

# Introduction to Quantitative Questionnaire Study

*Lecture series: HOW TO GET A PH.D.: METHODS AND PRACTICAL HINTS*

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## Structure:


- 1) The art of asking good questions
- 2) How to draft and organize a questionnaire
- 3) Sampling process and data collection
- 4) Basic analysis methods



## Why is this important?


- Quantitative questionnaire survey is a good tool for analyzing human behavior and attitudes
- Facilitates the collection and analysis of large sample sizes
  - Enables sample segmentation for deeper understanding of the underlying phenomenon
  - Produces statistically significant results which can be generalized





## Why is this important?

- The design and the implementation of the study is vital!!
  - Pitfalls:
    - Poor questionnaire design → useless data
    - Poor implementation → inadequate sample size, undesirable sample distribution



## What type of info can be gathered:

- Info related to human behavior or population facts
- Info related to psychological states or attitudes
- Info related to knowledge





## 1) The art of asking good questions:

- You must ask the right questions
- Respondents must understand the questions
- Respondents must know the answers
- Respondents must be willing to answer the questions



## ABC for writing questions:

Before writing questions:

- A) Think through your research questions and objectives
- B) Prepare a plan for data analysis

After the preliminary set of questions:

- C) Ask yourself, in relation to A) and B) if each question on your list is necessary?
  - questions should be ultimately be used in analysis to make the cut!
  - “Nice to know” - data should not be gathered!





## A good question...

- 1) yields a truthful, accurate answer
- 2) asks for one answer on one dimension
- 3) is easy to understand
- 4) has mutually exclusive response options
- 5) produces variability in responses



## Ask one question at a time


- **Bad Question:**
  - “During the past week, have you used SMS and mobile data services?”
- **Better question:**
  - “During the past week, have you used:
    - a) SMS services?
    - b) Mobile data services? “





## Don't bias the respondent


- **Bad question:**
  - “During the past week, have you shopped in luxury stores such as Pertti Palmroth?”
- **Better question:**
  - “During the past week, have you shopped in the following stores:
    - a) Pertti Palmroth?
    - b) ... “



## Make sure the respondent knows the answer

- **Bad question:**
  - “How many text messages did you send last year?”
- **Corrective measures:**
  - Limit the time interval to more comprehensive one
  - Provide reasonable choice categories





## Is the respondent willing to answer?


- In the extreme: no responses
  - “Have you ever broken the law?”
- In general: problem with social desirability
  - Respondents will try to represent themselves in a way that reflects positively on them
  - As questions become more threatening, respondents are more likely to overstate or understate behavior, even when the best question wording is used



## Social desirability

- For socially desirable behavior, it is better to ask whether respondents have ever engaged in the behavior before asking whether they currently engage in the behavior
- For socially undesirable behavior, it is better to ask about current behavior first, rather than ask about their usual or typical behavior





## 2) How to draft and organize a questionnaire:

- Open vs. Closed questions
  - In general, closed questions are better
    - + easier for respondents, less coding, categorizing of answers
    - limits spontaneity, may lead to casual responses
- Questions involving choices
  - Dichotomous questions
    - Two choices (yes/no)
    - May limit the analysis
  - Response scales
    - Most common ones: 1-5, 1-7 (Likert scales)
      - “Strongly disagree, ... ,Strongly agree”
      - “Not at all important, ... ,Very important”
    - Associate greater response levels w/ greater numbers
  - Multiple choice questions
    - “Which appliances have you used today?”  
TV\_, Radio\_, Mobile phone\_, ...



## Ordering of Questions:

Cover letter/introduction before questions!

- purpose of the questionnaire, who is conducting the study, how will the data be used, (possible) incentives to participate

- 1) “Warm-up” questions
  - Easy to answer, non-threatening
- 2) Questions related to research objectives
  - Easier ones first
    - 1) Questions about behavior
    - 2) Questions about knowledge
    - 3) Questions about attitudes
- 3) Demographic questions
  - Age, gender, education, income, address, etc.



## APPENDIX A

### Survey Cover Letter, Insert, and Survey

Dear Consumer:

The Dairy Science Club at Kansas State University in cooperation with \*\*\*\*\* Supermarkets is conducting a research study with residents of Kansas City regarding their preferences for organic milk that is produced in Kansas by a small dairy. Your household was scientifically selected to be included in this study and we would be grateful for your help. We would like the person who is most responsible for food purchases in your home to complete the enclosed survey. This should take only about 5 or 6 minutes of your time. We want to assure you that the information you provide will be kept strictly confidential and used only for the purposes of this research.

Please return your completed survey to us in the enclosed postage paid envelope. The enclosed money is a token of our appreciation for your help. We would ask that you return the survey by August 1.

Sincerely,

Kansas State Dairy Science Club

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## Response rate

- **Varies considerably**
  - In general ~30%
  - Even 20% can be considered adequate
  - May be as high as 80%
- **Ways to enhance:**
  - Good cover letter
  - Good incentives
  - Follow-up
    - OBS: in case of follow-up study, non-response bias must be checked.
    - Chi-square –test for the two response groups


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CONDUCT A PILOT TEST BEFORE THE  
ACTUAL STUDY!!!

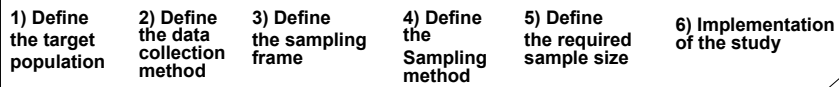


### 3) Sampling process and data collection

- The objective of most questionnaire studies is to gain information related to a population
  - Population = a set of entities concerning which statistical inferences are to be drawn
  - Sample = a subject chosen from a population for investigation



# Sampling process

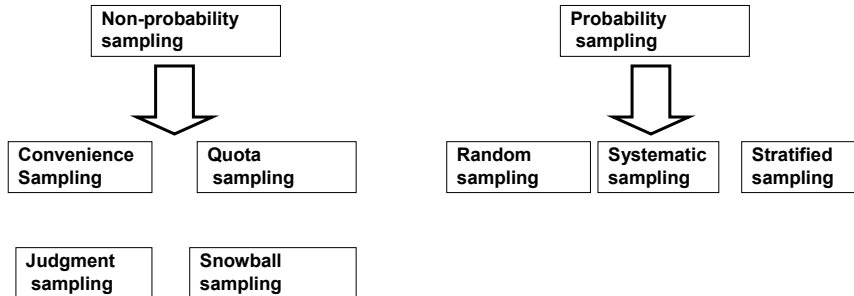


# Sample size

- Depends on the purpose of the study:
  - Market potential (500 →)
  - Product test (300 – 500)
  - Advertising research (200 – 500)
  - Attitudes, behavior (100 to thousands, depending on the population definition )



# Sampling methods



## 4) Basic analysis methods

Process of the analysis:

- 1) Validate the responses
- 2) Code the responses
- 3) Input the data into a database
- 4) Check the data
- 5) Statistical analysis



# Descriptive analysis

- Frequency distributions
  - Basic statistics:
    - Mean
    - Mode
    - Variance
    - Skewness

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	Statistics			
	N		Mean	Std. Deviation
	Valid	Missing		
Mielestäni palvelu on hyödyllinen	113	0	5,51	1,507
Palvelun avulla saamani tiedot lisäävät mahdollisuuttani osallistua keskusteluihin	112	1	5,08	1,699
Selaimen asentaminen oli mielestäni helppoa	111	2	5,35	1,797
Palvelu oli helppokäyttöinen	110	3	5,36	1,595
Sisällön asentaminen oli mielestäni helppoa	112	1	5,17	1,883
Olen tyytyväinen palvelun käyttöön	111	2	5,23	1,599
Palvelun käyttö tekee pelistä paljon mielenkiintoisemman	111	2	4,76	1,738
Suunnittelen käyttäväni vastaavaa palvelua tulevaisuudessa	112	1	5,56	1,632
Pidän palvelun käyttämisestä	112	1	5,23	1,507
Palvelun käyttäminen oli mielestäni mielenkiintoista	111	2	5,64	1,432
Omaan käyttöni vaikutti se, että haomasin muidenkin katsojien käyttävän palvelua	112	1	3,35	2,470
Palvelun käyttäminen oli mielestäni hauskaa	109	4	5,26	1,474
Käyttöni vaikutti se, että Kärrppä-organisaatio suosittelee palvelun käyttöä	110	3	3,72	2,218
Palvelun käyttäminen oli mielestäni jännittävää	110	3	4,91	1,612
Palvelun avulla saan tietoa pelistä nopeasti	109	4	5,19	1,601
Sain palvelun avulla paremman kokonais kuvan ottelakerroksesta	110	3	4,81	1,899
Palvelun käyttö oli hauskaa	109	4	5,46	1,525

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# Comparison of groups

- t-test
  - Compares the means of two groups (e.g. men and women)
- F-test
  - Compares the variances of two groups
- A chi-square test
  - any statistical hypothesis test in which the test statistic has a chi-square distribution when the null hypothesis is true
  - Specifically, a chi-square test for independence evaluates statistically significant differences between proportions for two or more groups.
- One-way ANOVA (Analysis of Variance)
  - Used to test for differences among three or more independent groups



## Example t-test for equality of means

	You were using	N	Mean	Std. Deviation
In my opinion, the system is useful	A borrowed mobile phone	167	4,98	1,366
	Your own mobile phone	45	4,60	1,421
Using the system was beneficial to me	A borrowed mobile phone	161	4,11	1,525
	Your own mobile phone	45	3,38	1,723
I am going to use a similar system also in the future	A borrowed mobile phone	144	4,77	1,509
	Your own mobile phone	44	5,05	1,765
Using the system was clear	A borrowed mobile phone	167	4,00	1,501
	Your own mobile phone	46	3,78	1,812
The system was easy to use	A borrowed mobile phone	166	4,04	1,629
	Your own mobile phone	49	5,53	1,815
I am satisfied with using the system	A borrowed mobile phone	164	4,24	1,347
	Your own mobile phone	42	3,81	1,435



		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
In my opinion, the system is useful	Equal variances assumed	.103	.749	1.625	210	.106	.376	.231	-.080	.832
	Equal variances not assumed			1.589	67.556	.117	.376	.237	-.096	.848
Using the system was beneficial to me	Equal variances assumed	2.263	.134	2.773	204	.006	.734	.265	.212	1.256
	Equal variances not assumed			2.589	64.528	.012	.734	.284	.168	1.300
I am going to use a similar system also in the future	Equal variances assumed	.932	.335	-1.014	186	.312	-.275	.271	-.809	.259
	Equal variances not assumed			-.933	63.397	.354	-.275	.294	-.863	.313
Using the system was clear	Equal variances assumed	4.740	.031	.830	211	.458	.217	.262	-.299	.734
	Equal variances not assumed			.746	62.999	.458	.217	.291	-.365	.800

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## Dependency between variables

- Correlation
  - a measure of the relation between two or more variables
  - Spearman, Pearson, Canonic, ....
  - Values between -1, ..., 1
- Regression analysis
  - Dependency between an independent and explanatory variables
  - Linear, logistic
  - Regression equation depicts the causal relationships between the variables
    - Statistical measures: R2(model fit), beta coefficients (dependency measures)
    - Possible problems: Multicollinearity, Autocorrelation

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## Example regression tables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,552 <sup>a</sup>	,305	,290	1,260

a. Predictors: (Constant), REGR factor score 3 for analysis 1, REGR factor score 2 for analysis 1, REGR factor score 1 for analysis 1

Coefficients<sup>a</sup>

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5,465	,105		52,043	,000
	REGR factor score 1 for analysis 1	,460	,137	,308	3,360	,001
	REGR factor score 2 for analysis 1	-,005	,123	-,003	-,042	,966
	REGR factor score 3 for analysis 1	,476	,128	,320	3,726	,000

a. Dependent Variable: Voisitteko käyttää vastaavia mobiilipalveluita myös tulevaisuudessa?



## Factor analysis

- Factor analysis is a statistical data reduction technique used to explain variability among observed random variables in terms of fewer unobserved random variables called factors.
- Two types:
  - Exploratory factor analysis (EFA) could be described as orderly simplification of interrelated measures. EFA, traditionally, has been used to explore the possible underlying factor structure of a set of observed variables without imposing a preconceived structure on the outcome
  - Confirmatory factor analysis (CFA) is a statistical technique used to verify the factor structure of a set of observed variables. CFA allows the researcher to test the hypothesis that a relationship between observed variables and their underlying latent constructs exists.



• Example: Structure matrix

	1	2	Component		
			3	4	5
Olen tyytyväinen laitteen tarjoamien palveluiden tasoon ja laitteen toimivuuteen	.849	.032	.130	.271	-.241
Käyttö vastasi käsitystäni hyvästä mobiilipalvelusta	.832	.056	.257	.356	-.532
Käyttö tuntuu miellyttävän haasteelliselta	.625	.105	.141	.325	-.402
Mobiilimainosten sisältämä informaatio oli tarpeellista	.601	.206	.070	.553	-.146
Internet	.077	.926	.122	.192	-.082
Tietokoneet ja ohjelmistot	-.011	.898	.121	.207	-.101
Matkapuhelin ja sen palvelut	.080	.798	.248	.056	-.183
Koen olevani taitava mobiilipalveluiden käyttäjä	.033	.772	.047	.364	-.366
Sain ennen käyttöä kattavan opastuksen palveluiden käytössä	.214	.081	.945	.088	-.190
Sain ennen käyttöä kattavan opastuksen päätelaitteen käytössä	.133	.096	.944	-.017	-.142
Ongelmatilanteissa olisin tiennynt miten toimia ja mistä saada apua	.002	.267	.603	.205	-.259
Laitte helpotti elämäni	.279	.167	.059	.842	-.181
Uskon, että päätelaitteesta ja sen tarjoamista palveluista olisi hyötyä minulle tavallisessa arjessa	.182	.203	.134	.821	-.287
Laitte helpotti asiointia kaupungilla	.404	.156	.112	.803	-.182
Laitteen avulla sain hyödyllistä tietoa	.341	.194	.071	.802	-.327
Käyttö liittymä oli selkeä ja helppotajuinen	.182	.229	.196	.299	-.856
Palveluvalikossa liikuminen oli miellyttävää	.474	.019	.298	.315	-.773
Käyttö oli vaivatonta ja helppoa	.496	.274	.207	.132	-.754
Palvelut olivat miellyttäviä käyttää	.689	.108	.300	.468	-.698

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## Recap: Steps in conducting a quantitative questionnaire study

- Decide what information is needed
- Design the questions carefully
- Pilot test the questionnaire
- Plan the implementation carefully
  - Population, sample size
- Choose the relevant analysis SW and statistics
- Report your findings and submit to journals!

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