Surveys 101:
How to & How NOT to...

Or a brief look at a Survey Process

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Survey Overview

Definition of Survey

A method used to identify the opinions, feelings or attitudes of those targeted by asking carefully designed questions.

Why a Survey?

- When current process needs to be improved
  - In case qualitative data needs to be quantified
    - ex) Which is better? A 3-step approval or a 2-step approval process?
- When current process needs to be re-designed
  - In case direction on improvement needs to be set
    - ex) Do you think the security check at the front gate is really effective?
Importance of a Survey

- Quantitative data are important, but there are some concepts that can be difficult to measure (satisfaction, applicability).
- Relatively objective and accurate information can be quickly obtained by making use of a survey.

Types of Surveys

- Telephone, mail, 1:1 interview, focus group, on-line
## Use of a Survey in Six Sigma

<table>
<thead>
<tr>
<th>Phase</th>
<th>Purpose of Use</th>
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<tbody>
<tr>
<td><strong>Define</strong></td>
<td>Define</td>
</tr>
<tr>
<td></td>
<td>To study Voice of Customer (VOC) to select potential projects</td>
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<tr>
<td><strong>Measure</strong></td>
<td>Measure</td>
</tr>
<tr>
<td></td>
<td>To generate Y of selected projects</td>
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<tr>
<td><strong>Analyze</strong></td>
<td>Analyze</td>
</tr>
<tr>
<td></td>
<td>To confirm system design</td>
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<tr>
<td><strong>Analyze</strong></td>
<td>Design</td>
</tr>
<tr>
<td></td>
<td>To verify x’s that affect project Y</td>
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<tr>
<td><strong>Improve</strong></td>
<td>Optimize</td>
</tr>
<tr>
<td></td>
<td>To review feasibility of improvement results</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>Verify</td>
</tr>
<tr>
<td></td>
<td>To identify elements of follow-up management</td>
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</tbody>
</table>
Common Effects of a Poor Survey

- Low response rate
- Misinterpreted questions
- Inaccurate or biased conclusions
- Meaningless information
- No actions taken
- Actions taken on issues that are not important to customers
- Or wrong actions taken on issues important to customers

Frustrated customers
Is a Survey Necessary?

- Are we the right group to develop this?
- Do we know what’s important to our customers?
- Is the necessary info already available?
- Are my questions important enough to warrant?
- Am I truly interested in the results?
- Am I prepared to act on the results?
- Do we have the resources to conduct an effective survey?
Survey Procedure

- Purpose of Survey
- Survey Items
- Candidates
- Size
- Period of Time
- Survey Method
- Analysis Method
- Reporting Method
- Budget
- Schedule

- Design Questionnaire (Statements of Question and Answer)
- Pilot Survey
- Modify Questionnaire (Statements of Question and Answer)
- Execute Main Survey

- Decide how to collect and analyze data; then execute

- Document it in a report
  - ‘Utilize’ the result
Develop Survey Plan

- Clearly define these items

1. Purpose - What is the survey for? How is it going to be utilized?
2. Survey Items - What do we want to know? What are we going to investigate?
3. Candidates - Whom are we going to ask?
4. Size - How many people are we going to ask?
5. Period of Time - When are we going to do the survey?
6. Survey Method - How are we going to do the survey?
7. Analysis Method - How are we going to collect data and analyze them?
8. Reporting Method - How and to whom are we going to make a report?
9. Budget - How much will it cost?
10. Schedule - When are we going to finalize it?
Designing the Questionnaire

9 steps in developing survey questions

Step 1: **Determine what to ask** – clearly define what information should be attained through survey.

Step 2: **Determine how to gather information** – interview survey, telephone survey, on-line survey, etc.

Step 3: **Determine details for each item.**

- Do the respondents remember what information we need?
- Would the respondents tend not to give information or reveal their feelings in the survey?
- Review the necessity of each question.
- Review the necessity of repeating questions.
Step 4: **Determine question types** – whether to use open-ended or closed questions.

- **Open-ended question**: in order to hear voluntary response from respondents, this question type does not limit answers (free question and answer).

- **Closed type question**
  - **YES or NO**
  - **Multiple choices**: to limit answer by asking respondents to choose one of 4 or *x* answers.

- **Ranking** question: to indicate level of preference in the order of liking or disliking.
- **Rating** question: to indicate the level of intensity of respondents’ opinion.

- Combined comparative question: to select one pair after comparing each pair in provided paired groups.
Basic Principles and Cautions Needed in Developing Questionnaire

Step 5: Develop questions with following considerations

- **Do’s**
  - Make it simple
  - Keep it clear
  - Be specific
  - Use plain words/language
  - Use familiar sentences

- **Do Not’s**
  - Questions that
    - ask too many personal details
    - lead to a particular answer
    - are prejudiced
    - ask two (or more) things
    - assume something
    - are disagreeable
    - researcher already had or can get the data on their own
    - use professional jargon
    - use colloquial terms
    - use adverbs indicating certain numbers of degree/level
Step 6: **Determine number of questions and their order in survey.**

- Questions attracting interest, buy-in of respondents and making them comfortable.
- Consider linkage between questions.
- Carefully consider where to put serious and important questions.
- Put questions asking personal information of respondents in the last part.
Designing the Questionnaire (cont.)

Step 7: **Determine exterior design of survey**
- Design survey appearance, arrangement of questions, font, style, etc. in a way to boost response rate. (Make it professional looking.)

Step 8: **Pilot survey questionnaire**
- Based on pilot, modify survey questions to be more applicable

Step 9: **Complete survey questionnaire**
Determine Sampling

The survey sample population is as important as sample size.

Key Points:
- Clearly define the population of interest.
- Ensure that all members have an equal chance of being selected to the sample.
- Select samples on a random basis.
Sampling Methods

• Simple Random
• Stratified Sampling
• Cluster Sampling
• Systematic Sampling
• Purposive Sampling

Can be difficult to get unbiased and/or independent sample

• Census (complete population)
Sampling Size

• Consider cost of data collection, survey delivery and analysis

• If target population has very different characteristics or is very small (<60), you’ll want to sample a larger percentage or take a census

• There are sample size formulas which take into account confidence levels
Sampling Error

\[
Sampling \ Error = \pm Z_{\alpha/2} \times \sqrt{\frac{p(1-p)}{n}}
\]

p = probability drawn from samples, \( Z_{\alpha/2} \) = standardized value corresponding to significance level, 
\( n \) = sample size

Confidence level (1-\( \alpha \)) | \( \pm Z_{\alpha/2} \) | Confidence level (1-\( \alpha \)) | \( \pm Z_{\alpha/2} \)  
--- | --- | --- | ---  
90 % | 1.645 | 95 % | 1.96  
91 % | 1.695 | 96 % | 2.056  
92 % | 1.75 | 97 % | 2.17  
93 % | 1.81 | 98 % | 2.327  
94 % | 1.88 | 99 % | 2.575
Application, Example 1

Prior to a local election, a survey was conducted by randomly selecting 1,000 voters from the phone book to estimate voters' preference of candidates. In this survey, what is its sampling error within 95% confidence level and within 99% confidence level, respectively?

- Sampling error (95%) : \( 1.96 \times \sqrt{\frac{0.5(1-0.5)}{1000}} = 3.1\% \)
- Sampling error (99%) : \( 2.575 \times \sqrt{\frac{0.5(1-0.5)}{1000}} = 4.1\% \)

Explanation

- If you conduct same survey (with same sample size) involving same population 100 times, the results of 95 surveys would be within ±3.1% error from the average value of the survey stated above.
- In the same situation, the results of 99 surveys would be within ±4.1%.

※ For surveys like this, use \( p=0.50 \). This is conservative allowing for maximum error.
Size of Survey Sample

Size of sample \( n \geq p(1-p) \times (Z_{\alpha/2} \div d)^2 \), \( d \) : sampling error

- Example 2

A regional public health center tries to estimate the ratio of sight-challenged people in the region. In order to conduct a survey with 95% confidence level, what should the minimum sample size be? In addition, the ratio of the sight-challenged is thought to be around 30%. Sampling error set at \( \pm 5\% \).

- Size of sample : \( n \geq 0.3 \times 0.7 \times \left(\frac{1.96}{0.05}\right)^2 = 322.69 \)

- Explanation : minimum 323 samples are necessary in order to get an estimation with 95% confidence level
Size of Survey Sample (cont.)

- If information on probability value of population is not available (use p=0.5):

  - Size of sample: \( n \geq \frac{0.5 \times 0.5 \times (Z_{\alpha/2} \div d)^2}{d^2} \)

- Example 3

  - As stated in example 2, if it’s hard to estimate the ratio of the sight-challenged, what should be the proper size of sample? (sampling error = ±0.05)

    - Size of sample:
      \[ n > \frac{1}{4} \times \left( \frac{1.96}{0.05} \right)^2 = 384 \]
    
    - Explanation
      > 384 samples should ensure 95% confidence.
Errors

- **Sampling Error**
  - It’s the error that arises since estimation is done based on samples of the population.
  - Sampling error decreases as the size of sample increases.
  - It does not occur in a complete population (census) survey.

- **Non-Sampling error**
  - It is error arising in physical counting, summing up or analysis.
  - Response error, non-response error, sample selection error.
  - It occurs in both sampling survey and complete population survey.
Analyze Survey

- PGA (practical, graphical, analytical)

- Problems of existing training quality
- Detailed analysis on training hours/frequency
# Prepare Reports

<table>
<thead>
<tr>
<th>Cover</th>
<th>Text</th>
<th>Attachments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Title, researcher, issue date, etc.</td>
<td>Size of population including sample size</td>
</tr>
<tr>
<td></td>
<td>&lt;Summary&gt;</td>
<td>Survey schedule including response rate</td>
</tr>
<tr>
<td></td>
<td>1. Survey objectives</td>
<td>Summary of survey structure</td>
</tr>
<tr>
<td></td>
<td>2. Survey design</td>
<td>Key results of survey items and statistical results</td>
</tr>
<tr>
<td></td>
<td>2.1 Sampling method</td>
<td>Added value to survey results</td>
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<tr>
<td></td>
<td>2.2 Survey method</td>
<td>Copy of survey actually used</td>
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<td>2.3 Key survey details</td>
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<td>3. Key results</td>
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<tr>
<td></td>
<td>3.1 ……</td>
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<tr>
<td></td>
<td>3.2 ……</td>
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<tr>
<td></td>
<td>4. Conclusion and final comment</td>
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<tr>
<td></td>
<td>1. Questionnaire</td>
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<tr>
<td></td>
<td>2. Survey results by question item including usage of research results.</td>
<td></td>
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</tbody>
</table>
## 10 Key Points/Summary

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Clear and simple for everything</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>No unnecessary details</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>Absurd requests jeopardize efforts</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Create reliable survey from respondents’ standpoint</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Well structured questionnaire</td>
<td>10</td>
</tr>
</tbody>
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Some Sites Offering Free Tools

- Surveymonkey
- Kwiksurveys
- Surveytool
- Surveyplanet
- Surveygizmo
- Esurv.org
Team Activity

• Analyze survey in light of what was presented
• Identify problem areas
• Propose improvements
• Debrief