Chapter 4
ICT Applications in U.S. Higher Education

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ABSTRACT

This chapter examines applications of information and communications technologies (ICTs) for education, including multi-user virtual environments (MUVEs) and their returns to teaching and learning in U.S. higher education. ICT applications are most valuable when used in the context of courses with a team-based approach to learning or collaboration opportunities. Some drivers of ICT integration are discussed including the internationalization of higher education and the Millennial generation as the new customers of higher education. Recommendations for the fundamentals of positive ICT applications and integration are provided, as well as a discussion about the future of ICT applications such as MUVEs.

INTRODUCTION

Popular usage of terms like *Globalization*, *knowledge-based society*, and the *Net Generation*–along with the progressively aggressive marketing of concepts and products by educational technology firms–have made technology and its use in higher education a "hot topic" over the last decade. As a result, a number of governments, and most recently the U.S. government, have made support for the study of information and communications technology in education and for broad applications of educational technology a high priority. As a result, researchers are being pressed to examine the core educational value of ICT applications, the status of ICT usage in a global context as well as the predictors of ICT integration at both the pedagogical and administrative levels. All sectors of government, academic and industry are watching for formulas for success.

The authors approached this research effort by first verifying and substantiating claims that the use of information and communications technology (ICT) applications in higher education improves learning. While it is difficult to measure teaching and learning directly in almost any context, in

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the case of ICTs we are able to draw upon well established ideas around the value of course-based *team-learning* and *collaborative learning* (also known as module-specific collaboration), and use these grounded ideas as support for the idea that ICT applications are best used in these learning contexts.

Later in the chapter we explore the current use of information and communications technology in the USA as well as an emerging application known as "virtual teaming" with the support of two surveys. In this section we identify how technologies are being used in higher education, in what kinds of courses and for what purposes, and also look at the drivers and barriers to integration. This discussion is then followed by a section examining information and communication technologies in the context of globalization, along with the value and utility of using information and communications technologies for selected course-based international collaborations.

BACKGROUND

Information and communications technology (ICT) is defined as any medium used to transmit information, and is often used synonymously with the term "information technology" (IT); however, ICTs tend to be more inclusive as they quite often refer to any device used to transmit or record information including all computer application software. Examples include popular basics such as cellular phones, radio, video, and even paper. What we hear about most frequently today are innovative ICT applications such as wikis, blogs, virtual teaming and multi-user virtual environments (MUVEs). Wiki's, blogs, Google Docs, MUVEs and other Web 2.0 applications all *use* ICTs to create environments that meet our changing social demands in all sectors. The distinction between ICTs and ICT applications is an important aspect of this chapter.

Demands upon human capital by manufacturing and industry have played a large role in the emergence and application of ICTs and are characteristic of high income economies. That said, there has been a precipitous downward shift in the demand for skills in manufacturing over the past century. For example, in 1800, 90 percent of the labor force consisted of farmers, while by 1900 this percentage declined to 38 percent; today less than 2 percent of the workforce participates in farming occupations. Along with a downward shift in demand for manufacturing, over the last half-century there has been an upward shift in the demand for skills required of the services industry. Today, services account for over 85 percent of U.S. GDP and 60 percent of GDP for all advanced countries. This trend has lead to replacing physical capital with human capital. Indeed, it is predicted that by 2010 the U.S. will need over twice the number of computer software engineers, data communications analysts and computer support specialists than it had in 2000. As reported in an OECD-PISA Report (2000) and other studies, these trends signal that the *knowledge worker era* has arrived and we are seeing more and more people seeking access to higher education (Schleicher & Stewart, 2008).

Due to these workforce trends and a host of fundamental socio-economic changes in both the USA and other forward-thinking economies it, is no mystery that e-learning has emerged as strongly as it has, and equally no surprise how the use of ICT applications has penetrated the university classroom. Students around the world are increasingly exploring ways to access higher education outside the traditional in-classroom, in-person, and teacher-student paradigm. Internet penetration in the classroom has also sufficiently enabled students to collaborate and experience learning in unprecedented ways.

ICTs have been used in the developing world to help overcome teacher shortages as well as to develop and upgrade teaching skills (Crede, 1998). Likewise, use of information and communication