Research methods and Design

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Lecture 1

Research Methods & Design

Definitions

What is Research?

The systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions.

What are methods?

A particular procedure for accomplishing or approaching something, esp. a systematic or established one.

What is design?

It is a logical structure of the inquiry (research)

Types Of Research

Descriptive

Explanatory

Ethnographic

Experimental

Action research

Case study

Longitudinal vs. cross-sectional

Quantitative vs. Qualitative

Quantitative: you collect data through some tools and you quantify them

Qualitative: you collect data through some tools and you explain and discuss, argue, hypothesis and philosophy them.

Classical Report of Research

Abstract

Introduction

Literature Review

Methods

Data Analysis

Results

Discussion

Conclusion

Bibliography

Appendices

Lecture 2

Classical Report of Research

Classical Report of Research

Abstract

Introduction

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Abstract

The abstract is a short (about 100-500 word) summary of the entire paper. It should include: goals and objectives, results, and conclusions. It is usually one of the last parts of the paper to be written.

Introduction

The introduction describes the focus and purpose of the paper you are writing. It gives an overview of what is contained in the paper's various sections.

Literature Review

A literature review is a search and evaluation of the available literature in your given subject or chosen topic area. It documents the state of the art with respect to the subject or topic you are writing about. It also shows your readers that you have an in-depth grasp of your subject; and that you understand where your own research fits into and adds to an existing body of agreed knowledge.

Methodology

This section describes what you did, how you did it, gives strategies, sample calculations, diagrams and circuits, and descriptions of equipment. The goal here is to give the reader sufficient information to be able to repeat your work if desired.

Data Analysis

Data analysis is the most crucial part of any research. It summarizes collected data. It involves the interpretation of data gathered through the use of analytical and logical reasoning to determine patterns, relationships or trends.

Results

This section is where you prove your point with the data. Give graphs and tables of costs, profits, whatever your data is. Also give some description or guide to help the reader recognize your important points.

Discussion

The purpose of the discussion is to interpret and describe the significance of your findings in light of what was already known about the research problem being investigated, and to explain any new understanding or insights about the problem after you've taken the findings into consideration.

Conclusion

Here you state what your learned or proved. What are the "take home messages" or major accomplishments of this work? You may also describe interesting observations, new questions, and future work here.

Bibliography

A list of the references you used in the work & writing the paper.

Appendices

An appendix contains supplementary material that is not an essential part of the text itself but which may be helpful in providing a more comprehensive understanding of the research problem or it is information that is too cumbersome to be included in the body of the paper. A separate appendix should be used for each distinct topic or set of data and always have a title descriptive of its contents.

Lecture 3

Quantitative Research I

Quantitative research methods are research methods dealing with numbers and anything that is measurable in a systematic way of investigation of phenomena and their relationships. It is used to answer questions on relationships within measurable variables with an intention to explain, predict and control a phenomena.

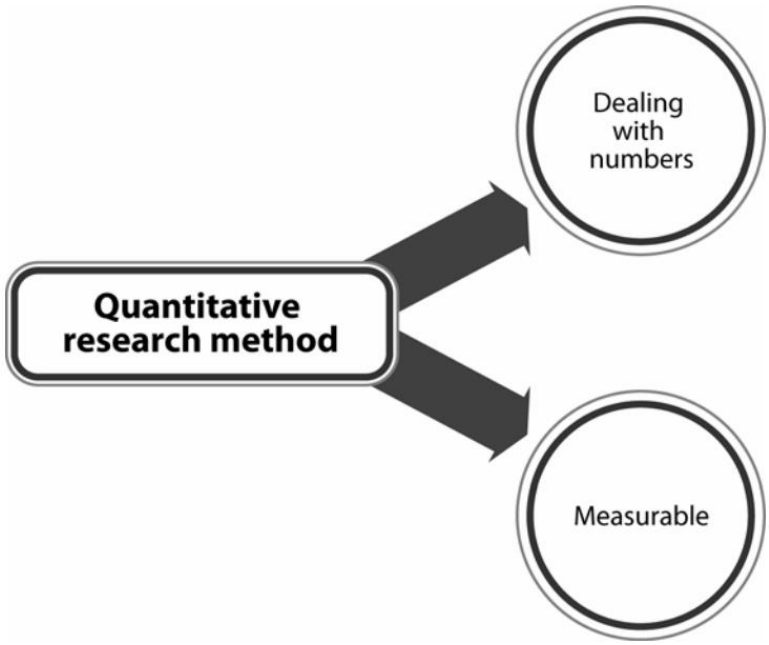


Figure 8.1: Description of Quantitative Method

Quantitative method typically begins with data collection based on a hypothesis or theory and it is followed with application of descriptive or inferential statistics. Surveys and observations are some examples that are widely used with statistical association.

Descriptive Research

Quantitative research methods fall under the broad heading of descriptive research. This type of research corresponds to identifying the characteristics of an observed phenomenon, or exploring correlations between two or more entities.

Observation Studies

Observation studies are involved in both quantitative and qualitative research methods. However, in quantitative methods, the focus of observation studies is on a particular factor of behaviour and it is quantified. In this type of design, a researcher will try to maintain objectivity in assessing the behaviour being studied.

No.	Strategies	Description
1	Using rating scale	Using rating scale (e.g. Likert Scale) to evaluate the behaviour in terms of specific factor or reasons.
2	Defining the behaviour	Defining the behaviour being studied in a precise and solid manner so that the behaviour is easily recognised during its occurence.
3	Rated by two or more individuals	Having two or more individual ratings the same behaviour independently, without the knowledge of one another's ratings.
4	Clustering the observation periods	Divide observation period into small clusters and then record whether the behaviour does or does not occur during each cluster or segment. Time period may be assigned with some intervals depending on the studies requirement.
5	Train the rater(s)	Train the rater(s) of the behaviour to follow some specific requirement until consistent ratings are obtained during any of the behaviour occurences.

Observation

A type of data collection that involves the watching, inspecting, and taking note of behaviors and the environment.

Observational Situations

SITUATION:

People Watching People

EXAMPLE:

Observers stationed in supermarkets watch consumers check out their groceries. The purpose is to see how much “prepared” vs. “fresh” food is purchased.

Observational Situations

SITUATION:

People Watching Phenomena

EXAMPLE:

Observer stationed at the fair counting visitors moving in various directions.

Lecture 4

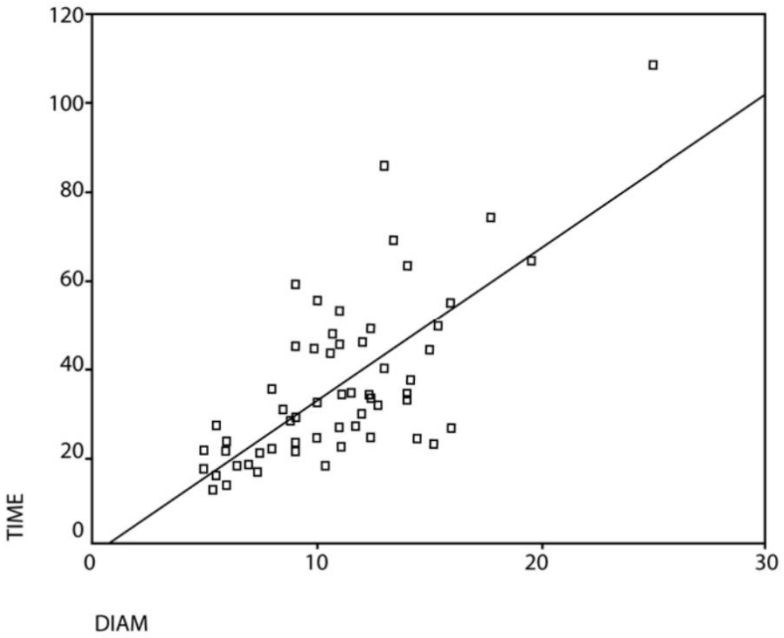
Quantitative Research II

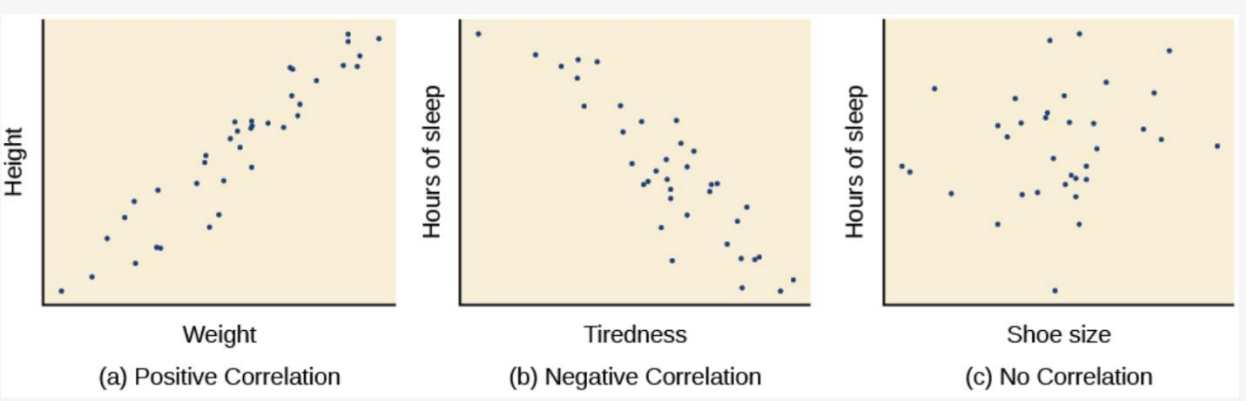
Correlational Research

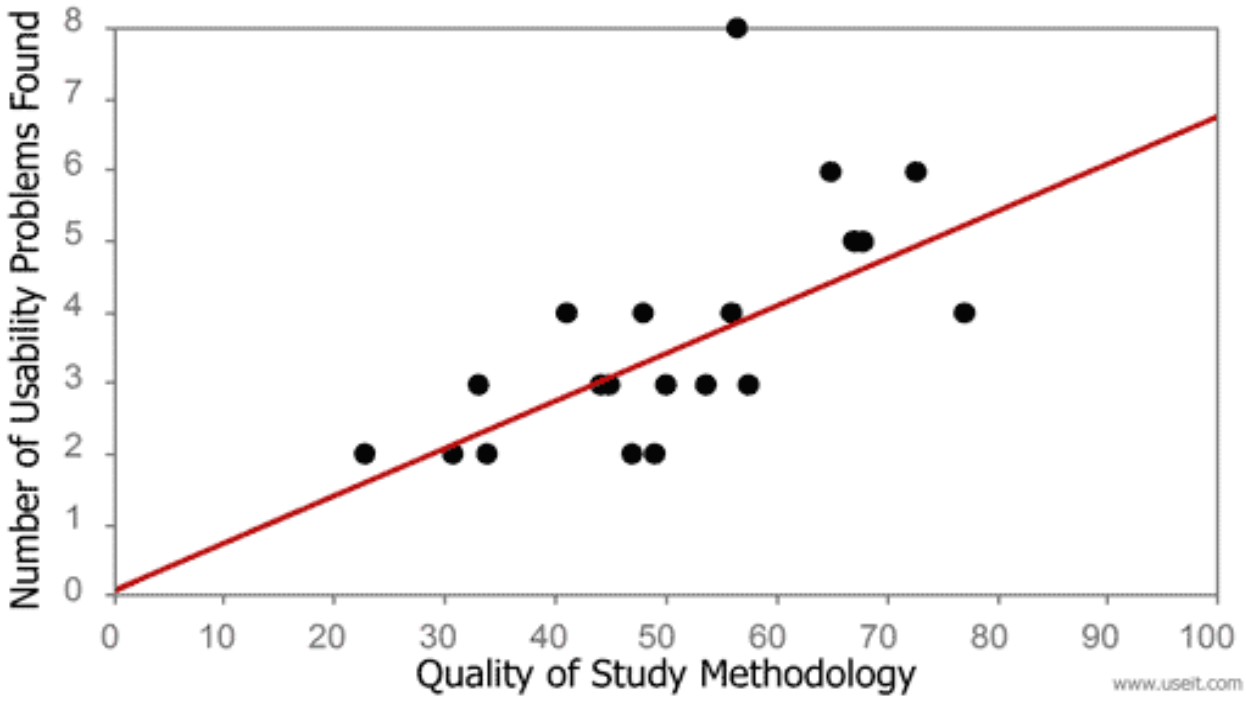
Correlational research or studies examine differences of characteristics or variables of two or more entities. A correlation exists when one variable increases

or decreases correspondingly with the other variable. A researcher will gather data about two or more variables in a particular group.

These data are numbers that reflect measurement of the characteristics of research questions such as test scores, baud rate, device jitter or network performance using 2 different transmission mediums. For example, as storage becomes larger, it is easier to manage databases. In other words, there is a correlation between storage size and database capacity. Correlational results can be represented using various means of visualisation.




Height
Weight
(a) Positive Correlation
Hours of sleep
Tiredness
(b) Negative Correlation
Hours of sleep
Shoe size
(c) No Correlation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1
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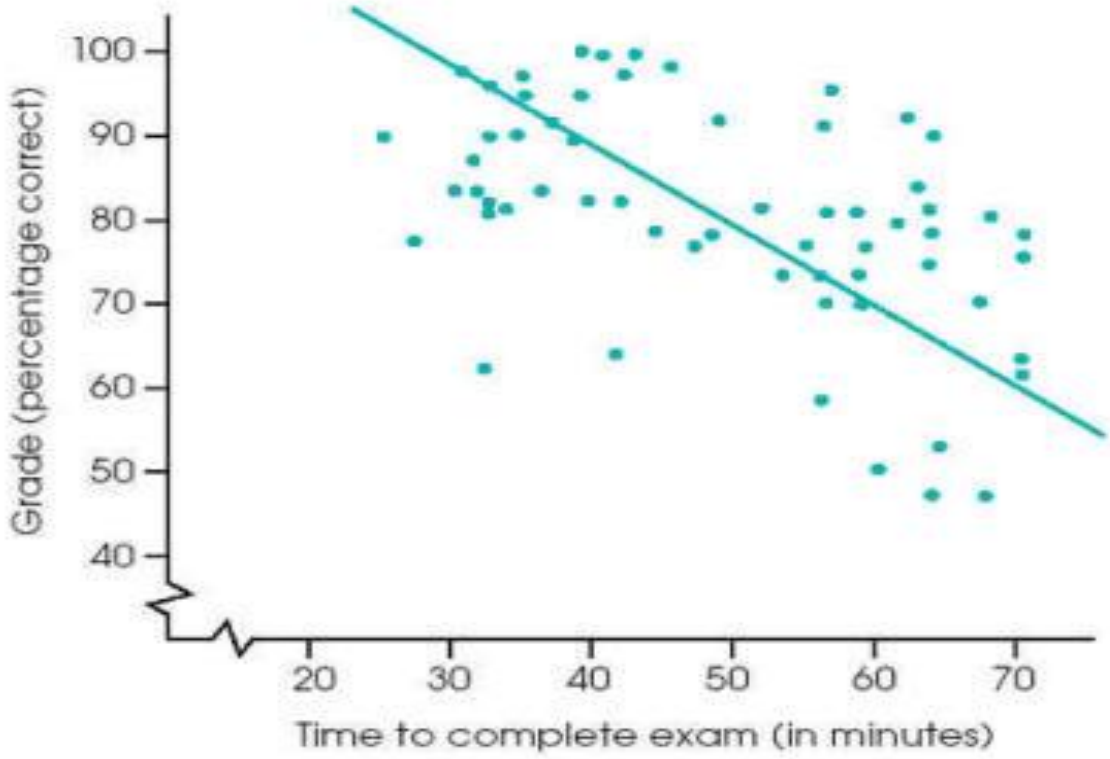
Quality of Study Methodology
www.useit.com



Lecture 5

Quantitative Research III

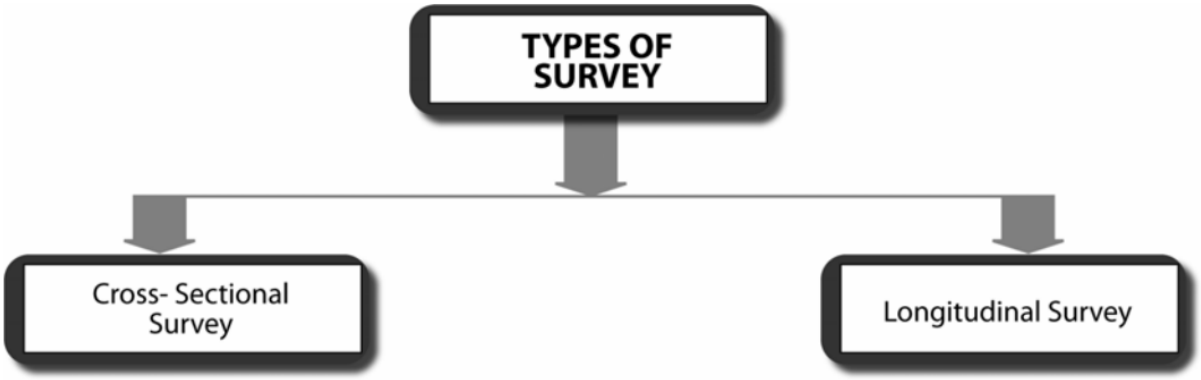
Survey Research

Survey research is as a study on large and small populations by selecting samples chosen from the desired population and to discover relative incidence, distribution and interrelations.

The ultimate goal of survey research is to learn about a large population by surveying a sample of the population; thus we may also call it descriptive survey or normative survey. In this method, a researcher poses a series of questions to

the respondents, summarises their responses in percentages, frequency distribution and some other statistical approaches.

Survey research typically employs face-to-face interviews, telephone interviews or the common approach using questionnaires. Basically, information is acquired by asking respondents questions related to the phenomenon that is studied.



Normally, the type of survey method used depends on the scope of the research work. If the research needs a pool of opinions and practices, a cross-sectional survey would be appropriate. On the other hand, if a researcher specifies the objective as to compare differences in opinion and practices over time, a longitudinal survey would be the ideal method.

In cross-sectional survey, a researcher collects information from a sample drawn from a population. It involves collecting data at one point of time. The period of data collection can vary and it depends on the study weightage. For example: You administer a questionnaire on broadband usage among 500 university students for information dissemination using research network.

The university students may comprise 20-23 year old students. The students could be males and females from different course backgrounds in a particular

university. In this case, the data you obtain is derived from a cross-section of the population at one point of time.

In longitudinal surveys, data collection is done at different points of time to observe the changes. Two common types of longitudinal surveys are Cohort Studies and Panel Studies.

(a) Cohort Studies

In Cohort Studies, a researcher specifies population (e.g. IT subordinates in an organisation dealing with security audit and penetration tests) and lists the names of all members of this population. At each data collection point, a researcher will select a sample of respondents from the population of IT subordinates doing security audit and penetration testing and administer a questionnaire.

This is then repeated at another point of time. Although the population remains the same, different respondents are sampled each time. The researchers' aim here is to see if there are changes in perceptions or trends that occur in the study.

(b) Panel Studies

In Panel Studies, a researcher can identify a sample from the beginning and follow the respondents over a specified period of time to observe changes in specific respondents and highlight the reasons why these respondents have changed.