Metode Penelitian

Deciding the Methodology

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Contents

- Paradigm
- Positivistic Paradigm
- Phenomenological Paradigm
- Mix Methodologies

Dealing with conceptual issues

- Deciding which methodology to use can be made easier when you realize that your choice is limited by a number of factors as follows:
  - The nature of your *research problem* and the *paradigm* you have adopted
  - Some methodologies are more suitable for a *positivistic paradigm* and others for a *phenomenological paradigm*
  - You may decide to *mix methodologies*

Research paradigms (1)

- **The term *paradigm* refers to:**
  - The progress of scientific practice based on people's philosophies and assumptions about the world and the nature of knowledge, in this context, about how research should be conducted
- **Paradigms:**
  - Universally recognized as scientific achievements that for a time provide model problems and solutions to a community of practitioners
  - Offer a framework comprising an accepted set of theories, methods and ways of defining data

Research paradigms (2)

- Unfortunately, the term *paradigm* is used quite loosely in academic research and can mean different things to different people
- To help clarify the uncertainties, Morgan (1979) suggests that the term can be used at 3 different levels:
  - At the philosophical level, where it is used to reflect basic beliefs about the world
  - At the social level, where it is used to provide guidelines about how the researcher should conduct his or her endeavors
  - At the technical level, where it is used to specify the methods and techniques that ideally should be adopted when conducting research
- Therefore, your basic beliefs about the world will be reflected in the way you:
  - Design your research
  - How you collect and analyze your data
  - Write your thesis

Alternative terms for the main research paradigms

Positivistic paradigm	*Phenomenological paradigm*
Quantitative	Qualitative
Objectivist	Subjectivist
Scientific	Humanistic
Experimentalist	Interpretivist
Traditionalist	

Assumptions of two main paradigms (1)

Assumption	*Question*	*Quantitative*	*Qualitative*
Ontological	What is the nature of reality?	Reality is objective and singular, apart from the researcher	Reality is subjective and multiple as seen by participants in a study
Epistemological	What is the relationship of the researcher to that being researched?	Researcher is independent from that being researched	Researcher interacts with that being researched
Axiological	What is the role of research?	Value-free and unbiased	Value-laden and biased
Rhetorical	What is the language of research?	• Formal • Based on set of definitions • Impersonal voice • Use of accepted quantitative words	• Informal • Evolving decisions • Personal voice • Use of accepted qualitative words

Assumptions of two main paradigms (2)

Assumption	*Question*	*Quantitative*	*Qualitative*
Methodological	What is the process of research?	• Deductive process • Cause and effect • Static design – categories isolated before study • Context-free • Generalizations leading to prediction, explanation and understanding • Accurate and reliable through validity and reliability	• Inductive process • Mutual simultaneous shaping of factors • Emerging design – categories identified during research process • Context-bound • Patterns, theories developed for understanding • Accurate and reliable through verification

Paradigms and methodology (1)

- Some writers use the words *methodology* and *methods* interchangeably. Reasons:
  - To make them sound more impressive
  - Method is so closely interwoven with the assumptions and philosophies of the paradigm that it permeates the entire research design (so similar to methodology)
- If they are distinguished:
  - *Methodology* refers to the overall approach to the research process, from the theoretical underpinning to the collection and analysis of the data (i.e., *why you collected certain data, what data you collected, from where you collected it, how you collected it, and how you will analyze it*)
  - *Methods* refer only to the various means by which data can be collected and/or analyzed

Paradigms and methodology (2)

- The paradigm you adopt has great importance for the methodology you use. Table below shows the main features of the two paradigms:

Positivistic paradigm	***Phenomenological paradigm***
Tends to produce quantitative data	Tends to produce qualitative data
Uses large samples	Uses small samples
Concerned with hypothesis testing	Concerned with generating theories
Data is highly specific and precise	Data is rich and subjective
The location is artificial	The location is natural
Reliability is high	Reliability is low
Validity is low	Validity is high
Generalizes from sample to population	Generalizes from one setting to another

Types of research methodology

Positivistic methodologies	***Phenomenological methodologies***
Cross-sectional studies	Action research
Experimental studies	Case studies
Longitudinal studies	Ethnography
Surveys	Feminist perspective
	Grounded theory
	Hermeneutics
	Participative enquiry

Positivistic methodologies: Cross sectional studies

- Designed to obtain information on variables in different contexts, but at the same time
- Normally, different organizations or groups of people are selected and a study is conducted to determine how factors differ
- Conducted where there are constraints of time or resources
  - Data is collected just once, over a short period of time, before it is analyzed and reported
  - Often used to investigate economic characteristics of large number of people or organizations
- Some problems that may exist:
  - How to select a representative sample
  - How to isolate the phenomena from all other factors that may influence any correlation
  - Do not explain why a correlation exists, only that it does or does not

Positivistic methodologies: Experimental studies

- Experiments are conducted either in a laboratory or in a natural setting in a systematic way
  - Permit causal relationships to be identified
  - The aim is to manipulate the independent variable in order to observe the effect on the dependent variable
- Some problems that may exist:
  - Laboratory settings do not reflect the actual environment
  - Strong control may not be able to performed over *confounding* and *extraneous* variables
    - A confounding variable is one that obscures the effects of another
    - An extraneous variable is any variable other than the independent variable that might have an effect on the dependent variable

Positivistic methodologies: Longitudinal studies

- It is often, but not always, associated with a positivist methodology
- It is a study, over time, of a variable of group of subjects
  - The aim is to research the dynamics of the problem by investigating the same situation or people several times (or continuously) over the period in which the problem runs its course (over many years)
  - Repeated observations are taken with a view to revealing the relative stability of the phenomena user study (some will have changed considerably, others will show little sign or change)
  - Such studies allow the researcher to examine change processes within a social, economic and political context (it should be possible to suggest likely explanations from an examination of the process of change and the patterns that emerge)
- It can be argued that a longitudinal study can be based primarily on a qualitative approach
  - A distinctive feature of this approach is that there is a chain of studies
  - Each link in the chain is an examination or re-examination of a related group or social process
  - The early studies in the chain are mainly exploratory, but as the chain of studies progress, grounded theory is generated

Positivistic methodologies: Surveys

- A *sample* of subjects is drawn from a *population* and studied to make inferences about the population
  - If the sample is representative, it is possible to use statistical techniques to demonstrate the likelihood that the characteristics of the sample will also be found in the population (it may be possible to generalize from the findings)
  - It is important to ensure that your sample is not *biased* and representative of the population from which it is drawn
- There are two types of survey
  - A descriptive survey is concerned with identifying and counting the frequency of a specific population, either at one point in time or at various times comparison
  - Analytical survey where the intention is to determine whether there is any relationship between different variables (need to be familiar with the theoretical context so that you can identify the independent, dependent and extraneous variables)

Phenomenological methodologies: Action research

- It is an approach which assumes that the social world is constantly changing, and the researcher and the research itself are part of this change
- The term was coined by Lewin (1946) who saw the process of enquiry as forming a cycle of planning, acting, observing and reflecting
  - The planning stage is concerned with identifying an objective, that is intended to achieve, and how this may be done
  - The first phase of action is implemented and its effects observed and reflected on before modifying the overall plan, if appropriate
- It is a type of applied research designed to find an effective way bringing about a conscious change is a partly controlled environment
  - The main aim of action research is to enter into a situation, attempt to bring about change and to monitor the results
  - The close collaboration required between the researcher and the client poses a number of problems

Phenomenological methodologies: Case studies

- An extensive examination of a single instance of a phenomenon of interest and is an example of a phenomenological methodology
- Case studies are often described as exploratory research, used in areas where there are few theories or a deficient body of knowledge
  - A unit of analysis is the kind of case to which the variables or phenomena under study and the research problem refer, and about which data is collected and analyzed
  - A case study approach implies a single unit of analysis, such as a company or a group of workers, an event, a process or even an individual
- Yin (1994) identifies the following characteristics of case study research:
  - The research aims not only to explore certain phenomena, but to understand them within a particular context
  - The research does not commence with a set of questions and notions about limits within which the study will take place
  - The research uses multiple methods (e.g., documentary analysis, interviews, and observation) for collecting data that may be both quantitative and qualitative

Phenomenological methodologies: Ethnography

- Ethnography is a phenomenological methodology that stems from anthropology
  - Anthropology is the study of people, especially of their societies and customs
- Ethnography is an approach in which the researcher uses socially acquired and shared knowledge to understand the observed patterns of human activity
  - The main method of collecting data is *participant observation* where the researcher becomes a full working member of the group being studied
  - The aim of methodology is to be able to interpret the social world in the way that the members of that particular world do

Phenomenological methodologies: Grounded theory

- Grounded theory is one of the interpretive methods that share the common philosophy of phenomenology; that is, methods that are used to describe the world of the person or persons under study
  - It uses a systematic set of procedures to develop an inductively derived grounded theory about phenomenon
  - The findings of the research constitute a theoretical formulation of the reality under investigation, rather than consisting of a set of numbers, or a group of loosely related themes
  - The theory is generated by the observation rather than being decided before the study
- Theoretical framework is developed by the researcher alternating between inductive and deductive thought
  - First, researcher inductively gains information that is apparent in the data collected
  - Next, a deductive approach is used that allows the researcher to turn a way from the data and think rationally about the missing information and form conclusions based on logic
  - When conclusions have been drawn, the researcher reverts to an inductive approach and tests these tentative hypotheses with existing or new data
  - By returning to the data, the deducted suggestions can be supported, refuted or modified

Phenomenological methodologies: Hermeneutics

- Hermeneutics is a phenomenological methodology that was originally concerned with interpreting ancient scriptures
  - Essentially, this methodology involves paying particular attention to the historical and social context an action when interpreting a text
  - It is assumed that there is a relationship between the direct conscious description of experience and the underlying dynamics or structures
  - Thus, hermeneutics process involves interpreting the meaning of a text through continual reference to its context
- Although hermeneutics is not a widely used methodology is computer science, its unusual approach illustrates the importance of being flexible in classifying methodologies and methods and the value of creativity

Phenomenological methodologies: Participative enquiry

- Participative enquiry is a phenomenological methodology and is about research with people rather than on people
  - The participants in this research study are involved as fully as possible in the research that is conducted in their own group or organization
  - The research may even be initiated by a member of the group
  - Participants are involved in the data gathering and analysis (one reason for this is that such involvement will produce better quality data)

Mixing methodologies

- You will need to make a choice about the paradigm you will adopt at an early stage in your research
  - Once this is established, it is not unusual in research to take a mixture of approaches, particularly in the methods of collecting and analyzing the data
  - This allows you to take a broader, and often complimentary, view of the research problem
  - What is central, is how well you pull the data together to make sense of it

Triangulation

- The use of different research approaches, methods and techniques in the same study is known as triangulation and can overcome the potential bias and sterility of a single-method approach
- Denzin (1970) defined triangulation as the combination of methodologies in the study of the same phenomenon
- Four types of triangulation can be identified:
  - Data triangulation, where data is collected at different times or from different resources in the study of a phenomenon
  - Investigator triangulation, where different researchers independently collect data on the same phenomenon and compare the results
  - Methodological triangulation, where both quantitative and qualitative methods of data collection are used
  - Triangulation of theories, where a theory is taken from one discipline and used to explain a phenomenon in another discipline

Methodology:
Deciding which information is relevant to your research project

- information concerning theory
- information concerning methods
- information concerning data analysis

Methodology: Models

- easier to comprehend or manipulate than the real thing
- mathematical models are popular
- examples: ISO OSI and ANSI/SPARC
- architecture of a system is often proposed by using a model

Methodology: Languages

- type of language depends on your goal
- not presented primarily to propose a new language, but rather to clarify some aspect of your research
- often introduced with the same intentions as models (e.g., New type of database)
- syntax is usually described formally
- semantics described informally

Methodology: Mathematical proof

- is the ultimate argument
- if the proof is correct it cannot be disputed
- mathematical proofs are, however, based on assumptions
- sometimes assumptions are expressed as axioms
- sometimes assumptions are tacit

Methodology: Prototypes

- can demonstrate that a new model can indeed be implemented
- can serve as a vehicle for experimentation
- construction can provide new insights into the model
- implementation of a complex system can serve as the basis of a case study

Methodology: Algorithms

- a series of step-by-step instructions that produces a solution to a problem
- purpose might be to find a new algorithm for some problem
- useful to express some ideas as program fragments
- algorithms have to be good - better than any previously proposed algorithm

Methodology: Surveys

- conducted using questionnaires
- not only applicable to humans
- test theories put forward about the surveyed population

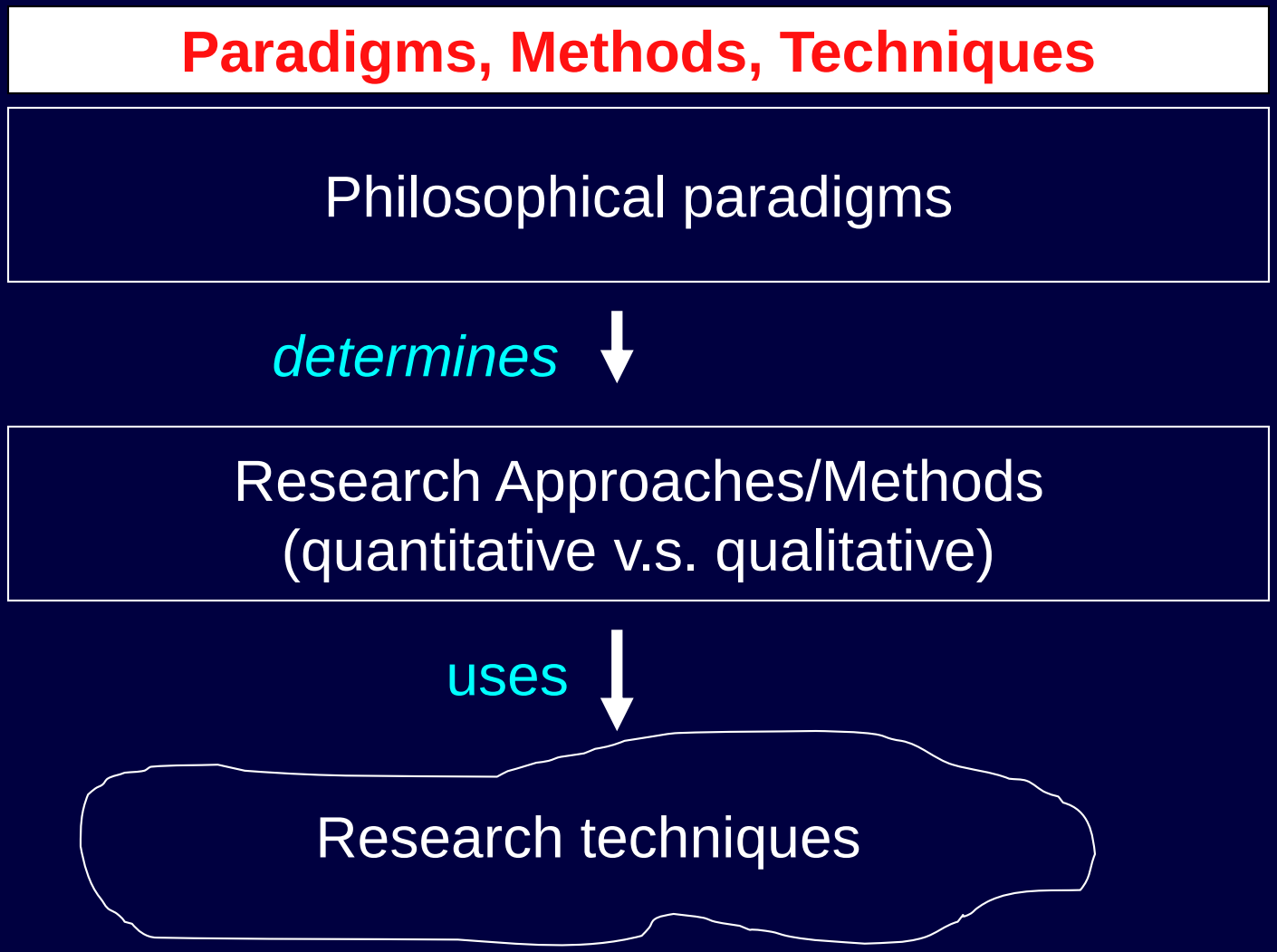
Methodology: Case studies

- similar goals than surveys
- studies one or more cases that presently occur in detail
- are often qualitative than quantitative

Methodology: Experiments

- try something and note the effects
- can be conducted under controlled conditions, or in the field
- controlled conditions (laboratory) - attempt to measure the effects precisely
- field experiments - studies are often qualitative

Methodology: Summary (1)



Methodology: Summary (2)

Hypotheses and Methods

- Methods follow from hypotheses, not the other way around
- **DO** ask yourself what you need to implement and for what specific purpose
- **DO NOT** decide to implement and then think about contribution

Methodology: Summary (3)

Research Methods

- **Documentary research**
- **Survey research**
- **Case study** - investigates a contemporary phenomenon within its real-life context
- **Action research**
  - interacts with the object system of study
  - combines a substantive act with a research procedure
- **Ethnographic research**
    - originated from anthropology
    - "immerses oneself in the field of study"
- **Grounded theory-** an inductive, theory discovery methodology"
    - developing theory from data systematically gathered and analyzed

Methodology: Summary (4)

Research techniques

- Qualitative and quantitative data collection
  - interview
  - observation (conversation recording and analysis, photographs and video-taping, role-playing)
  - field work
  - survey and questionnaire
- Data analysis
  - categorisation/classification
  - quantitative data analysis
- Reasoning
  - deduction, induction

Methodology: Summary (5)

Methods (informal classification)

- Formal
- Case Based Reasoning
- Empirical
  - Quantitative
  - Qualitative

Methodology: Summary (6)

Formal

- Properties of systems
  - correctness of locking protocols
  - correctness of Join algorithms
- Complexity measures
  - time complexity of temporal queries
  - efficient buffer strategies for synchronized data retrieval

Methodology: Summary (7)

Case Based Reasoning

- Properties of systems
  - complete semantic capture in ER to SQL3
  - an improved API for temporal databases
- Complexity measures
  - an improvement on a method for coupling of databases and expert systems

Methodology: Summary (8)

Empirical: Quantitative

- Simulation
  - predicting the behaviour of a locking scheme or buffering algorithm
  - a comparative study of database caching algorithms in client-server architectures
- Profiling
  - benchmarking of trigger management in current DBMS

Methodology: Summary (9)

Empirical: Qualitative

- Evaluation
  - a comparative study of the quality of data modelling notations for user feedback
  - visualisation in scientific databases: is it effective?
- Diagnosis
  - why do CASE tools fail to improve DBA performance in schema maintenance?

Methodology: Summary (11)

Limitations of Methods

Consider:

- scalability of techniques
- generality of results
- counter-indicators
- affecting factors

thanks