

Research and methodological foundations  
of transaction log analysis.

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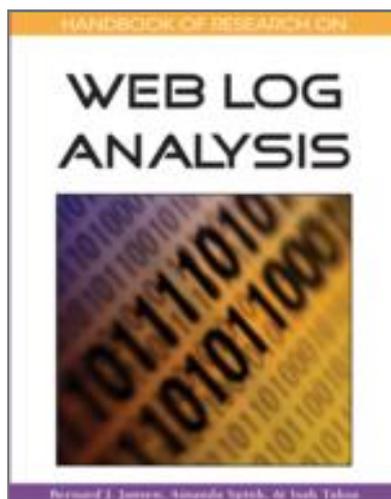


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## Research and Methodological Foundations of Transaction Log Analysis

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## Abstract

This chapter outlines and discusses theoretical and methodological foundations for transaction log analysis. We first address the fundamentals of transaction log analysis from a research viewpoint and the concept of transaction logs as a data collection technique from the perspective of behaviorism. From this research foundation, we move to the methodological aspects of transaction log analysis and examine the strengths and limitations of transaction logs as trace data. We then review the conceptualization of transaction log analysis as an unobtrusive approach to research, and present the power and deficiency of the unobtrusive methodological concept, including benefits and risks of transaction log analysis specifically from the perspective of an unobtrusive method. Some of the ethical questions concerning the collection of data via transaction log applications are discussed.

## Chapter Preview

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## Introduction

Conducting research involves the use of both a set of theoretical constructs and methods for investigation. For empirical research, the results are linked conceptually to the data collection process. Quality research papers must contain a thorough methodology section. In order to understand empirical research and the implications of the results, one must thoroughly understand the techniques by which the researcher collected and analyzed the data. When conducting research concerning users and information systems, there are a variety of methods at ones disposal. These research methods are qualitative, quantitative, or mixed. The selection of an appropriate method is critically important if the research is to have effective outcomes and be efficient in execution. The data collection also involves a choice of methods. Transaction logs and transaction log analysis is one approach to data collection and a research method for both system performance and user

behavior analysis that has been used since 1967 (Meister & Sullivan, 1967) and in peer reviewed research since 1975 (Penniman, 1975).

A transaction log is *an electronic record of interactions that have occurred between a system and users of that system*. These log files can come from a variety of computers and systems (Websites, OPAC, user computers, blogs, listserv, online newspapers, etc.), basically any application that can record the user "system" information interactions. Transaction log analysis is the methodological approach to studying online systems and users of these systems. Peters (1993) defines transaction log analysis as *the study of electronically recorded interactions between on-line information retrieval systems and the persons who search for information found in those systems*. Since the advent of the Internet, we have to modify Peter's (1993) definition, expanding it to include systems other than information retrieval systems.

Transaction log analysis is a broad categorization of methods that covers several sub-categorizations, including Web log analysis (i.e., analysis of Web system logs), blog analysis, and search log analysis (analysis of search engine logs). Transaction log analysis enables macro-analysis of aggregate user data and patterns and microanalysis of individual search patterns. The results from the analyzed data help develop improved systems and services based on user behavior or system performance.

From the user behavior side, transaction log analysis is one of a class of unobtrusive methods (a.k.a., non-reactive or low-constraint). Unobtrusive methods allow data collection without directly interfacing with participants. The research literature specifically describes unobtrusive approaches as those that do not require a response from participants (c.f., McGrath, 1994; Page, 2000; Webb, Campbell, Schwarz, & Sechrest, 2000). This data can be observational or existing data. Unobtrusive methods are in contrast to obtrusive or reactive approaches such as questionnaires, tests, laboratory studies, and surveys (Webb, Campbell, Schwartz, Sechrest, & Grove, 1981). A laboratory experiment is an example of an extreme obtrusive method. Certainly, the line between unobtrusive and obtrusive methods is sometimes blurred. For example, conducting a survey to gauge the reaction of users to information systems is an obtrusive method. However, using the posted results from the survey is an unobtrusive method.

In this chapter, we address the research and methodological foundations of transaction log analysis. We first address the concept of transaction logs as a data collection technique from the perspective of behaviorism. We then review the conceptualization of transaction log analysis as trace data and an unobtrusive method. We present the strengths and shortcomings of the unobtrusive approach, including benefits and shortcomings of transaction log analysis specifically from the perspective of an unobtrusive method. We end with a short summary and open questions of transaction logging as a data collection method.

The use of transaction logs for academic purposes certainly falls conceptually within the confines of the behaviorism paradigm of research. The behaviorism approach is the conceptual basis for the transaction log methodology.

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## Key Terms in this Chapter

**Behaviorism:** A research approach that emphasizes the outward behavioral aspects of thought. For transaction log analysis, we take a more open view of behaviorism. In this more encompassing view, behaviorism emphasizes the observed behaviors without discounting the inner aspects that may accompany these outward behaviors.

**Transaction Log Analysis:** A broad categorization of methods that covers several sub-categorizations, including Web log analysis (i.e., analysis of Web system logs), blog analysis and search log analysis (analysis of search engine logs).

**Ethogram:** An index of the behavioral patterns of a unit. An ethogram details the different forms of behavior that an actor displays. In most cases, it is desirable to create an ethogram in which the categories of behavior are objective, discrete, not overlapping with each other. The definitions of each behavior should be clear, detailed and distinguishable from each other. Ethograms can be as specific or general as the study or field warrants.

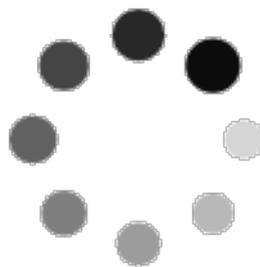
**Transaction Log:** An electronic record of interactions that have occurred between a system and users of that system. These log files can come from a variety of computers and systems (Websites, OPAC, user computers, blogs, listserv, online newspapers, etc.), basically any application that can record the user "system" information interactions. For transaction log analysis, behavior is the essential construct of the behaviorism paradigm. At its most basic, a behavior is an observable activity of a person, animal, team, organization, or system. Like many basic constructs, behavior is an overloaded term, as it also refers to the aggregate set of responses to both internal and external stimuli. Therefore, behaviors address a spectrum of actions. Because of the many associations with the term, it is difficult to characterize a term like behavior without specifying a context in which it takes place to provide meaning.

**Unobtrusive Methods:** Research practices that do not require the researcher to intrude in the context of the actors. Unobtrusive methods do not involve direct elicitation of data from the research participants or actors. This approach is in contrast to obtrusive methods such as laboratory experiments and surveys requiring that the researchers physically interject themselves into the environment being studied.

**Trace Data (or measures):** Offer a sharp contrast to directly collected data. The greatest strength of trace data is that it is unobtrusive. The collection of the data does not interfere with the natural flow of behavior and events in the given context. Since the data is not directly collected, there is no observer present in the situation where the behaviors occur to affect the participants' actions. Trace data is unique; as unobtrusive and nonreactive data, it can make a very valuable research course of action. In the past, trace data was often time consuming to gather and process, making such data costly. With the advent of transaction logging software, trace data for the studying of behaviors of users and systems has really taken off.

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