Case Studies for Reverse Engineers

Susan Elliott Sim  
*University of California, Irvine*  
es@ics.uci.edu

**Abstract**

Case studies are an empirical method with established design principles for conducting scientific investigations. The topic of this half-day tutorial was to give an introduction to case studies as an empirical research method. Our goal is to bring attention to this method as an option in the pantheon of empirical methods.

1. Characteristics of Case Studies

A case study is an empirical method. By this we mean a defined, scientific, method for posing research questions, collecting data, analyzing data, and presenting the results. Each of these steps is planned from the outset of the study and do not come about through serendipity. Case studies are well-suited to “how” and “why” questions in settings where the researcher does not have control over variables and there is a focus on contemporary events.

Unfortunately, there is a great deal of confusion regarding the term “case study” within software engineering. Some of this misuse of the term is understandable because it has different meanings in different settings or disciplines. For the remainder of this Section, we will clarify what case studies are not.

A case study is not an exemplar or case history. The term case study is frequently used in medicine and law. Patients or clients are referred to as “cases,” so a study of interesting instances of these are case studies [1]. In addition, a case study is not a report on something interesting that was attempted by researchers on a toy problem.

A case study is not an experience report. The latter is a retrospective report on an experience that was particularly illuminating and best examples of these include lessons learned. However, even exploratory case studies need to start out with a research question and systematically collect and analyze data to answer the initial question.

A case study is not a quasi-experimental design with a single subject or site, i.e. n=1. While some quasi-experimental studies are conducted in the field, they still retain control over some independent variables, so that time series designs, non-equivalent before-after designs, and ex post facto designs can be brought to bear on the research question.

2. Goal of the Tutorial

The purpose of this tutorial is to bring attention to case studies as an option in the pantheon of empirical methods. Reverse engineer researchers need to conduct a variety of empirical studies for a variety of purposes, such as understanding the context in which their tools are used, justifying the appropriateness of heuristics or assumptions built into their algorithms, and evaluating the usefulness of their technology in an industrial setting. In such situations, a case study can be a better choice than a controlled experiment or questionnaire.

3. Curriculum

This tutorial gave attendees a starting point for learning how to conduct case studies. When they return to their home institutions, they would be able to find, assess, and apply appropriate resources in designing their studies.

The curriculum included the following topics:

- Research Methodology;
- Case Study Fundamentals;
- Designing Case Studies; and
- Publishing Case Studies

The primary text used for the tutorial was *Case Study Research: Design and Methods, 3/e*, by Robert K. Yin [2]. This book is a respected resource on case studies and is widely cited both inside and outside software engineering. While the tutorial was primarily lecture-based, there were opportunities for discussion and in-class exercises.

4. References
