

## Evaluating the Evidence: Lessons from Ethnography

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### Abstract

There are many disciplines that have well-defined theoretical foundations and techniques for studying human behaviour. One such technique is ethnography which originates from anthropology and sociology. Ethnography is an inductive, qualitative technique suitable for investigating complex human phenomena in an open-ended manner. Results from these studies tend to be descriptive and prosaic. Neither the style nor the findings of ethnographies follow the research model presented by physics, which can be problematic for some readers. This paper reviews some of the approaches and theory used by ethnographers to counter misconceptions about their methods and to present their work as rigorous, scientific research.

### Introduction

Despite technological improvements over the years, software development remains an activity that involves a great deal of human effort. These human aspects have become the subject of recent research in software engineering. As these studies have evolved, computer scientists have found that other disciplines have a great deal to offer. Psychology, sociology, management, and education are all examples of disciplines that have contributed theory, methods and results. Ethnography is one of these “borrowed” modes of inquiry. It has been applied with different degrees of intensity and formality in various empirical studies of software developers [2, 7, 8]. Ethnography can also provide guidance for considering equivocal, qualitative evidence. In this position paper, the ethnographic approach will be described along with some of its perceived shortcomings. I will conclude with a discussion of the implications of these issues for empirical studies of software maintenance.

### Ethnography: Facts and Criticisms

Ethnography is a technique was originally used in anthropology and sociology to study the culture of groups. The term itself is literally folk (*ethno*) description or writing (*graphy*). Some examples of classic studies from these fields are Margaret Mead’s *Growing Up in New Guinea*[4], Bronislaw Malinowski’s *Argonauts of the Western Pacific*[3], and *Street Corner Society* by William Foote Whyte [10]. It has also been used in studies of nursing, organisational behaviour, education, and even human-computer interaction [9]. The defining characteristic of an ethnography is its goal “to grasp the native’s point of view, his relation to life, to realise *his* vision of *his* world” [3] (p. 25). This is usually accomplished by the researchers immersing themselves in a field site for an extended period of time. Ethnographers typically use some combination of observation, participation, and interview. The notes from a visit to the field must be highly detailed and descriptive, as they are the raw data for later analysis.

What sets ethnography apart from other qualitative studies is that “No homogenous units or specific characteristics of culture are defined a priori, but rather those groups and processes recognized by native participants are discovered and studied ‘in their terms’ during the research.” [2](p. 366) When starting an ethnography, the researcher needs to cast aside any pre-conceived notions of the site or the phenomenon being studied. She needs to be highly observant and sensitive to the smallest details of the site. During the early stages of a study, taking notes can be difficult, as the researcher may not yet know what is important and so must record everything in detail. Over time relationships and patterns will emerge from sequences of events.

Ethnography is an inductive, open-ended mode of inquiry. It usually starts with a broad statement of interest, for example, “the role of documentation in software process”. The conclusions and endpoints are rarely defined from the start, and they can deviate significantly from initial expectations. As a result, the texts on how to perform ethnographies, from starting the study to analysing the data, tend to offer only high-level strategic advice. [1, 5, 6] One comment that rings true is, “You know when you’re done when you know what questions to ask.” The final results tend to be book-length descriptive stories, reflecting the complexity of the phenomenon being studied. Often they do not contain a single statistic or table. However, these descriptive accounts are essential to understanding quantitative data and interpreting statistical generalisations.

There have been many criticisms of ethnography as an “un-scientific” approach. It is important to note that these criticisms often come from within sociology and anthropology, as well as other disciplines. Advocates of ethnography are well aware of these potential problems and take pains to address these concerns in their work. Their experience can provide guidance for how researchers in software maintenance can deal with qualitative studies. In the remainder of this section, I will list some of these criticisms (and misconceptions) and present counter-arguments.

**Claim:** “The field notes and the analyses are all based on the researcher’s interpretation and theoretical background. How do you know that some one else doing the same study will come the same conclusions?”

Subjectivity is a fact of life. Since eliminating it or controlling for it is not possible, the researcher must take into account of subjectivity and personal impact on the site during data collection. The goal is to make note-taking and analysis as *transparent* as possible. When writing field notes (or “accounts” or “memos”), the researcher must take care to separate direct observations from labels or generalisations. Rather than recording “A and B had a fight”, the observer must record all the evidence that led to this impression, for example, their body language, what they said, and even events before and after this fight. Field notes need to be objective and thorough because they will serve as the raw data for later analyses. During analysis and write-up, the researcher is free to use any philosophical or theoretical approach, provided these and other personal biases are acknowledged and the conclusions are supported by the field notes. The raw data, the context of the study, and the researcher’s personal context taken together provide the transparency necessary for another researcher to draw the same conclusions.

Claim: "Field studies lack experimental control and can't be replicated."

This criticism essentially reproaches a field study for not being a controlled experiment or quasi-experiment. Experiments and field studies serve different roles in research. Experiments are good for isolating the influence of factors. Field studies are good for understanding complex phenomena *in situ*. In many of these studies, it is inappropriate or infeasible to control different factors in the environment, for doing so would change the environment itself and in turn the phenomenon being studied.

Ethnography acknowledges the complexity of human behaviour. Furthermore, it acknowledges that by simply having the researcher in the field setting changes it. Rather than trying to remove her influence on the group being studied (an impossible task), the researcher's presence itself becomes part of the study and sometimes is used to draw out aspects of the group or site.

Given that field sites are dynamic and complex, replications of studies simply are not possible. Instead, researchers increase understanding using *convergence* and *triangulation*. Convergence occurs when studies with different goals and focus on different phenomena come to the same conclusion. Triangulation is the process of using disparate data, for example historical documents, interviews, and observation, to support a conclusion. Also, provided that the field notes and analysis is sufficiently detailed, re-analysis is always possible.

Claim: "How do you know you have anything here? Your final report is just prose. You don't do any tests of statistical significance."

The validity and accuracy of a study can not always be determined using a statistic. There are other ways of evaluating an ethnography. One way is by natives to the group themselves: does the ethnography reflect their experience and perceptions? Another way is by naïve visitors to the group: does the ethnography allow you to make accurate predictions about the behaviour of group members? Affirmative answers to both questions indicates that an ethnography has been well done.

On the other hand, the format of the report can be problematic because it doesn't follow the format of a technical paper commonly seen in computer science and the lessons learned cannot be distilled into a one-sentence thesis without losing much of their value. The report for an ethnography is structured like a story because it's trying to convey the native's viewpoint, on her own terms. As a result, when some readers get to the end of the report they wonder at what was the point being made with all that prose. The point was the prose, the story told by the descriptions and quotations.

Similarly, tests of statistical significance, even non-parametric ones, don't fit with a typical ethnography. Although an ethnography may contain numbers and counts of events, they are not amenable to this type of analysis. In general, when applying a statistical tests, it is essential to know the assumptions and underlying data model it uses, which in turn determine whether it is appropriate for a particular set of numbers. An ethnography can provide information that will aid the design, generalization, and interpretation of statistical analyses.

Claim: “An ethnography is only a preliminary study for a later experiment or survey.”

Although an ethnography can serve in this role, it is by no means limited to it. A high-quality ethnography is a study that can stand on its own merit. It can be used to study situations and behaviours that are not open to other modes of inquiry. Ethnography is well suited for studying complex, dynamic, human activities. The classic studies have stood the test of time and have been criticised and re-analysed, yet none of these authors have gone back to do an experiment or survey.

## Implications for Empirical Studies of Software Maintenance

Given the facts and criticisms of ethnography, there are useful lessons for empirical software research, particularly in the evaluation of results.

- Context is necessary to evaluate the results of a study.

Evaluation of qualitative results relies on the context of the study and the researcher, which means that providing this background information is essential to evaluating the credibility of the study and its conclusions. From the point of view of empirical studies of software maintenance, it is good to show that a particular innovation works; for instance, inspections may be observed to improve software quality; but it is better to know why it did so and whether the results can be generalised to another setting. Case studies fit well with this requirement to provide context and background.<sup>1</sup>

- Use methods appropriate to the phenomenon being studied.

Although this point may seem obvious, it is often difficult to do. Using the appropriate method may require significant investment of effort in learning and preparation over ones that have been used previously with success. The appropriate method may also be one which has not yet gained wide acceptance in the field.

- Complex, qualitative results are not easily condensed.

Qualitative studies often take into consideration disparate aspects of software development, such as personalities on the team, physical layout of the offices, the source code, change requests, and process documentation. Viewing software as a complex process naturally results in findings which are themselves complex. Often the descriptions, or the story contained in the descriptions, is the main conclusion of the study. The research contribution of such a study is the weaving together of the stories to create a deep understanding of a dynamic process.

- Qualitative data is essential to understanding quantitative data.

When faced with two apparent conflicting statistical results, qualitative information about the context should be used to mediate between them and to identify the underlying sources of

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<sup>1</sup> Case study here refers to a particular type of study, as described by Yin [11]. Another kind of case study, i.e. exemplars used for pedagogical purposes, also provide contextual information and are pertinent to this point.

conflict. It is this understanding of the setting that allows us to interpret statistical generalisations in a meaningful way and determine the applicability of results to other settings, thereby furthering to our ability to wade through the mire of evidence.

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