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Research Practice & Ethics

COMP9011

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Delivered To

MSc Software Architecture and Design

MSc Artificial Intelligence

MSc Information Design and Development

Week 7

- **Research Design**
- **Supervisor/Student Relationship**
- **Research Methods**

Material Taken From Dr. Donna O'Shea Lecture Slides

What is Research Design?

- The research design refers to the overall strategy that you choose to integrate the different components of the study in a coherent and logical way, thereby, ensuring you will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data.

- There are many types of research design approaches you can take which are going to be discussed in later slides.

What are Research Methods?

- Techniques to do research.
- Provides ways to collect, sort and analyse information so that you come to some sort of conclusion.
- If you apply research methods successfully then it should be possible:
  - To support the validity of your research
  - New knowledge created is sound.

Who is a Researcher?

- Being a researcher involves
  - Doing a practical job.
  - Being academically competent.
  - Identifying a subject to research, finding and collecting information and critically analysing the information.

All at sea but learning to swim

- Are you currently feeling all at sea not knowing in which direction to turn?
- Or is you research going swimmingly, and you are steaming ahead in the knowledge you are doing a good job?
- Perhaps you are fluctuating between the ends of the spectrum. You have a sense you are drowning at one moment in the size of the task ahead, and floating at the next.
- Or perhaps you are at the stage of dipping your feet into icy cold waters for a short paddle in order to test the water before you take the plunge and begin your research.
- Or maybe, if you are engaged in a piece of small-group research, you have yet to synchronise your swimming.

L. Blaxter, How to Research, McGraw-Hill Education (UK), 2010

All at sea but learning to swim

- Experienced and not so experienced researchers commonly feel the range of emotions described in the previous slide.
- Goes with the territory of research!
- You will be excited at discovering new things.
- You will be confused over what you are meant to be doing.
- You should aware you have the skill set to build on existing knowledge to complete the task.
- You will probably be afraid though that you are not really up to the mark of undertaking a major form of independent study.

L. Blaxter, How to Research, McGraw-Hill Education (UK), 2010

All at sea but learning to swim

- **The first time researcher:**

- "Mary has an appointment to see her dissertation supervisor. She is worried and has no idea what topic she intends to research or even a clear idea of the different kinds of methodological techniques available to her. Her assumption is that it is only great men and women, who actually do "real" research. Her intellectual anxieties are only one of her concerns. She also has doubts about whether she will be organised enough to complete a piece of work that she will have to design and execute herself. To date, her only experience has been on courses with set tasks and readings. This thesis is really going to test her."

All at sea but learning to swim

- **Purpose is to:**
- Teach you how to swim so that you can survive and thrive to complete a major form of independent study.
- Successfully accumulate knowledge and extend your skills.
- Study the tools and techniques to allow you to complete the research component of the award.

Audit Yourself!

- You should audit your existing skills, knowledge and resources. At the end of this, you should have a greater understanding of your own strengths and weaknesses.
- What skills, resources and knowledge do you already have?
  - Identify your skills i.e. ICT skills, reading, writing, time management.
  - Resources i.e. time, money, support networks.
  - Knowledge i.e. subject knowledge, research knowledge.
  - Personality/temperament.
- Be aware to complete your research project, you will need to increase your skill and knowledge levels, to work independently and to have a greater sense of direction.
- Identify you personal learning needs!

What you can do with Research?

- **Research can be used to:**
- Categorise
  - Explains which things belong together and how.
- Describe
  - Attempts to examine situations in order to establish what is the norm.
- Explain
  - Aims to move beyond ‘just getting facts’ in order to make sense of things.
- Evaluate
  - Involves making judgements about the quality of object or events.

What you can do with Research?

- Compare
  - Two or more contrasting cases examined highlighting differences and similarities.
- Correlate
  - Relationships between two phenomena are investigated to see how they influence each other.
- Predict
  - Possible future behaviour or events made on the basis, made by correlating past events to predict future ones.
- Control
  - Knowledge of cause and effect relationship and you are capable of exerting control over vital components.

Research Design

- **Historical**

- Systematic and objective evaluation and synthesis of evidence in order to establish facts and draw conclusions about past events.

- Uses historical data, such as archaeological remains as well as documentary sources.

Research Design

- **Descriptive**
- This design relies on observation as a means of collecting data. It attempts to examine situations in order to establish what is the norm, i.e. what can be predicted to happen again under the same circumstances.
- Three methods
  - Observational
    - Method of viewing and recording the participants
  - Case study
    - In depth study of individuals or group of individuals
  - Survey
    - Brief interview and discussion with individuals about a specific topic.

Research Design

- **Correlation**

- This design is used to examine a relationship between two concepts.
- There are two broad classifications of relational statements:
  - An association between two concepts where there is some kind of influence of one on the other;
  - A causal relationship where one causes changes to occur in the other.
- Example
  - Kosinski proved that on the basis of an average of 68 Facebook "likes" by a user, it was possible to predict their skin color (with 95 percent accuracy), their sexual orientation (88 percent accuracy), and their affiliation to the Democratic or Republican party (85 percent).

Research Design

- **Comparative**
- This design is used to compare past and present or different parallel situations, particularly when the researcher has no control over events.
- Comparative studies can be used to increase understanding between cultures and societies and create a foundation for compromise and collaboration.
- The researcher select two groups of participants, the experimental and control groups, commonly referred to as comparison groups.
- Example questions:
  - How does pre-school attendance affect social maturity at the end of Junior Infants?
  - How does having a working mother affect a child school absenteeism?

Research Design

- **Experimental**
- Attempts to isolate and control every relevant condition which determines the events investigated and then observes the effects when the conditions are manipulated
- It is considered the most scientifically sophisticated research method.
- Plan experiments in advance to ensure results are both objective and valid (form a hypothesis).
- Example
  - Suppose a farmer wishes to evaluate a new fertilizer. She uses the new fertilizer on one field of crops (A), while using her current fertilizer on another field of crops (B). The irrigation system on field A has recently been repaired and provides adequate water to all of the crops, while the system on field B will not be repaired until next season. She concludes that the new fertilizer is far superior.

Research Design

- **Simulation**

- Simulation involves devising a representation in a small and simplified form (model) of a system, which can be manipulated to gauge effects. It is similar to experimental design in the respect of this manipulation, but it provides a more artificial environment in that it does work with original materials at the same scale.

Research Design

- **Ethnological**
- Ethnological research focuses on people.
- In this approach, the researcher is interested in how the subjects of the research interpret their own behaviour rather than imposing a theory from outside.
- It takes place in the undisturbed natural settings of the subjects' environment. It regards the context to be as equally important as the actions it studies, and attempts to represent the totality of the social, cultural and economic situation.

Decide Your Type of Research

- **Research Question and Research Design**
- Your research question is what will decide the nature of your research problem and this will also determine the type of research to follow.
- The research design provides a framework for the collection and analysis of data and subsequently indicates which research methods are appropriate.
- You can combine two or more types of research design, particularly when your subject combines the study of human behaviour with that of, for example, economics, technology, legislation or organizations.

Supervisor

- **Supervisor/Student Relationship**
- Your relationship with your supervisor is of critical importance for you and your research.
- That is not to say that you cannot complete your project independently but it certainly makes it a lot easier, more simulating and rewarding if you have a good supervisor.
- Supervisors have:
  - Personal responsibility for overseeing the progress of individuals students research projects.
  - In-depth knowledge of both written and unwritten rules and regulations, that affect your project.
  - Be able to keep you focused and on track.

Supervisor

- **Choice**
- You can ask to have a specific research supervisor allocated to you.
  - This is normally done in cases where you have engaged with the supervisor as part of this module and have asked for feedback on the research question.
  - This is no guarantee that this allocation will be met.
- In most cases, a supervisor is allocated to you at the beginning to third semester.

Supervisor

- **What students expect from their supervisors?**
- To be actually supervised!
- To read their work in advance of meeting
- To be available when needed
- To be friendly, open and supported
- To be constructively critical
- To have knowledge in the research area
- To allow for the exchange of idea
- To have interest in their research and help put more information in the students path
- To be sufficiently involved in their success to help them get a good job at the end of it all!

Supervisor

- **What supervisors expect of their students?**
- To be independent
- To produce written work that is not just a first draft
- To have regular meetings
- To be honest when reporting their progress
- To follow the advice given
- To be excited about their work

Research Skills

- **Research involves the professionalization of everyday skills**
- Reading
- Listening
- Watching
- Choosing
- Questioning
- Summarizing
- Organising
- Writing
- Presenting
- Reflecting

Research Skills

- **Research methods and methodology**
- There are many ways of thinking, and categorizing the wide variety of methods available for designing, carrying out and analysing the results of research.
  - Which method is best?

- Method
  - Relates principally to the tools of data collection of analysis
- Methodology
  - Refers to the approach or paradigm that underpins the research.

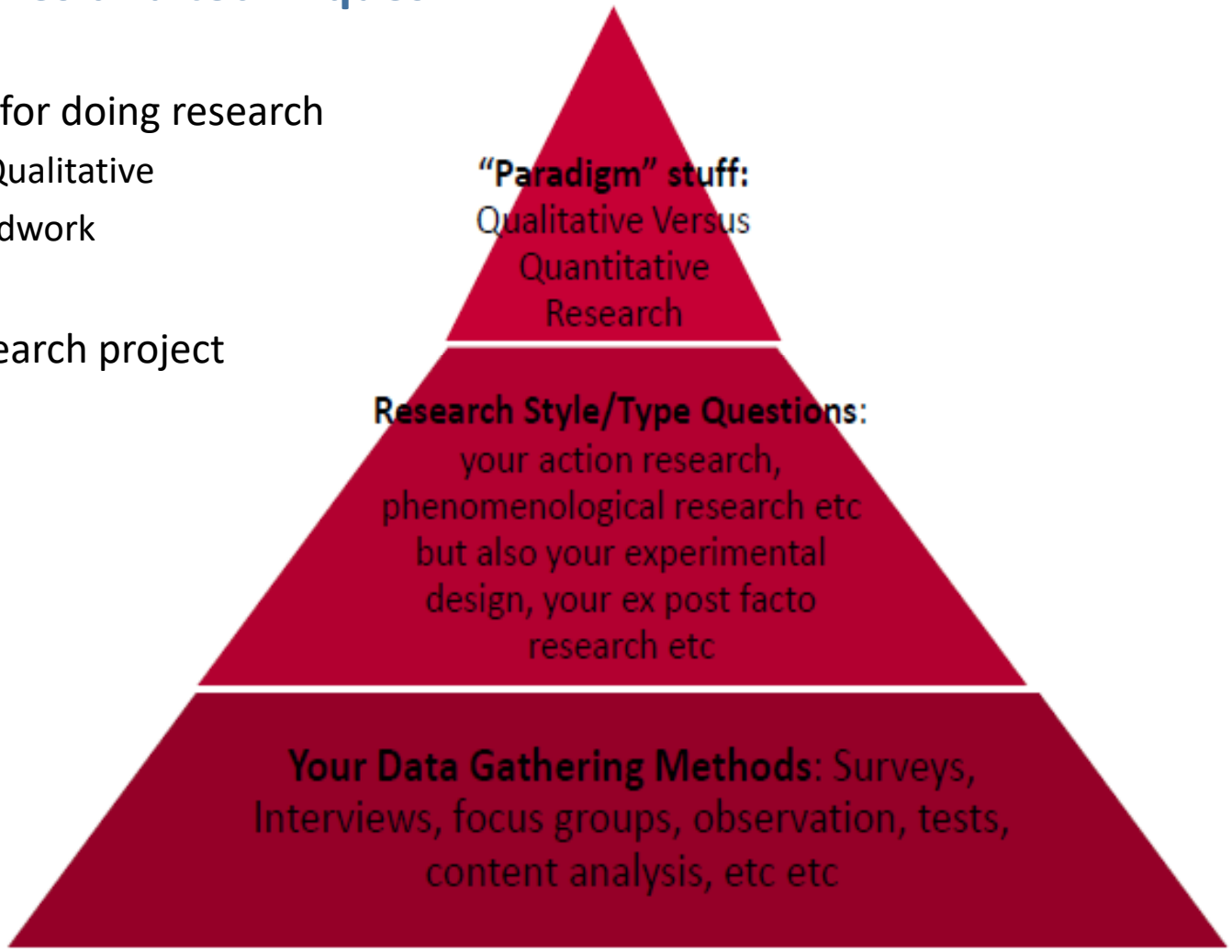
Research Skills

- **Common Paradigms**
- "[Paradigms] are ways of breaking down the complexity of real world and tell their adherents what to do. Paradigms are essentially intellectual cultures, and as such are fundamentally embedded in the socialisation of their adherents: a way of life rather than simply a set of technical and procedural differences" [Oakley, 1999]

- Basic frameworks
  - Quantitative
  - Qualitative

Research Skills

- **Families, approaches and techniques**
- Research families
  - General strategies for doing research
    - Quantitative or Qualitative
    - Deskwork or Fieldwork
- Approaches
  - To design your research project
    - Action research
    - Case studies
    - Experiments
    - Surveys
- Techniques
  - For collecting data
    - Documents
    - Interviews
    - Observations
    - Questionnaires



Research Methods

- **Quantitative versus Qualitative?**
- Some research methods/instruments are more quantitative/qualitative than others (in a largely but not solely data-related way) for example:
  - Quantitative:
    - Closed Questionnaires
    - Tests
    - Experiments
    - Highly structured observation (where you e.g. “count” incidences of events)
  - Qualitative:
    - Unstructured or semi-structured interviews
    - Open (free-text) questionnaires
    - Unstructured observations (where e.g. you’re not sure what you’re looking for)

Research Methods

- **Differences between qualitative and quantitative research**

Qualitative Paradigms	Quantitative Paradigms
Concerned with understanding behaviour from actors own frames of reference	Seeks the facts of social phenomena
Naturalistic and uncontrolled observation	Obtrusive and controller measurement
Subjective	Objective
Close to the data: the insider perspective	Removed from the data: the outsider perspective
Ungeneralizable: single case studies	Generalizable: multiple case studies
Process oriented	Outcomeoriented

Research Methods

- **Differences between qualitative and quantitative research**
- Quantitative research
  - May be used mostly for theory testing, but it can also be used to explore an area and generating hypotheses and theory.
  - It can also collect qualitative (non-numeric) data through open-ended questions in large scale surveys.
- Qualitative research
  - May be used for testing hypothesis and theories, even though it is mainly used for theory generation.
  - Data often includes quantification (e.g. statements such as more than, less than etc.)

Quantitative Research

- **Definition**

- … is the systematic empirical investigation of observable phenomena via statistical, mathematical or computational techniques.
- Its really all about numbers.
- Anything that is quantifiable.

Quantitative Research

- **Experimental research design**
- Experimental research
  - An attempt by the researcher to maintain control over all factors that may affect the result of an experiment. In doing this, the researcher attempts to determine or predict what may occur.
- Steps involved in conducting the experiment
  - Identify and define the problem.
  - Formulate hypotheses and deduce their consequences.
  - Construct and experimental design that represents all the elements, conditions, and relations of the consequences i.e. subjects, time etc.
  - Conduct the experiment.
  - Compile raw data and reduce to usable form.
  - Apply an appropriate test of significance.

Quantitative Research

- **Three features of good experimental design**
- Control
  - control all sources of extraneous variation apart from the experimental parameter under investigation.
- Randomise
  - allows us to equalize the effects of unknown or uncontrollable sources of variation
- Replicates
  - taking multiple samples at every critical point of the experimental process

Quantitative Research

- **Time**
- Hugely significant variable in research.

- Single stage experiments
  - where the outcome of an experiment is determined immediately.
- Time Course experiments
  - where multiple readings are taken over the defined experimental period
- End point experiments
  - Where an experiment is allowed to proceed for a finite period of time.

Quantitative Research

- **Experimental intervention**

- Blinded study –where details are kept from some / all of the participants to prevent conscious or unconscious bias.

- Double Blinded study –where both the subjects and the scientists are unaware of the experimental details to guard against bias and placebo effects.

- Placebo–A substance that has no therapeutic effect, used as a control in testing new drugs.