Chapter IV

A Review of Experiments on Natural Language Interfaces

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ABSTRACT

This chapter provides a review, using both qualitative and quantitative approaches, of experimental studies on natural language interfaces. As data utilization is an important aspect of information systems, numerous experimental studies have been conducted on user performance involving database-related tasks with various database models and/or languages. We propose a two-dimensional conceptual framework aimed at classifying and systematically analyzing these studies, in order to provide a bigger picture facilitating systematic understanding of this body of research. The classification exercise shows that studies involving natural language interfaces did not have very consistent findings. Correspondingly, we applied the meta-analytic technique to attempt to gain insight into these differences.
INTRODUCTION

Data utilization has been cited as one of the top MIS issues in many surveys (Brancheau & Wetherbe, 1987; McCormick, 1991; Niederman et al., 1991; Grover & Goslar, 1993). Information architecture continues to be a top-10 issue (Hayne & Pollard, 2000). In the early 1980’s, database research focused on relational, network, and hierarchical models. In particular, experimental studies on user performance largely compared relational models (and languages) with the network and hierarchical models (and languages), and revealed relative advantages of relational languages like SQL and QBE. In the field of database research, the emphasis has been increasingly shifting from the commercially prevailing relational model and SQL standard to higher level models and languages, which include the entity relationship (ER) and object-oriented models and languages.

It is therefore timely to summarize the experimental studies conducted so far, and to propose how further studies may be designed to further enhance our understanding of these newer models. Toward this end, we classify the various systems tested based on their semantic and syntactic levels. The resulting two-dimensional framework helps to organize findings of the individual experiments. Where necessary and feasible, the findings of the primary studies are quantitatively summarized by performing meta-analysis.

The following section presents a conceptual framework, which is used for mapping past studies. The natural language studies are then compared and integrated with a meta-analysis. This is followed by the conclusion of the paper.

A CONCEPTUAL FRAMEWORK

In human-computer interaction (HCI) research, it is common to classify the interaction knowledge into syntax and semantics; one example is the syntactic/semantic model of user knowledge proposed by Shneiderman (1987). Syntactic knowledge includes the grammar of a language as well as the particular functions of different keys on the keyboard, the use of buttons on the mouse, and the functions of various icons on the screen. Semantics concerns the meanings of the interaction to the user, i.e., the concepts and actions that the user is trying to understand or perform. The distinction between semantics and syntax is also evident in the three-stage process model proposed by Ogden (1985) for database retrieval. At the first stage, users decide the real world information needed. At the second stage, users transform the real world requirement to data model requirement. At the final stage, users arrange the requirements into the format dictated by the language. The second stage therefore has to do with semantics, while the third deals with syntax.
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