Applied Software Development Project

Research Methodology
Implementation and Practical Issues

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What Should You Include in Your Research Methodology?

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- Title of research project ✓
- Abstract ✓
- Table of Contents ✓
- Introduction ✓
- Research Question and Rationale ✓
- Literature reviews or Related Material ✓
- Research Method and Specification ✓
- Proposed Research Implementation and Evaluation ✓
- Research timeline ✓
- Potential problems and remedies (If Applicable) ✓
- Conclusions ✓
- References ✓
- Appendix ✓

Agenda

- Methodology Approach: Case Study

1. Intrinsic: Case Study
2. Instrumental: Case Study
3. Multiple or Collective: Case Studies

- Methodology Approach: Case Study
- Implementation and Designing
- Back matter
- Citation and attribution
- Maintaining: Good Communications

Methodology Approach

Case Study

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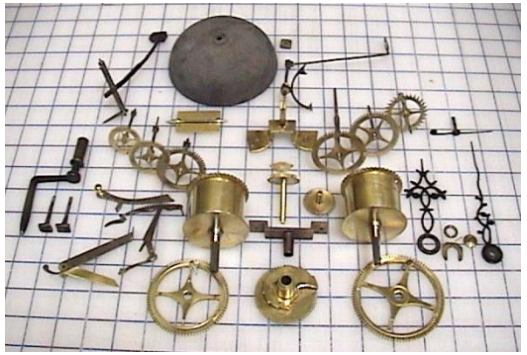
- The case study research aims to explore and depict a setting with a view to advancing understanding of it.
- The case study method embraces a full set of procedures needed to do case study research.
- These tasks include designing a case study, collecting the study's data from a **computational experiment**, analyzing the data, and presenting and reporting the results using visualizations.
- **Types of Case Studies:**

1. Intrinsic Case Study
2. Instrumental Case Study
3. Collective Case Study

1. Intrinsic

Case Study

- Researcher interested in understanding the specific computational experiment under strict operating conditions of your research project.
- Why?
- Goal = understand the case including all possible conditions
- Exploratory Research



2. Instrumental

Case Study

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- Researcher interested in understanding something more than just a specific case (Computational Experiment).
- Studies the case only as a means to some larger goal
- Goal = global or more than one target
- Draws conclusions that apply beyond the considered specific case.

3. Multiple or Collective

Case Studies

- Researcher studies multiple cases (a series of computational experiments) at the same time.
- Overall study

- **Selection of Methodology**
- Identify which of the three types of case studies applicable to your research project.
- Write an appropriate research plan with all variables, conditions for the computational experiments for your proposed research project.
- If your proposal is not falling in the above-mentioned cases, then develop a strategy with details of your **algorithm, tools and constraints**.

Methodology Approach

Case Study

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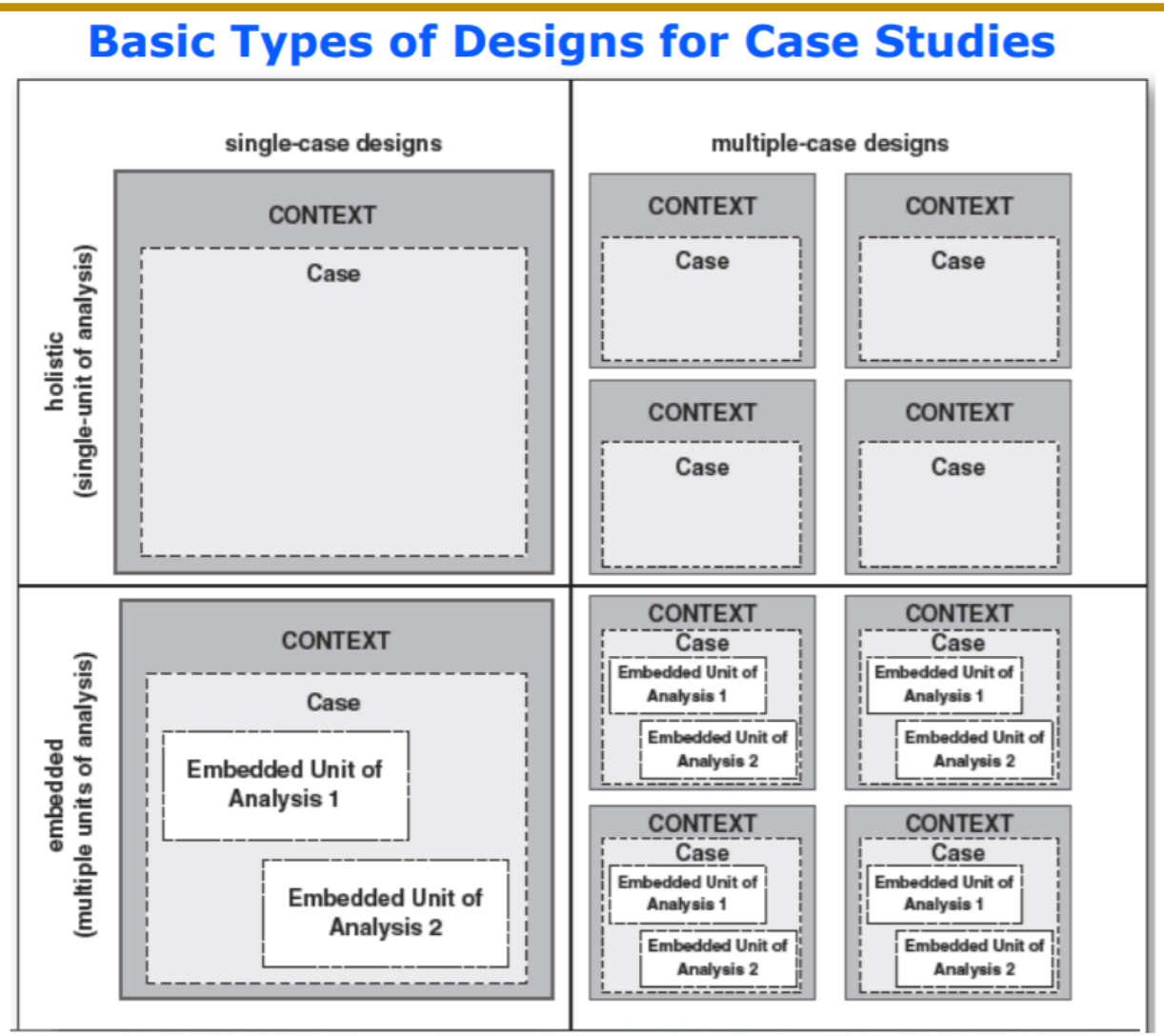

Implementation and Designing

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- The phase of **Design Methodology and Implementation** is the stage during the development of the research project in which an **executable code or collection of scripts** on a specific framework is developed/ reused based on the research question or objectives of the research project.
- **Design Methodology and implementation** activities are invariably inter-leaved during the development of the research project.
- For some simple projects, **design methodology and implementation** during research project is clearly illustrated using a diagram or system flow chart or Block diagram. In case of Object Oriented Programming, Class diagram can be used to describe the structure of the code.
- For large projects, **design and implementation** is only one of a set of processes (requirements collections, verification and validation, etc.) involved before the final delivery of the project.

Implementation and Designing

- The techniques and/ or architecture /framework that underlie the proposed implementation and the associated requirements are identified and presented.

- If a new algorithm or model is proposed, a description of the algorithm/ model functionality should be included.

- If you are planning to use or update some model or algorithm developed by senior researchers in your field of research, **clearly explain your contribution in the project proposal**.

Back Matter

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- **Bibliography:**
- List of articles referred to in the paper
- Enduring academic material that is accessible to likely readers
- Provide sufficient detail

- **Appendices:**
- Detail of proofs, detailed experimental results, extended tables of data
- Code (if brief and exemplary) for tricky algorithms
- Papers rarely need appendices; but they are often valuable for theses

Citation and Attribution

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- Cite to support claims
- Don't cite to pad the bibliography. Read it if you have cited it

Appraise other people's work fairly

- Use a sensible citation style that is meaningful to the reader. Your paper should consist of your own words!
- Don't reuse other people's text (or your own), or close restatements of it.
- Quote to bring in important statements from elsewhere
- *"Quotes should only make up a small fraction of your text"* [1]

- Poor or patchy bibliographies are a sure sign of sloppy research

Maintaining

Good Communications

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- Take the initiative in your own research.
- Keep regular meetings and communications on the research progress.
- Seek advice on topics, literature reviews, research designs, data collection, and analysis.
- Provide your committee with copies of your research proposal.
- Rushed work can compromise the quality.
- Frequent problems include underestimating the time required for research, poor planning, and failure to prioritize.
- Maintain a self-imposed research schedule.

References/ Resources

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- Student Research and Report Writing, From Topic Selection to the Complete Paper, Gabe T. Wang and Keumjae Park, WILEY Blackwell, 2016 John Wiley & Sons Ltd.
- Thanks to Dr. Catherine Mulwa for providing few presentation slides for this lecture.
- https://cals.arizona.edu/classes/aed615/documents/
- Some images used from Google Search Repository.