COMP 7036
Applied Research Methods in Software Development

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Introduction

Overview

Research definitions & types:

- Models
- Theories
- Conceptual frameworks
- Survey
- Experiment
- Observation/case study
- Proof of concept

Overview

Terms

- Knowledge: info, concepts, facts, data, …
- How is knowledge acquired?
- Research vs learning vs education vs instruction
- What is R&D?
- Why is research important? What happens if we don't know how to conduct proper research?

Overview

Why bother?

- Solve practical problems
- Extend knowledge
- What happens if we don't know how to conduct research?
  - Base important professional decisions (or advice) on faulty data, inappropriate interpretations and conclusions, or unsubstantiated personal intuitions
- Applied implies action-research; practical

What is research?

- Used in everyday speech to cover broad spectrum of meaning
  - Confusing term!!!
- Research is **not**:
  - mere information gathering
  - mere transportation of facts from one location to another
  - merely rummaging for information
  - a catchword used to get attention

What is research?

- Originates with question or problem
- Requires clear articulation of goal
- Follows specific plan of procedure
- Usually divides principal problem into more manageable sub-problems
- Guided by specific research problem, question, or hypothesis

What is research?

- Accepts certain critical assumptions
- Requires collection and interpretation of data in attempting to resolve problem that initiated research
- By its nature, cyclical; or more exactly, helical (in this respect is comparable to a software enigneering project).

Research Approaches

Fundamental (basic)

- Answering questions not primarily intended to have practical applications
  - e.g. proving a theory
- More often scientifically relevant

Applied

- Generated by day-to-day practice
- Can answer theoretical questions too

Research Approaches

Quantitative

- Uses numerical information, data
- Statistical techniques used

Qualitative

- Rarely uses numerical data
- A “field” is investigated
- Stories of people are also taken into account

Studies often combine both approaches

Quality of Research

Independence

- Client: benefit management vs. organization
- Researcher: keep your distance

Falsifiability of statements

- Make statements that can be tested
- Subject must be unambiguous (clear)

Generalizability

- Try to extend domain of your research

Tips and Tricks

- Know the client's organization
- Behave professionally
- Listen carefully and don't pretend to know "the answer" or try to pull "the solution" out of your hat
- Copy down impressions of first meeting
- Stay critical at all times
- Know what the client expects of you

Tips and Tricks

- Know what you expect of the client
- Find out what exactly the research goal is
- Use your theoretical knowledge and field experience
- Make it very clear during the first meeting which procedure you are going to follow
- Seriously consider if you can answer your client's question and if so, how
- Work up your advice/proposal at home or the office

Tips and Tricks

- Be humble
- Be rigorous
- Be honest
- Be organized
- Be clear
- Question everything

Starting out

- Accessing journals
- Google Scholar
- Indexes
- Different periodicals: journals, conference proceedings, letters, reviews, communications
- Importance of peer review
- Pitfalls of peer review in academia

Overview

- Find a paper and show me:
  - Journal name, year, pages
  - Research question
  - Results
  - Do you agree with conclusions? Why/not?
  - What other papers you would read to learn more about the above? Why?

Summary

- Course overview
- Why do research
- What is research
- Approaches and quality
- Tips and tricks
- Starting out