Chapter 1

Visual Support for Use Case Modeling: An Experiment to Determine the Effectiveness of Use Case Diagrams

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ABSTRACT

The Unified Modeling Language (UML) has been evolving as a standard approach to Systems Analysis and Design. Use cases are a de facto standard tool, and corresponding use case diagrams offer visual support for this tool. The Cognitive Theory of Multimedia Learning suggests that the visual nature of use case diagrams would enhance understanding, particularly for novice users, by providing visual cues to focus relevant information. This paper describes an experiment to test this theory, offering use cases with and without supporting use case diagrams. Retention, comprehension, and problem solving tasks were tested and measured. As hypothesized, the results find that users had a significantly higher level of understanding, measured by problem solving tasks, if they were provided with use case diagrams accompanying the use cases. These results are promising support that use cases and use case diagrams could be considered important boundary objects in systems analysis.

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INTRODUCTION

The Unified Modeling Language (UML) offers a language specification to support an object-oriented approach to systems analysis and design. The use case is a text-based description defined in the UML that provides a structured sequence of processes within a system (Jacobsen et. al., 1994). Use cases are a popular modeling technique amongst UML practitioners (Batra, 2008; Dobing & Parsons, 2008) and use cases have received significant research attention (Burton-Jones & Meso, 2006; Siau & Loo, 2006). While text is a rich, familiar and expressive modeling tool, the exclusive use of text across multiple use cases may be difficult for users to conceptualize, particularly as the size of the modeled system increases.

Given the popularity of use cases, it seems reasonable to consider whether a diagram in support of use case modeling, specifically in this case the use case diagram, provides a more effective method for communicating system analysis information than text-based use cases alone. Dobing and Parsons (2000) found that while use case narratives and use case diagrams were the UML tools most likely to be used in interacting with users, that 42% of respondents indicated that use case diagrams provide insufficient value to justify their cost. In a subsequent survey, Dobing and Parsons (2008) found that the use case diagram seems to be gaining popularity: for client validation, implementation, documentation, and clarification, respondents believed the use case diagram to be at least moderately useful.

Communication of analysis information is recognized as an important factor in information system development success. The oft-quoted CHAOS report (Standish Group, 1994) and more recent reports (Charette, 2005) suggest that poorly defined system requirements and poor communication with users remain important inhibitors to development success. A primary challenge of effective systems analysis is to find ways to integrate knowledge across user and technical communities in a way that develops a high quality of pragmatic understanding. In her study of shared work contexts, Bechky (2003) noted that a lack of a shared work context leads to poor communication because members of the different communities will describe elements of the work system in different ways using context most familiar to them. She labeled this issue “decontextualization” and suggested that: “decontextualization occurred when people from different groups met to discuss a problem, and brought different understandings of the problem to their discussion,” the result of which was a “situation was presented in language that was assumed to be universal and unproblematic, but in fact the words were incomprehensible to those who did not share an understanding of the context of the situation” (Bechky 2006). While the context of operational work in Bechky (2006) differs for that of work system analysis, the notion of decontextualization clearly rings true when considering the communities in conceptual modeling.

One method to bridge the knowledge gap across communities is to find an appropriate boundary object that can be understood by members of both communities (Star et al. 1989). According to Star et al. (1989, p. 393), boundary objects:

“...may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds.”

Given this definition, and a recognition that the quality of a conceptual model is realized by the effective communication that is made through the model (Lindland et al. 1994), it can be argued that a use case serves as a potential boundary object for the stakeholder and analyst communities in systems analysis and design.
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