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Introduction

Group support system (GSS) software and computer-aided systems engineering (CASE) tools trace their roots to the early attempts at automating the systems development process (Dennis, George, Jessup, Nunamaker, & Vogel, 1988). Thirty years later the evolution of GSS software and CASE has come nearly full circle. The information systems literature contains examples of GSS in support of systems development activities (e.g., Carmel, George, & Nunamaker, 1992), as well as examples of CASE support for the workgroup activities associated with systems development (e.g., Vessey & Sravanapudi, 1995).

This paper describes exploratory research aimed at investigating the utility of a GSS tool for a systems development task that is commonly associated with a CASE tool. Two studies were conducted using a collaborative drawing tool (CDT) to construct data flow diagrams. The subjects' perceptions obtained after using the CDT are presented here.

Literature Review

In an attempt to determine the extent to which CASE tools may be used as collaborative support technologies, Vessey and Sravanapudi (1995) present a three-level conceptual architecture for collaborative support technologies, and then apply it to the support of systems development work groups. Taskware is defined to be support for a particular task; for example, embedded methodology support in a CASE tool; teamware is defined to be support for a group working toward a common goal; for example, sharing data dictionary entries in a CASE tool; and groupware is defined to be support for the task-independent activities of a group; for example, electronic mail. While taskware and groupware are fairly well-defined, "teamware is the part of the architecture that is least developed and about which the least is known" (p. 85).

Along with examining the extent to which CASE tools can be used as collaborative support technologies it may be appropriate, especially when studying teamware, to also study the issue from the opposing perspective, and pose the question, To what extent may collaborative support technologies be used as CASE tools? While several studies have examined the use of collaborative support technologies in support of systems development activities, the vast majority focus on support for textually-oriented tasks such as requirements elicitation. Only a small fraction of the work conducted to date focuses on graphically oriented tasks (Aytes, 1993), which are typically performed with CASE.

Methodology

Two exploratory studies were conducted to examine the utility of a CDT for a systems development task, constructing data flow diagrams, that is usually performed with CASE. Prior to the studies a pilot study was conducted in order to rehearse the CDT demonstrations provided to the subjects, and to determine the appropriateness of the experimental task. The subjects were information systems majors, all of whom had completed a course in systems analysis and were familiar with data flow diagramming. The subjects were

randomly assigned to a workstation located around the perimeter of an electronic boardroom. Each workstation was equipped with an identical CDT; in the first study there was one subject assigned to each workstation, while in the second study there were two subjects assigned to each workstation.

Before beginning the task the subjects completed a pre-test questionnaire containing questions about their background with CASE, data flow diagrams, graphics software, and working in teams. The subjects were then presented with a demonstration of the CDT, focusing on its drawing functionality. Working in stand-alone mode the subjects replicated a context diagram, which was projected on a screen in the front of the boardroom. After the subjects finished drawing the context diagram a demonstration was given focusing on the collaborative aspects of the CDT. Each of the subjects was presented with a description of the system represented by the context diagram they had just completed. The subjects were then asked to work as a group to draw a level 0 diagram for the system. Group sizes varied between two and four workstations. In the first study there was one group of two subjects and three groups of three subjects. In the second study there were six groups of four subjects (two subjects per workstation). In both studies the subjects were allowed to verbally communicate with their group members. After the groups finished the level 0 diagrams the subjects completed a post-test questionnaire focusing on their perceptions of the CDT and the collaborative drawing process.

Results

The focus of the post-test questionnaire is on the perceptions of the students vis a vis the CDT and the collaborative drawing process. The questions were scored on a five-point Likert scale. The questions are drawn from standard GSS outcome evaluation

instruments that are based on work done by Green and Taber (1980). The questions measure solution satisfaction and decision scheme satisfaction. For question 1 the scale ranged from "Very dissatisfied" to "Very satisfied"; for questions 2-15 the scale ranged from "Not at all" to "To a very great extent". The fifteen questions dealt with the following aspects of the task:

1. How satisfied are you with the quality of the DFD?

2. To what extent does the DFD reflect your input?

3. To what extent do you feel committed to the group's DFD?

4. To what extent are you confident that the group's DFD is correct?

5. Do you feel as if one person had a greater amount of influence in the group?

6. Did anyone emerge as a leader?

7. Was your group's use of the CDT efficient?

8. Was your group's use of the CDT coordinated?

9. Was your group's use of the CDT fair?

10. Was your group's use of the CDT understandable?

11. Was your group's use of the CDT satisfying?

12. Did working in a group facilitate the process of drawing the DFD?

13. Was the CDT easy to use?

14. Compared to other graphics tools you have used was the CDT easy to use?

15. Would you use the CDT again?

The means for the fifteen questions are presented in the chart on the following page.

Discussion

The exploratory nature of these studies, coupled with the small sample size, makes it inappropriate to draw statistically valid conclusions from the data. It is interesting to note that the groups comprised of one subject per workstation evaluated both the outcome and the collaborative process higher than did the groups comprised of two subjects per workstation. However, the groups comprised of two subjects per workstation rated the CDT easier to use.

The CDT used in these studies contains templates for many popular diagramming techniques, including data flow diagrams and flowcharts. However, the CDT has no embedded methodology to help a user construct a set of data flow diagrams, nor does it have a data dictionary. This may explain why the majority of the negative comments received from the subjects about the CDT were specifically directed at task-related, as opposed to team-related, activities. This tends to contradict the results, which indicate that the subjects were more pleased with their product than with the collaborative drawing process. Based on Vessey and Sravanapudi's (1995) architecture it is clear that the CDT used in this study is deficient in the area of taskware. However, the CDT does an excellent job in the area of teamware by meeting many of the coordination information sharing requirements defined by Vessey and Sravanapudi.

Further Research

The two exploratory studies summarized here report the results of face-to-face meetings focusing on a diagram creation task. The subject's comments regarding the drawing functionality indicate that the CDT utilized in this study may not be an appropriate tool for diagram creation; rather, the CDT may be better suited for a diagram review task. The documentation accompanying the CDT notes that the software is ideally suited to a group reviewing a complete diagram created by one person (Ventana, 1993). Therefore, it is appropriate to repeat these studies with a review task.

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