12.1 Introduction

Designers primarily use paper and pencil or software packages for articulating their ideas. As the need for capture and re-use of the knowledge generated during designing becomes stronger, this propels the need to develop more sophisticated mechanisms for supporting these knowledge processes. We argue that interactions occurring during the design process play a vital role in knowledge processing. We define interaction as a mutual or reciprocal action or influence of agents (perceptible objects through which designing occurs). Since interactions especially between designers and tools is likely to have a substantial impact on the knowledge processes, it is necessary to change or modify existing tools, or develop new tools, to increase the effectiveness of capturing and reusing knowledge.

Review of literature on tools for capture and re-use of knowledge reveal that a variety of new tools has been developed in the last few years (Mugellesi-Dow et al., 2008). However, while the importance of knowledge management (KM) tools has been stressed in organisations, the implications of usage of these tools on KM performance are yet to be studied in detail. Even though many tools have been implemented in organisations, the full potential of the tools could be extracted only when these are applied correctly and integrated into the day-to-day processes of designers. Many software tools have been studied and reported in literature, such as document management systems, decision support systems, groupware, content management systems, and electronic directories. However, the impact of design equipment such as paper, digital tablets, or Personal Digital Assistants (PDAs), on knowledge processes has not been studied in detail. Most tools have been evaluated in terms of their usability. Pinelle and Gutwin (2000) summarise the evaluation factors considered in the various studies as:

- organisational impact/impact on work practices;
- end product produced through using the software;
- efficiency of task performance using software;
• user satisfaction with the software;
• task support provided by the software;
• specific features of the software interface,
• patterns of system use;
• user interaction while using the software.

Cugini et al. (1999) propose a frame divided into four levels for evaluating tools: requirements, capability, service and technology. Based on a review of literature, Taylor (1996) identifies six broad categories of criteria that users employ to select information systems: ease of use, noise reduction, quality, adaptability, time-saving, and cost-saving. Vizcaíno et al. (2005) argue that while some of these criteria are related to KM, none is specifically focused on evaluating information systems from a KM perspective. In this paper we intend to evaluate tools from the perspectives of knowledge capture and re-use. Since interaction is a main focus of this work, influence of tools on knowledge capture and re-use during interactions is studied. This study, it is hoped, will help moderate the current emphasis of KM systems on the technical stages rather than on addressing the needs of designers. Duffy and Duffy (1996) propose Engineering Design Re-use Process Model to effectively use learned knowledge. But influence of interactions is not studied.

The work contains two consecutive studies. In the first study, seven individual tools (with which two designers worked individually in conceptual design sessions) have been tested for their effectiveness on knowledge processes during designing. The tools used were Paper, Mobile e-Notes Taker™, Tablet without viewing facility, Wacom™ Tablet with viewing facility, Computer with Rhinoceros™ CAD package, Mobilis™ Personnel digital assistant (PDA), and Sony Ericsson P1i™ PDA (Encore, 2008; Hi-Tech Solutions, 2008; iBall, 2008; Rhinoceros, 2008; Sony Ericsson, 2008; Wacom, 2008). The specifications of the tools are given in (Ideas Lab - Equipment, 2010). Based on this evaluation, the three, top rated individual tools were selected for a second, more in-depth study. The rest of the paper elaborates the research questions, methodology used, the results obtained from the two studies and the conclusions drawn.

12.2 First study: Research Questions and Methodology

The primary focus of this paper is on studying the influence of the following tools on knowledge processes: Paper, Mobile e-Notes Taker™, Digital Tablet without viewing facility, Digital Tablet with viewing facility, Computer with Rhinoceros™ CAD package, Mobilis™ Personnel Digital Assistant (PDA) and Sony Ericsson P1i™ PDA. Selection of these tools has been influenced by their potential to replace pencil and paper which are currently the most commonly used aid for conceptual design. Even though support is required for all design stages, we took the task clarification and conceptual stages as the first stages to be considered in initiating an assessment of these tools, because of the impact these stages have on the design while being the least time consuming to carry out.