

An Empirical Investigation of Object-Oriented Query Writing for Three User Groups Using Casual Map

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ABSTRACT

Understanding human's information processing for information retrieval task has contributed to the advancements of database modelling and user interaction design. In particular, the query writing model proposed by Ogden has improved our understanding on core steps in writing a relational database query. However, this model is limited in explaining query writing for more advance database models and the increased complexity of tasks we performed nowadays. It also failed to address the diverse needs of different user groups. In this study, we aims at a) identify extra elements in the traditional model for object-oriented query writing; b) construct, and compare and contrast the cognitive models of three user groups for database retrieval tasks; and c) analyze how the object-oriented database model has affect on the query writing task. This study expands on the existing cognitive model of query writing by seeking to identify pertinent exogenous elements to be used for modeling using causal maps. We employed the semi-structured interview methodology in the data collection and causal maps are constructed from the collected data. Several analyses were performed on the individual as well as merged collective causal maps to identify significant elements that are missing from the traditional query writing models. Results from the analyses revealed several new concepts for the three groups of users at different stages of query writing. We also report major observations on the novel elements in writing object-oriented query not available in traditional query models at discussion section. Our finding offer a better understanding on the inherent differences of query writing information processing for different user groups and insight over additional elements in cognitive model for object-oriented database model. This knowledge is also potential to improve the modern query graphical interface design as well as query writing training practice for object-oriented model databases.

KEYWORDS

Causal mapping, cognitive model, object-oriented database, query

1.0 INTRODUCTION

Databases are essential form of organizational resources and backup information [9]. Nevertheless, developing an advanced database system is not solely focus on information storage, but also how users perform retrieval tasks. The increasing of complex data types in real world applications have demand the efficient and effective design of Structure Query Language (SQL) for data retrieval. New query language standard and data models have been introduced to support these constantly changing users'

activity and computational requirements [22]. These advancements required us to understand the information processing of users performing database retrieval tasks as this might provide generalized pattern on how users formulate a query and serve as a source for database developers to understand users. The purpose of this research is to construct cognitive map that represent a complex cognitive model of query writing of object-oriented database for expert, intermediate and novice users by using qualitative approaches.

To date, there are little studies conducted on cognitive processes emphasizing on how users construct query during query writing for database retrieval. The cognitive model of query writing process proposed by Ogden [26] gave incomplete information about user's internal consideration during database retrieval. However, many empirical studies sprang out from that either using this framework or contrasting it [7, 8, 9, 30]. A cognitive model of query writing process proposed by Ogden [26] consists of three stages: **query formulation**, **query translation** and **query writing**. The cognitive model was generated by an analysis of user's natural query writing protocol for solving database problems [27] combined with analysis of verbal report from expert users of SQL [25]. However, these two studies were vague and did not show completely how the cognitive model of query writing process was constructed. There are empirical studies employing Ogden's model to measure user's performance by considering data models, task complexity, system characteristics, and query languages [7, 8, 9, 30]. Those studies concentrated mainly on factors that affect user performance instead of considering the cognitive model and capturing the cognitive processes involves in different type of database when user perform querying. Ogden's model gives abstract information about user's internal organization during database retrieval and it appear to be similar to a mental model that could be biased toward conceptual discussion. The drawbacks of a mental model are: a) it is hard to understand; and b) assumptions on which they are based are usually difficult to examine. As a result, ambiguities and contradictions within them can go undetected, unchallenged and unresolved [16]. Relevant models related to query writing include model of query writing process combination based on the query language interaction model of Stohr, the GOMS model of Schlager and the definition of deep structure and surface structure of Rist mentioned in [13]; model of the process of query writing by Chomsky [28] and some of the query model mentioned in [9]. However, there were no models that is depicted specifically to cognitive process of query writing and comparing different users level. We are interested to study object-oriented instead pure relational query writing as its ability to capture semantic of