Information retrieval evaluation

9.1. Research concepts

Overview

This series of modules will assist you in developing the Information Organization Project (IOP) section on system evaluation. One goal of this assignment is to underscore the need to make system evaluation an intrinsic part of the plan for designing an information system. All too often, evaluation research is treated as an afterthought and is conducted too late to be able to truly improve an information system.

This module describes evaluation research within the larger context of empirical research in general. It describes basic research concepts, positions library and information science (LIS) research in the academic and professional arenas, and clarifies the research roles of information professionals.

What is research?

Empirical research is a systematic approach to observing and describing phenomena or events using specific empirical methods and tools. Major components of research are:

- Ideas: theories and theoretical constructs that build on previous research
- Questions or hypotheses: substantive topics to be investigated
- Methodology: specific techniques for collecting and analyzing data

Researchers incorporate all of these components in the design of a study. Research methods are carefully chosen to collect data relevant to the research questions, control for biases and intervening factors, and generally yield the most accurate, objective results possible. Examples of LIS problems and behavior that might be studied are:

- Attempting to determine why a library’s usage has fallen since the library remodeled and moved its online catalogs to a new location
- Trying to determine whether population shifts in a library’s community affect usage patterns
- Comparing the difference in database search success rates of students who have had bibliographic instruction and students who have not
- Determining whether a new graphical interface for the library’s online catalog is helping or impeding successful searches
- Determining whether the specificity and exhaustivity of a thesaurus is appropriate for a database’s users
Each of these studies focuses on different types of problems and issues. Specific research questions must be formed to address each problem. The choice of research methodology depends on the research problem and questions.

**Approaches and topics**

LIS is both a social science and a professional field, as are many related disciplines (economics, education, management, psychology, social work, etc.). The approaches to research in all these fields can be described in terms of their goals, methodologies, levels of analysis, and topics.

**Goals**

Research studies are often characterized as basic or applied, depending on their intended outcomes. However, the line between basic and applied research in the social sciences is not hard and fast. Ideally, each kind of research can and should contribute to the other.

**Basic research** is also called theoretical, academic, or scholarly research.

- Its primary goals are to observe information phenomena and relationships, build models and theories, and generate and advance knowledge in the field. An example is the changing regional population study mentioned above. Essentially, the researcher wants to know whether there is a relationship between the rapid growth in local population and the fact that peak usage time seems to have shifted from midday to after 5 p.m.

- Research findings are generalized to larger populations or phenomena. After surveying library users, the researcher may find that the library has had an increase of new users that is proportional to the population growth in the area. However, the new population consists primarily of dual-career families—a major shift in the library’s user demographics—who use the library after the end of the traditional workday. This finding could be generalized to other libraries, in that it may predict changes in user demographics for similar communities. The researcher may develop a model to show how these changes occur.

- Most researchers are experts with advanced academic degrees, such as university professors, graduate students, and members of industry think tanks.

**Applied research** is also called practical or professional research.

- Its primary goals are to design, evaluate and improve the quality of products and services, solve particular problems in particular settings, and support institutional goals and objectives. An example is the study of a new graphical interface mentioned above. The researcher wants to determine whether there is a relationship between the screen presentation (number and type of searchable fields, arrangement on the screen, screen graphics and color) and the success rate of user searches.

- Research findings focus on specific institutional situations, problems, and clients. A test of the new interface with users may reveal that the presentation is ugly and poorly arranged; that users don’t like it and are not willing to pursue searches for long periods. Thus it could be said that the interface is impeding successful searches. These findings can be used to improve the system.

- Most researchers are workplace experts with professional degrees, such as managers, R&D and marketing personnel, and front-line practitioners, as well as university professors with advanced academic degrees.
Methodologies

The type of data collected and analyzed broadly distinguishes research methods.

- **Quantitative methods** collect numeric (hard) data, such as measures of time and costs, that can be analyzed statistically. Quantitative data answer questions of how many and how much.

- **Qualitative methods** collect nonnumeric (soft) data, such as text and images, that can be analyzed for intellectual content or meanings. Qualitative data answer questions of what and why.

These methods are not mutually exclusive. Quantitative data are related to variables with meaningful qualities, and qualitative data can be quantified by counting or measuring. The two approaches are complementary, and well-designed studies employ both.

For example, the bibliographic instruction study could be approached quantitatively. It is fairly easy to count how many students have had bibliographic instruction and how many have not, as well as how many retrieve search results that help them solve an information problem and how many give up. The data might indicate that 83% of those who had instruction were successful searchers, whereas only 31% of those who had not had instruction were successful searchers. A qualitative approach to this study might rely on a survey with questions such as “What database features did you use?” and “Why did you skip the advanced search features?” The students’ answers might indicate that those who had had bibliographic instruction found the system easy to use, whereas those who had not had instruction found it bewildering. Thus the quantitative results would suggest that bibliographic instruction does appear to make a difference in students’ success in searching, while the qualitative results would help explain why.

Levels of analysis

In social sciences research, the phenomena of interest are people: their status, situations, interactions, activities, products, and tools. People are studied at various social levels, from individual to group to organization to society or culture. In LIS research, most studies have been at the level of the individual information user, but studies in larger social contexts are increasing. This broader scope of attention may be due in part to the fact that libraries are dealing with Web-based users, who may have noticeably different demographics and social environments from local walk-in users.

Topics

LIS research covers an enormous range of topics. Below are a few general areas relevant to information organization. Some topics pertain more to users and some to systems or resources.

- **User research** includes user behavior studies, information needs analyses, and user satisfaction evaluation studies. The first three studies above (library usage after remodeling, library usage and population shifts, and effects of bibliographic instruction on search success) fall into this category.

- **Systems research** includes information retrieval (IR) system design, IR system testing and evaluation, and web site design. The last two studies above (effects of a new graphical interface on search success, and appropriateness of thesaurus specificity and exhaustivity) fall into this category.

Note that evaluation is intrinsic to both user and system studies. Further, evaluation studies in either category can address system **effectiveness** (usefulness of IR results, benefits to users, etc.) or system **efficiency** (storage capacity, speed, costs, etc.).
An unfortunate truth about this separation of user and systems research is that the researchers often do not communicate closely with each other. A classic example is when an IR system is designed, built and tested by IR system specialists with no input from real users—or from behavior researchers who could assist in conducting user-based tests. Often the result is a system that requires considerably more system and domain knowledge than the users have.

Although this is changing, more collaboration would help ensure that the results of user studies are incorporated in system design and that system design responds to users in real-life information-need situations. This is one reason we want you to look at information organization system development from the perspectives of both user and designer.

Cites & sites

Examples of past and present LIS research are readily available online in journal articles. An easy way to get an idea of common topics is to browse article titles in the journals’ tables of contents. The UNT Libraries’ LIS subject guide at <http://iii.library.unt.edu/search/d> lists major journals.