to fulfill those needs more effectively. The AE feature allows the users not only to ask questions but to suggest improvements to the Web site. This allows changing trends in issues regarding soy and human health to be monitored as well as allowing the Web site to be tailored specifically to users' needs. Daily two-way communication on the Web site, along with occasional more in-depth studies of users' needs via surveys, can potentially greatly improve general information dissemination on the Internet and more specifically (as in the case of StratSoy) an agricultural communications information system on soy.

This research has revealed a large amount of information concerning users of the StratSoy SHH AE feature. The format of the Web site was changed in the beginning of 1999 (this research concentrated on use of the site during 1997-1998) and thus a follow-up survey could assess whether the change in the Web site had any affect on use of the Web site, their effect if any, changes in the number of hits to and prevalent interest areas of the FAQs, and whether the demographics of the users and their disease interests are changing over time. Modifications made to the Web site are potentially more rapid and effective because of the two-way communication which allows changes to be implemented based on user feedback.

At present, most of the WU group visit the site to learn more about the role of soy in enhancing health and the nutritional content of soyfoods as opposed to how to prepare them. The FAQs specifically address these two issues and will be instrumental in facilitating the dissemination of information to Web site visitors. Implementation of some or all of the suggestions for improving the AE feature (most individuals in the WU and WNU groups thought that a searchable database would greatly improve the site) should allow for users' needs to be more fully met. Specific changes in the AE features might include dynamic reranking of the FAQ features so that the more frequently addressed concerns are the most easily accessed, and redirection of inquiries to dedicated Web pages and servers for extremely high-traffic issues. Again, it is the feedback loop built into this Internet communications system that facilitates improvement of the system by allowing for user-requested modifications to be implemented so that the Web site can be tailored specifically to users' needs.

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Keywords: Soy, Internet, StratSoy

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