



## **Chapter XIV**

# **Exploring the Effects of Hardware Performance, Application Design, and Cognitive Demands on User Productivity and Perceptions**

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### **ABSTRACT**

*We report on an investigation of the effects of hardware performance, application design, and cognitive demands on user productivity and perceptions. This investigation focuses on clerical tasks typical of those activities that many lower level organization workers encounter. This was accomplished by engaging one hundred seventy-five representative participants in a field-based experiment. Participants worked one eight-hour shift and completed a variety of realistic tasks involving the creation and modification of documents using Microsoft® Word, Excel, and PowerPoint®. Motivation was ensured through the use of a quantity/quality-based financial incentive. An analysis of both task-completion times and error rates revealed significant effects for cognitive demands, with more demanding tasks resulting in*

*longer task completion times and higher error rates. The analysis also confirmed that, under the right circumstances, providing individuals with a more powerful computing platform can lead to an increase in productivity. Participants also expressed a preference for more powerful computing platforms. Finally, the results provide strong support for the importance of navigational activities even when the users' primary goal is not navigation. Implications for user training, task design, and future research are discussed.*

## INTRODUCTION

Computing platforms continue to increase in performance. These increases can be attributed to many changes, including more powerful processors, additional memory, and improvements in many other components central to the storage, processing, and display of information. As computers become more powerful, additional features that take advantage of this power are added to standard applications, such as word processors, spreadsheets, and presentation packages.

Ultimately, the goal of using computers is to make individuals and organizations more productive. In this chapter, we explore the relationship among the demands placed on users by their tasks, the performance of the computing platform being utilized, the application being used, productivity, and user perceptions. We explore these issues in the context of clerical tasks typical of those activities lower level organizational workers may engage in, as opposed to the tasks managers working in decision-making environments may encounter. Our goal is to begin answering the following question in the context of traditional office tasks such as document creation and modification:

*Under what circumstances does a more powerful computing platform enhance user productivity?*

While users often express a preference for more powerful computers, and new features that utilize the increased computing power are added to applications, there is little evidence to support the claim that more powerful computers enable office workers to be more productive when completing common office tasks. Anecdotal evidence exists, but empirical results are limited. Therefore, our research incorporates several computing platforms to investigate the relationships among hardware performance, productivity, and user perceptions.

Toward this objective, we acknowledge that different tasks may place different cognitive and physical demands on the user. Therefore, we simultaneously address this important issue by having participants complete several tasks that result in varied cognitive demands with the current chapter focusing on a subset of these tasks. The effects of differing physical demands are addressed through a detailed analysis of the results.

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