

USER SURVEYS – “WHO, WHAT, WHERE, WHEN, WHY”

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Abstract

Introduction

The map user plays a key role in the design and development of maps and atlases whether printed or online. User Centred Design (UCD) methodologies focus on the user while keeping the user, business objectives and mandates in balance. When surveys are conducted within a UCD framework, they allow map developers and designers to obtain valuable feedback and information about the users of their maps and map products. Surveys are useful in determining and obtaining user group profiles, satisfaction measurement, objective feedback and issue detection. Also, they are effective as a prelude to a user needs/requirements analysis. Surveys can be done in many ways including by mail, telephone, online and in person. While there is variation in the method, the approach to create an effective survey remains fairly consistent. This paper will delve into the various types of surveys highlighting their differences, similarities, structure and analysis. Some examples will be offered and practical advice given from the Atlas of Canada.

Objectives

Surveys are conducted to understand users and user groups. They are composed of questions with a predefined selection of answers and, in some cases, answers that are open ended. The objective of this paper is to offer an understanding of what the various types of surveys are, where they should be conducted, when and why they are used and for whom they are given. This type of research method, being quantitative in nature, can be subject to statistical analysis based on sample sizes, measures of error and levels of confidence. Surveys are suitable for limited qualitative or subjective feedback and can be used to detect issues that can later be researched using a suitable qualitative research method. This paper will also explain the kinds of analyses that can be done and their limitations.

Methodology

Surveys play an important role in User Centred Design (UCD) methodologies. These will be explored and given context within a UCD environment. The differences between surveys – a quantitative, and qualitative research methods will be explained. Individual survey methods will be described. Survey characteristics both common and unique will be explored. Other factors in conducting surveys such as target audience, sample size, confidence interval, research limitations and margin of error will be outlined. The types of questions along with survey structure and design will be presented. Methods of analysis will be presented together with what can and cannot be done with data collected from surveys.

Results

This paper will offer the map maker practical background information to understand the various surveys types, their composition, structure and analysis. Some examples from the Atlas of Canada will be given as a guide to illustrate what is presented.

Conclusion

Surveys, as research method, are an effective way to objectively understand map users, their characteristics as well as measure their satisfaction. Surveys conducted as part of a more integrated user centred research methodology will provide valuable information necessary for successful mapping products. The key is to know who, what where, when and why.

What are Surveys?

Surveys are a research method that allows the collection of information and feedback from map users. As part of a User Centred Design methodology, results from surveys allow for informed decisions to be made in the course of defining and developing a mapping product. There are limitations to their use, but great benefits as well. Surveys are useful in determining and obtaining user group profiles, measuring satisfaction, collecting feedback, detecting issues and researching markets. They can be done in a variety of ways including by mail, telephone, online and in person. While there is variation in the method, the approach to create an effective survey remains mostly consistent. This paper will explain the “who, what where, when and why” of surveys highlighting their uses, strengths, composition and analysis.

Quantitative Versus Qualitative Research Methods

Research methods fall into one of two groups: quantitative and qualitative. Quantitative research is focused on gathering and analysing data using statistical analysis methods. Therefore, quantities or numbers of respondents are important to be representative of broader user groups and to permit analysis of the results. Surveys are an example of this. Qualitative research is focused on gathering an in-depth understanding of human behaviour and the reasons for that behaviour (Wikipedia, 2008). Accordingly, smaller but focused numbers of participants are needed rather than large, randomly selected quantities required by surveys. User observation, interviews and focus groups are examples of qualitative research. Quantitative research differs from qualitative research in the following ways:

- Data are usually gathered using more structured research instruments
- Results provide less detail on behaviour, attitudes and motivation
- Results are based on larger sample sizes representative of the user population
- Research can usually be replicated or repeated, giving it high reliability

Surveys in the Context of User Centred Design (UCD)

Surveys can be conducted for stand-alone reasons, but they can best be used and appreciated in a user centred context. UCD is both a philosophy and a process (Katz-Haas 1998). As a philosophy, it approaches map and atlas design from the position of the map user. As a process, it focuses on understanding what users need and how they think by using established research methods. The methodology used by the Atlas of Canada (Maskery 2002-05) is

shown in Figure 1. The first stage is an examination of business requirements, where surveys can be used to identify potential user groups and their characteristics. This is valuable when a map or atlas is being initially defined. Surveys can also be used for market research activities, probing into a product’s potential when validating a business case.

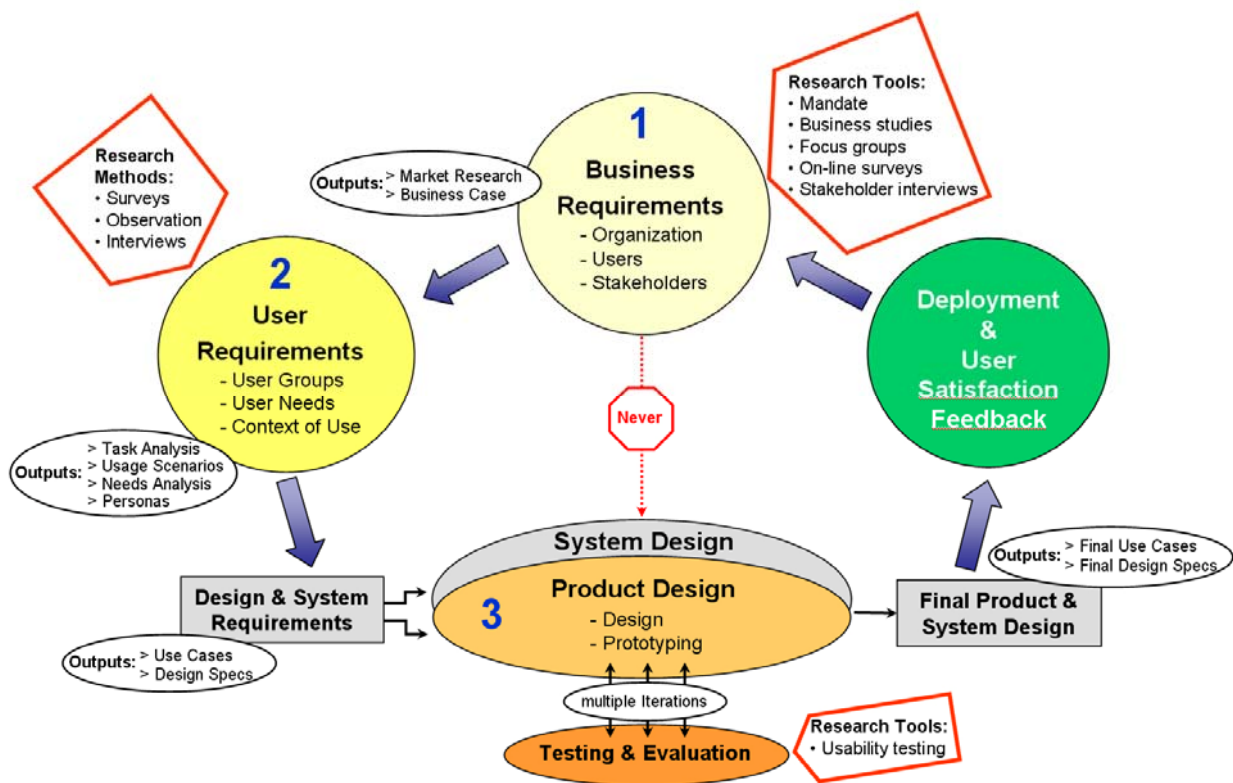


Figure 1: The Atlas of Canada’s User Centred Design methodology

In the second stage, user requirements, surveys are essential in identifying and defining detailed user group profiles/characteristics. Initial user needs can be identified that feed more detailed qualitative user needs research through interviews. The third stage involves the map or atlas and systems design. This is followed by deployment or release of the product (Kramers 2006). In the case of an existing product, surveys can be used to measure user satisfaction. When this is done on a regular basis, trends and changes can be identified to help refine the business approach and the components of a mapping product or program.

Establishing correct and valid profiles/characteristics is fundamental to understanding users and is the basis for all user centred research. Without knowing who the actual users are, no other research can effectively be conducted. Profiles determined using a survey include various characteristics such as:

- Demographics
- User behaviour based on medium (print, wireless, Internet)
- High level mapping needs and preferences

Measuring user satisfaction gives map makers an understanding of how well user needs are being met. This can be done at an overall level and for specific sections of a product. Levels

of satisfaction can vary from one part of a mapping product to another so determining this will assist map makers and developers in improving only what needs to be improved. Effective satisfaction measurement provides the right kind of feedback to ensure that any mapping product is meeting the needs of its users and its required level of success. Some examples of attributes of overall site satisfaction measured for the online Atlas of Canada are:

- The scope of information provided meeting user needs
- The clarity and ease of understanding subject headings and labels
- The visual appeal of the overall design
- The ease of navigating from one part of the site to another
- Recommending this atlas or mapping site to others

Types of surveys

There are many ways to conduct a survey and each has its strengths and weaknesses. When choosing a survey type it is important to understand the characteristics of each and balance that with the resources available to do it. The choice of survey type is also influenced by the type of mapping product and the most suitable way to communicate with users. This section describes the primary types of surveys.

Survey Cards

Comment or survey cards are a simple and concise method useful for obtaining specific user characteristics and satisfaction feedback. Their simple format requires few resources to create and administer. The questions should be few in number and focused and will take little time for respondents to complete. They are quite often distributed with a product, ensuring they reach actual users. Comment and survey cards primarily serve to supplement rather than replace a customer satisfaction Survey (Treasure Board of Canada Secretariat, 2001). They can, however, be used for any survey need suitable in a compact format. If survey cards are distributed to targeted user groups and sufficient cards are returned, the results will be statistically representative. Their main disadvantage is that the onus is on the respondent to complete and return them. To maximize the rate of return, cards can be returned to a central or number of locations convenient to the respondents. If returned by mail, they should be postage paid and addressed.

CANADA: A LAND OF SUPERLATIVES

Map Survey

Canadian Geographic, in cooperation with the National Atlas Information Service of Geomatics Canada, is pleased to offer you a complimentary copy of Canada: A Land of Superlatives. We hope that this map will help you discover the richness of Canada. We would greatly appreciate your feedback on Canada: A Land of Superlatives. Please fill in and return the postage-paid card. Results will be used to help us develop future products. All responses will be confidential.

1) Your reaction to:
amount of text
number of illustrations

2) How do you intend to use the map?
 hang it on a wall
 offer it as a gift
 at home
 at work
 at school
 other _____

3) Do you like the design of the product?
 yes no somewhat

4) Is the map easy to understand?
 yes no somewhat

5) Has it given you a greater understanding of the geography of Canada?
 yes no somewhat

6) Would you be interested in buying similar maps?
 yes (if yes, what topics would you like to see covered?) _____
 no (go to Q.8)

7) How much would you be willing to pay for this type of product?
 \$15.00 to \$19.99
 \$20.00 to \$24.99
maximum price willing to pay _____

8) Do you have comments you would like to make about the map?

9) In what type of organization do you work?
 government
 private company
 educational institution
 other _____

10) In which region do you live?
 Maritime Central
 Quebec Western Canada

Canada

Figure 2: Survey card used by the Atlas of Canada for a poster-map distributed in a magazine.

Mail Surveys

Surveys distributed by mail are a useful method to obtain broad and detailed user characteristics and satisfaction feedback. They are relatively low in cost as they require few resources to create, send and administer. Another advantage is that respondents can choose the best and most convenient time to complete the survey (American Statistical Association, 1997). They should be professionally styled and formatted and be written using language suitable for the recipients. The two main challenges with this method are ensuring that it is distributed to a representative sample of users and securing sufficient completed surveys to be representative of the user population. As with survey cards the onus is on the respondent to complete and return them. Mailing lists should be checked to ensure that the respondents are suitably representative of the target user group(s) and that they have previously agreed to receive surveys to ensure that they are completed. Reminder letters or cards may be necessary, after a reasonable period of time, to ensure that sufficient numbers are returned. If the completed surveys cannot be easily dropped off by respondents, it is good to include an addressed and postage paid return envelope.

Telephone and In-person Surveys

Surveys conducted by telephone and in person are very common methods to obtain broad and detailed feedback and information about users and to measure their satisfaction. They can be more effective than those done online and by mail since they are not done anonymously. They are always completed person to person at the time a respondent is engaged and agrees to participate. Those conducting the survey should have sufficient experience and skill to prevent any bias from their presence, voice and explanations affecting the respondents' answers. These methods are the most resource intensive and expensive due to each one needing someone to conduct it. Another disadvantage is that in some places people can be inundated with telephone surveys and they may be reluctant to participate. A patient and

polite approach encourages potential respondents to do the survey. As with all surveys, it is important to ensure that those contacted and engaged are representative of the targeted user group(s). Phone lists should be checked to ensure that the respondents are suitably representative of the target user group(s) and that they have previously agreed to receive surveys. Always indicate the length of the survey or time needed to complete it. In-person surveys are often done using hand-held devices to record the respondent's answers; this offers convenience and time savings in collecting the data and analysing the results.

Online Surveys

Online surveys are a flexible, simple and cost effective survey method. They are similar to mail surveys in that they are a useful method to obtain broad and detailed user characteristics and satisfaction feedback. The main difference is that these are located in one place so there are no distribution costs. In the past they used to be in the domain of research professionals. Today, however, there are many online survey tools that are both inexpensive and easy to use. Due to the wide access and reach of the Internet, online surveys have the ability to reach a large number of potential respondents, many of whom many not easily be reached with other methods (Wright 2005). Not all user groups and mapping products are internet-based. Accordingly, this method is only suitable for those that are. An online survey may need to be supplemented with other survey types, when this is the case. All the data is collated as soon as it is collected (University of Texas, 2009), offering significant time savings and reduction in transposition errors. Online surveys can be easily monitored to see the number of completed and rejected surveys to ensure that there are sufficient to be statistically representative of the of user population. If a survey is repeated over a particular time period, the survey is ready to use a second time with any needed minor changes or improvements. If using an online survey tool, the results can be analyzed using accompanying analysis tools or the data can be used within other analysis software. The data can be stored in a database or spreadsheet format, making for simpler, quicker analysis.

Survey Length

How long should a survey be? The answer, is a balance between the required number of questions to get the needed information and the respondents' willingness to answer them. The minimum number of questions should be asked to achieve the greatest value – only ask what is necessary and do not over-burden the respondents. When asking for their time use it wisely. There is little information to be found regarding the actual length of surveys. The Atlas of Canada has had success with both short and long user profile and satisfaction surveys ranging from nine to over 30 questions (Maskery, 2002-2005 and Kramers, 2007-09). Respondents should be informed how long the survey is, in time or number of questions, so they have an idea of their time commitment. A helpful aid for online surveys is to indicate on each page the number of questions completed out of the total, or display a status bar showing the percentage of questions completed. Once a survey is composed, evaluate its length and the time it takes to complete by testing it with some typical respondents.

Survey Sample Size

For a survey to be representative of a user group(s) or population, a sufficient sample size needs to be determined so that enough surveys can be completed for it to be statistically

accurate. These can easily be determined using one of the many free sample size calculators on the Internet as shown in Figure 3. There are three main factors to consider when determining the number of needed surveys or sample size: 1) confidence level, 2) confidence interval or margin of error, and 3) user population size.

Confidence level defines how confident a researcher can be with the results of a survey. It can be expressed as a percentage and represents how often the population picking an answer lies within the confidence interval. For example, a 95% confidence level, means that if a study were conducted 100 times, answers would be within the margin of error 95 out of 100 times.

Figure 3: Free online sample size calculator (Used with the permission of The Survey System by Creative Research Systems, 2009).

Confidence interval (also referred to as margin of error), usually expressed as a “+/- %” value, is the range around a survey result for which there is statistical probability that it reflects the actual amount. For example, a confidence interval of +/- 5% means that results may vary as much as five percent in either direction of the actual or true amount. Selecting a higher confidence interval will require in a smaller sample size; conversely, selecting a lower confidence interval will require a larger sample size as shown in Table 1.

Population	Confidence Interval and Sample Size									
	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1000	906	706	516	375	278	211	164	131	106	98
10,000	4899	1936	964	566	370	260	192	148	117	95

Table 1: Sample sizes for confidence intervals and population where confidence level is 95%.

The user population is the total number of users of a product. For example, a specialized map for a specific group of users may have a known user population. For an online atlas, such as the Atlas of Canada, intended for the general population, it is very difficult to know the total number users. Large user groups or populations do not require a proportionately greater number of completed surveys. When shown as a curve on a graph, the sample size for large user populations varies very little, as shown in Figure 4.

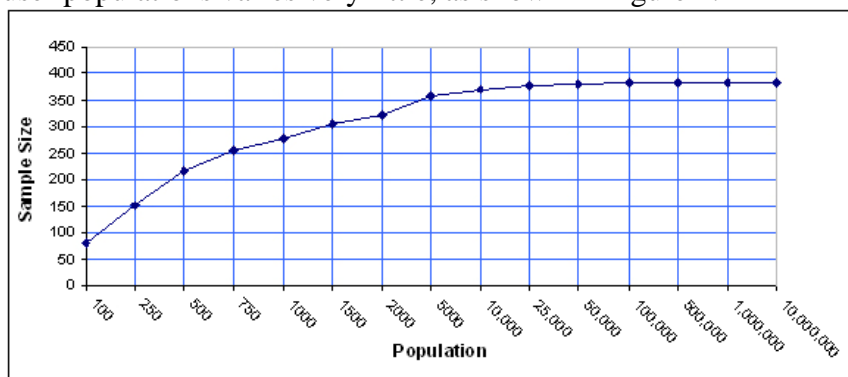


Figure 4: Sample size and population size comparison (confidence level = 95% and confidence interval = 5).

Survey Invitations

In order for a survey to be completed, potential respondents need to be asked. Whether the survey is in person, by mail, telephone or online, these invitations need to be informative, brief, accurate and polite. It is important that the invitation attract people to answer the survey questions. Expressing the survey’s objective and what will be done with the responses informs the user that their input is valuable and will be used. Incentives can be offered. It is better to offer many small incentives, so more respondents get one, than a small number of large ones (Koma, 2009). The invitation should also indicate how long the survey takes to complete. This can be done in two ways: for shorter surveys, indicate the number of questions; for longer surveys, estimate the time needed to complete it. A survey should be tested by typical respondents to accurately verify how long it takes to complete.

Respondents must be told if a survey is anonymous or not and what will be done with the information collected. Many countries, governments, companies and organizations have privacy laws, restrictions and guidelines that must be adhered to. Assuring anonymity of the survey answers is very important to many potential respondents and must be clearly communicated.

If e-mail, postal or telephone lists are used ensure that they come from a reliable and reputable source. Those on the list should be representative of your user group(s) and should have agreed to be on that list and contacted for this purpose. Otherwise, the invitation may be rejected or appear as spam or junk and be ignored. Invitations can be both active and passive. Active invitations are upfront obvious. Passive invitations are visible but not the primary content. All of the Atlas of Canada’s online surveys have used active invitations to meet the larger sample size requirements over a short period of time. At the end of the 4th survey in 2007, the active invitation was stopped and only passive graphic invitations were used. Table 2 shows that the passive invitations resulted in far fewer completed surveys and the completion rate was also opposite to the active invitation result, with the majority not being completed.

Invitation Type	Number of Days	Completed surveys	Percentage Completed	Percentage Abandoned
Active invitation	15	2327	68%	32%
Passive Invitations	15	62	59%	71%

Table 2: Atlas of Canada Survey 4 – Number of Completes by Invitation Type

Types of Questions

There are many standard question formats that can be used in online, in person, telephone and mail surveys. Most questions have a selection of pre-defined answers and are objective. This means that they should be clear, factual and not subject to interpretation. Subjective and open ended questions, where the respondent can offer their own answer, are subject to a great deal of variation. This can be useful but more time will be needed to classify and analyse these answers afterwards, due to the variation, subjective nature and completeness of the responses.

The following are standard types of questions used in Atlas of Canada surveys:

- a. **Multiple-choice:** A respondent chooses one or more of the listed answers. A variation of this type can include the last option being an open text field. Skip logic, directing respondents to another question, can be applied based on which answer they select.

- b. **Number rated:** A respondent would select a value, on a numbered scale, to answer a question regarding satisfaction, agreement, importance or quantity. Skip logic can be used based on the number selected.
- c. **Matrix:** Multiple questions would be offered in a table matrix format where the answers would be of the same type, such as a five-level numbered rating scale.
- d. **Open text field:** The respondent would enter text for the answer. The amount of text can be limited to a maximum number. The type of text can also be specific, for example, when numbers only are required.
- e. **Variable ranking:** A series of variables can be offered where the respondent ranks them in order of importance.

When considering which questions to ask, make sure you do not have another source for that information. If there is, the question does not need to be asked. This will bring greater value to the questions that are asked and the respondents' time. When composing questions, the objective is to ask what is needed in as few words as possible and in a manner that will not create confusion for the respondent. Bias should not be introduced into a question so that its objectivity is maintained. The type of language is very important and should suit the target audience. For example, a survey intended for maps and satellite images used by remote sensing specialists can use technical terminology. A survey for a general audience will have to be free of any jargon and terminology that may cause confusion. When determining the pre-defined answers for multiple choice questions, ensure that the selection is as complete as possible. Questions can include an answer option such as "do not know", "none of the above" or "not sure" and these have value if that answer is relevant to the research. It is always better to have enough useful options for the respondents. Remember, survey questions can only be asked once, there is no opportunity to clarify the question or probe a respondent's answer.

Questions can also be mandatory or optional. When a question is mandatory the respondent must answer the question to proceed. This can prompt the respondent to more carefully consider the question and answer instead of skipping it. Optional questions are also useful when a respondent can enter a textual response. Some respondents may not wish to do this, so this option allows them to skip that answer but still complete the survey. A multiple-choice question can have a free text option such as "Other" as the last choice. In this case, the multiple-choice can be mandatory where "Other" is selected, but entering free text can be optional.

For questions where a rating, such as satisfaction, agreement, importance or quantity is asked, a five-level response scale is the most suitable (CMT, 2003). The five levels give respondents a combination of sufficient choice and logic (see Table 3). The scale should only label the end points to ensure that respondents assume equal measure between each point. If this is not the case, then statistical analysis such as mean score and variance will not be possible. The intermediate points 2 to 4 in the table are given a label for informational purposes.

Scale Position	Satisfaction	Agreement	Importance	Quantity
5	Very satisfied	Strongly agree	Very Important	All
4	Satisfied	Agree	Important	Most
3	Neither satisfied nor dissatisfied	Neither agree nor disagree	Neither important nor unimportant	Some

2	Dissatisfied	Disagree	Unimportant	A little
1	Very dissatisfied	Strongly Disagree	Very Unimportant	None

Table 3: Rated questions and corresponding labels

Here is a summary of some tips for good questions:

- Keep the questions focused and objective, not vague
- Write questions that are simple, clear and as short as possible
- Make questions objective, not personal
- Ensure that all questions are not biased to maintain their objectivity
- Check spelling and grammar – use the carpentry rule, measure twice and cut once
- Use professional language that is familiar to the targeted respondents
- Avoid jargon and abbreviations and complicated terminology
- Ensure the questions and answers make sense together and are in a logical order
- Use fonts and font sizes that are legible and use good formatting and design
- Pre-test the survey questions to make sure they all make sense and to determine how long it will take to complete.

Survey Structure and Design

Surveys can be designed with any logical structure. From the respondent side, whether online, in person or by telephone, a survey should appear linear. The exception is a printed survey where the respondent can encounter skip logic.

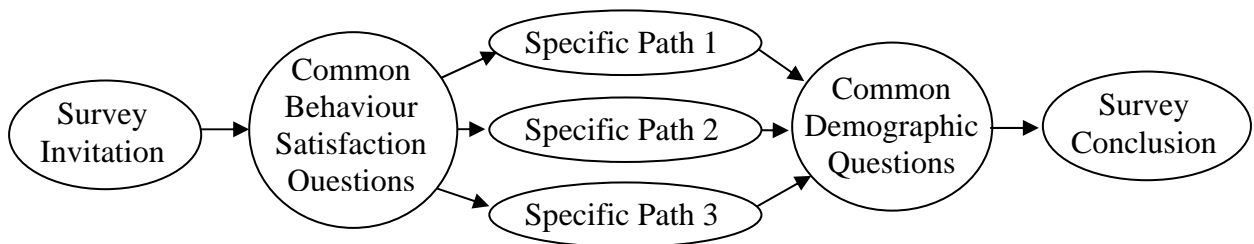


Figure 5: A simple multiple path survey

When a survey is designed as a linear survey (Figure 5), respondents complete all the questions. When multiple path skip logic (Figure 6) is used, respondents can be sent along a custom path of questions that is determined by the answers they select. As such, not all questions are answered by all respondents. Care must be taken to ensure enough responses are collected from each path the survey logic incorporates. This will ensure the desired margin of error is achieved. Too small a sample of respondents can render the results unrepresentative.

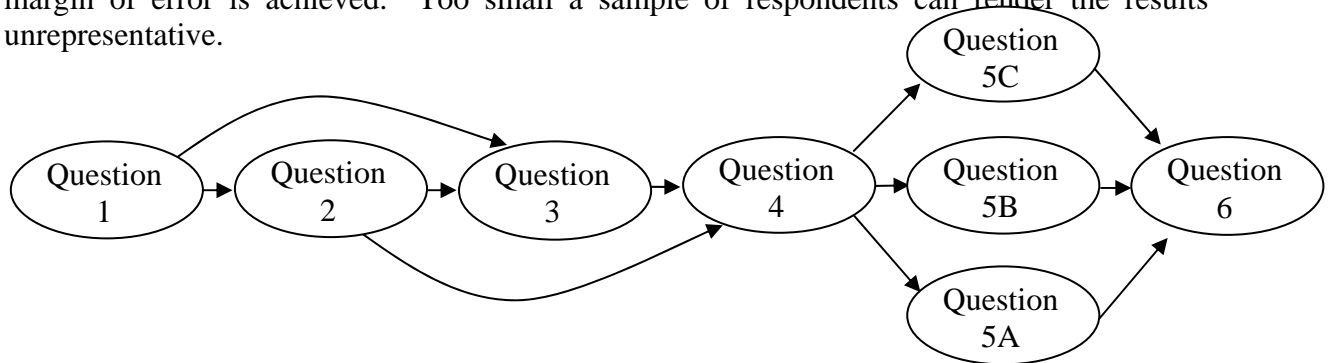


Figure 6: An example of skip logic directing a respondent through the survey

Analysis and Reporting

The value of the data collected from any survey is directly related to how well the results are analyzed documented and communicated. Surveys, being a quantitative method, can be analyzed using statistical methods. Any statistical analysis done for results of small unrepresentative sample sizes are of little to no use. All analysis should be done, interpreted and reported in the context of its sample size and confidence interval/margin of error. Analysis can be done by hand, but mostly using specialized software and in the case of online surveys, using the tools supplied by the online survey service.

The reporting of survey results typically takes a number of standard forms, such as:

- a. For multiple-choice and five-level range scale questions, the percentage of the total number of responses based on the total number of survey respondents should be reported.
- b. For all percentages reported, the actual number of respondents who selected a particular answer, and the total number of survey respondents, should be reported with the percentage. This is vital because if the numbers are too small then confidence level may not be high enough, making the results unreliable.
- c. All questions having open text fields should have their comments aggregated into common groups or themes of answers. If the number of answers/comments within a groups is small, they will be unrepresentative and of little value.
- d. Questions having built-in skip logic may need to have a connection made between the answers of the two linked questions.

Cross-tabulations between any two questions are useful. This is normally done after the initial results of the survey are seen. Relationships between the questions and answers can then be made. For example, the number of visitors identifying themselves as teachers in one question can be cross-tabulated with the responses to satisfaction level with a type of map or other atlas content in other questions. It is important to note that sample sizes must be considered when doing cross-tabulations. While the total sample size may be representative of a user group, a finer selection made through a cross-tabulation may not be.

Survey reports can contain many tables with numbers, so other forms of presentation are useful to draw attention to particular results. Column, bar, line and 3-dimensional graphs and pie charts may better communicate some results and could be experimented with. If surveys are repeated over time, the various graph types are very useful for reporting and communicating these time-based data.

Conclusion

Surveys, as research method, are an effective way to understand and obtain feedback from map users, as well as determine their characteristics and measure their satisfaction. They are flexible and easily customized for individual needs. When well written, designed, formatted and delivered, surveys provide quality, useful and user representative data and information. Surveys have an important place in a user centred design process and provide valuable information necessary for successful mapping products. The many kinds of surveys allow those interested in using this research method to select the one that is most suitable for their research needs, their map users and the resources available. The key is to know who, what where, when and why.

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