Developing a B2C Web-based Ontology Survey system and Business Model Construction

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ABSTRACT
This study proposes a Delphi web-based ontology survey system, which is designed based on the method for obtaining independent forecasts from an expert panel over two or more rounds, with summaries of the anonymous forecasts provided after each round. The platform makes ontology creation more convenient.

Recently, there have appeared many studies on web-based survey research, but only a few studies focus on B2C web-based ontology survey. We notice that different B2C web-based surveys offer different kinds of business models. This study focuses on studying the business model of B2C web-based ontology survey to learn how they are doing business. We also study and analyze the criteria of business owners to select a B2C web-based ontology survey, and hope this information will be helpful to such business owners. Finally, we also make recommendations to the business owner in charge.

KEYWORDS
Web-based Ontology Survey system, Delphi method, Business Models

1. INTRODUCTION
The NSF (National Science Foundation) opened the Internet to public and commercial use in 1991. (NSF, 1991) Various trades and occupations have since obtained benefits because the Internet provides limitless, zero-time-lag information access capability, while simultaneously providing the enterprise a brand-new sale and trading platform outside the tradition business model to not only expand the size of the market but also provide more opportunities for enterprises to make money.

At present, Taiwan's web-based survey services are at the beginning stage. The Internet survey services provided by the Chunghwa Telecom Research Institute (2007) according to function can be divided into the following:

a) Design and create web-based questionnaires in a flexible way
   It allows the user to create projects with unlimited number of questions and responses. Each type has its own advanced properties and customization, such as Multiple Choice Single Answer, Multiple Choice Multiple Answer, or having the entered number be an integer or floating. You can specify which questions must be answered and improve the quality of collected information. A questionnaire can be divided into many sections to make easy-to-read pages.

b) Categories and personal folder
   It provides a collection of frequently used questions. After each questionnaire is created, all questions can be saved in a personal folder for future use.

c) Live result analysis
   Live summary for all questions are provided with generation of either a bar chart or pie chart, allowing the user to view clearly the statistics of respondents' choices. All the data can be downloaded to one’s local computer for further analysis. Graphs can also be created by using spreadsheet applications such as Excel.

d) Request notification
It provides the function of automatically sending email notification to request response at indicated site.

A well-planned Internet business model is the only way to lead the market, and it is also a stepping stone to earn more profits. Companies with online businesses earn revenue through the employment of one or several of the following seven revenue models (Allan Afuah et al., 2003).

a) Commission-Based Model
A Commission-Based model is one that relies on commissions as a mainstay of the business. For example, when a broker helps a customer sell a stock (by pairing the seller with a buyer), the broker takes a commission on the transaction.

b) Advertising-Based Model
The advertising model refers to advertising as a source of revenue in and of itself. The website owner attempts to make money by charging advertisers fees for banners, permanent buttons, pop-up windows, and other ways of getting a client’s messages to visitors.

c) Markup-Based Model
Markup refers to value added in sales rather than in production. A company may buy finished goods from a manufacturer and then sell them to the public or to other firms.

d) Production-Based Model
Manufactures try to reach customers or end users directly through the Internet. By doing so, they can save on costs and better serve customers by finding out directly what they want.

e) Referral-Based Model
In the referral-based model, firms rely on fees for steering visitors to another company. Each time a visitor to an affiliate’s site clicks through to the merchant’s site and buys something, the affiliate is paid a referral fee.

f) Subscription-Based Model
In the subscription-based model, a company charges a flat rate on a periodic basis (such as a month) that qualifies the user for a certain amount of service. This is analogous to the monthly charge one pays on a telephone bill whether or not making any telephone calls.

g) Fee-for-service-Based Model
In this model, activities are metered and customers pay for only the service that they actually use.

The Internet service business model provided by the Chunghwa Telecom Research Institute is a pricing model where consumption is based on the number of services.

Although Taiwan's e-commerce market is a booming development, enterprises will not necessarily make a lot of money through e-commerce technology. There exist many critical success factors for Internet survey systems.

In this study, the Delphi web-based ontology survey system was applied to represent the vague knowledge of the Internet survey problems for ontology formation and to build a viable business model.

2. LITERATURE REVIEW

2.1. The forms of network survey
The forms of network survey can be divided into four types under the current network technology.

a) E-mail: Researchers edit the contents of questionnaires and store them in an e-mail to be sent later to respondents via the Internet. Respondents use the questionnaire reply mechanism to complete the survey work. E-mail surveys could be especially useful if rapid response time is necessary.

b) Newsgroup: Survey will be posted in the relevant newsgroup. Newsgroup subscribers were invited to respond to the questionnaire via the newsgroup site and return by e-mail.

c) Bulletin board system (BBS): With public survey posting, millions with like interests can post, read, and provide immediate feedback.

d) World-Wide Web (WWW): Web surveys can interactively provide participants with customized feedback. Advantages include savings in both time and money for survey researchers, and the ability to present survey information in formats that were previously difficult to achieve.
2.2. Advantages and limitations of Web-based surveys

Studies have found several advantages of Web-Based Surveys over Paper Surveys (Dillman, D. A. et al., 2000, Thomas M. Archer, 2003):

a) Once the Web-Based Survey system is developed, the cost of surveying additional respondents is much lower.
b) Data from Web-based surveys are available in real time in graphic and numerical format.
c) Reminders and follow-ups on non-respondents are relatively easy.
d) Time required for implementation can be reduced.
e) Paper, postage, mail out, and data entry costs are almost completely eliminated.
f) Data from Web-based surveys can be easily imported into data analysis programs.

There are however also some limitations of Web-Based Surveys:

a) Not everyone is connected, so this survey method will not work with the entire population.
b) Even if connected, not all potential respondents are equally computer literate.
c) Sampling of e-mail addresses is difficult. Sometimes there is more than one e-mail address per respondent, and addresses are not standardized.
d) Screen configurations may appear significantly different from one respondent to another, depending on settings of individual computers.

2.3. Web-Based Surveys Market in China

According to the report of the CNNIC (China Internet Network Information Center) in January 2008, the total of netizens in China has increased to 210 million- with an increase of 40 million as compared with June 2007 and 73 million in the year of 2007- at an annual growth rate of 53.3%. (Figure 1). Over the last year, the daily average increase was 200,000. Now, the total of netizens in China is slightly lower than the 215 million of the United States (MMG, 2008), ranking second in the world. In view of access methods, broadband netizens have reached 163 million and mobile phone netizens 50.40 million, both of which have been in a rapid growth. Analysis International Says China B2C Market Size Reached RMB 1.135 Billion in the second quarter of 2007, increasing 11% quarter on quarter. (AI, 2008)

2.4. Delphi method

The Delphi method was developed by the RAND Corporation during the 1950-1960s by Olaf Helmer, Norman Dalkey, and Nicholas Rescher (1959). It is a systematic interactive forecasting method for obtaining forecasts from a panel of independent experts. The carefully selected experts answer questionnaires in two or more rounds. After each round, a facilitator provides an anonymous summary of the experts’ forecasts from the previous round as well as the reasons they provided for their judgments. Thus, participants are encouraged to revise their earlier answers in light of the replies of other members of the group. It is believed that during this process the range of the answers will decrease and the group will converge towards the "correct" answer. Finally, the process is stopped after a pre-defined stop criterion (e.g. number of rounds, achievement of consensus, and stability of results) and the mean or median scores of the final rounds determine the results (Rowe, Wright, 1999). Riggs (1983) describes the nine steps for the Delphi method in Figure 2.

The methodology employed was initially based on a four-round study by Schmidt et al., (2001). The first round was used to elicit ideas from participants. There are also representatives of each dimensions of the topic, and the second round is to validate those ideas. All responses to each question are standardized by subtracting the mean value and dividing by the standard deviation for that question. The resulting distribution of "standardized deviates" shows an
excellent fit to a lognormal distribution. The third round reduces the list of ideas to a meaningful size and then, the last round to rank the final list.

Figure 2 Steps for the Delphi method Riggs (1983)

3. DELPHI WEB-BASED ONTOLOGY SURVEY SYSTEM

3.1. System Development Environment

a) Programming language : OWL, XML, PHP5, C++
b) Database: MySQL
c) Community platform: XOOPS & Apache Server

3.2. Delphi web-based ontology survey system (DOSS)

Based on the analysis results of this study, the domestic web-based ontology survey system is not yet complete, especially concerning the sampling design, how to remove a bad problem in the questionnaire, and in successful operation of a web-based ontology survey systems community. In this paper, we propose a web-based ontology survey system platform using the Delphi method. Table 1 illustrates the difference between the platform of this study and Taiwan's web-based survey services provided by the Chunghwa Telecom Research Institute. Figure 3 illustrates the overall system platform architecture. Our platform includes the following features:

- Questionnaire development system
  a) Survey design: an interface for users in a step-by-step manner. After each questionnaire is created, all questions can be saved in a personal folder for future use.
  b) Request notification: this provides the function of automatically sending email notification to request responding at an indicated site.
  c) Categories and personal folder: questionnaires can be either placed in one of the public categories or stored in personal folders.
  d) Live result analysis: live summary for all questions are provided. A bar chart or pie chart will be generated, allowing the user to view clearly the statistics of respondents’ choices.
  e) Sampling design: with stratified random sampling, the number of respondents is controlled automatically and high accuracy of the sampling could be achieved.

- Delphi questionnaire system
  Consistent expert opinions were elicited following numerous rounds of the survey. The web-based Delphi survey system automatically collected the individual responses after the expert had completed the questionnaire. The Delphi questionnaire system can remove a bad problem in the questionnaire by several intensive manipulations of the questionnaire and appropriate feedback. During feedback, the panel viewpoint as expressed in these quantitative measures is summarized statistically, using mean and deviation (Khorramshahgol et al. 1988) in order to enhance the content validity of the questionnaire.

- Question library
The web-based Delphi survey system provides a collection of frequently used questions. After each questionnaire is created, all questions can be saved in a personal folder for future use.

- Dynamic web content management system
  By providing the following management and service functions, the dynamic web content management system effectively improves business performance.
  a) News management
  b) Typical article management
  c) Website links management
  d) File download management
  e) Automatic News feed headlines
  f) Frequently Asked Questions(FAQ)
  g) Member management

- Ontology management system
  a) User administration
  b) Concepts management(e.g., entities, attributes, processes)

3.3. Core functions of Delphi web-based ontology survey system

a) The expert carries on the questionnaire evaluation

Figure 4 illustrates the process of the selection of experts carried out for a questionnaire and notifies the evaluation; selection of experts can provide a total of 20. According to Hogarth’s (1978) study, the number of members of the group to participate in the professional knowledge will affect topics to be discussed accurately. This view adopted Armstrong’s (1985) proposal to control the selection of experts to a number between 5 and 20, effectively controlling expert feedback on the quality.
3.4. Applications of Delphi web-based ontology survey system

Being that the delivery of printed questionnaires or telephone surveys and the processing of data collection are time-consuming, this study adopted a Delphi web-based ontology survey system that sent notice to experts via electronic mail and asked them to fill out the questionnaire on a web site. The Delphi web-based ontology survey system automatically collected the individual responses after the expert had completed the questionnaire. This answer not only is the result of the expert’s cooperative decision-making but also reflects the essence of the issue.

3.5. Business Model of B2C Web-based Ontology Survey system

a) Differentiated products to create more revenue
A firm can differentiate its products/services by offering features that competitors’ products do not have. For example, toothpastes differ in flavor, color, texture, whitening capability. The functional differences between the charging methods will generate more revenue.

b) Strengthening customer relationship management
Through understanding the needs of each customer, strengthening customer relationship management could be delivered to enhance customer loyalty and satisfaction. Commerce works most effectively when consumers have confidence that they are treated fairly. This not only leads more easily to a deal but also expands the size of the market.

c) To satisfy the needs and wants of consumers
A product is any combination of goods and services offered to satisfy the needs and wants of consumers. Thus, a product is anything tangible or intangible that can be offered for purchase or use by consumers. Combination of goods and services can attract those who like one-stop purchases or part of the purchase. The company can then apply to the collection of data for customers to customize the service.

In conclusion, this study is the combination of three revenue models: the Fee-for-service-Based model, the Advertising-based model, and the Referral-Based model. Through the establishment of a virtual
community, this will attract and retain the Internet crowd and build alliances with distributors sharing customer information to create business opportunities.

4. CONCLUSION

In this paper, we propose a web-based ontology survey system using the Delphi method, and then use it to construct a Collaborative Ontology which can help users effectively save manpower, time and funds of ontology construction. The system can further remove a bad problem in the questionnaire by several intensive manipulations of the questionnaire and appropriate feedback, thereby making ontology creation more convenient.

The contributions of this research include the following: (1) Establishing an integrated web-based ontology survey framework using the Delphi method for ontology construction. (2) Analyzing the criteria of business owners to select a B2C web-based ontology survey system.

<table>
<thead>
<tr>
<th>Questionnaire Design</th>
<th>Delphi web-based ontology survey system(DOSS)</th>
<th>Web Questionnaire Wizard(Taiwan's Chunghwa Telecom Research Institute)</th>
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<tr>
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<tr>
<td>Ontology questionnaire form</td>
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<td>Categories and personal folder</td>
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<td>Live result analysis</td>
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<td>Sampling design</td>
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<td>Delphi method (generating a quick consensus by a group)</td>
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