Chapter 2
Wearable Computers

Byron Havard
University of West Florida, USA

Megan Podsiad
University of West Florida, USA

ABSTRACT

Wearable computers include a variety of body-borne sensory, communication, and computational components that may be worn on the body, under, over, or within clothing. These mechanisms have potential benefits for (a) human performance support, (b) cognitive and psychomotor learning, and (c) K-12 educational environments. This chapter begins with a historical overview of wearable computers and then provides the reader with a current and future perspective of their use across a variety of educational environments.

INTRODUCTION

The purpose of this chapter is to provide an overview of wearable computers and the potential benefits for (a) human performance support, (b) cognitive and psychomotor learning, and (c) K-12 educational environments. Wearable computers include a variety of body-borne sensory, communication, and computational components that may be worn on the body, under, over, or within clothing. Wearable computers have the potential to change the dynamics of how individuals acquire, store, and retrieve information and offer new frontiers for both researchers and users.

HISTORY OF WEARABLE COMPUTERS

The first wearable computer is attributed to Thorp and Shannon in the 1960s with their roulette wheel predictor. The roulette wheel predictor was a cigarette-sized wearable computer that was intended to predict where the ball would land. It wasn't until the work and findings were published by Thorp in 1966 that the device earned the title of the first wearable computer (McCann & Bryson, 2009). The Bell Helicopter

DOI: 10.4018/978-1-5225-5484-4.ch002

Company experimented with head mounted display (HMD) camera-based augmented-reality systems in 1967. Within the same year, Hubert Upton created a wearable computer with eyeglass-mounted display to aid in lip reading (Popat & Sharma, 2013). By the late 1970s, C. C. Collins developed a wearable head-mounted camera for the blind, Hewlett Packard designed an algebraic calculator watch, and Eudaemonic Enterprises created a wearable shoe computer to predict roulette wheels (Popat & Sharma, 2013).

In the early 1980s, Mann experimented with a backpack-mounted computer with smart glasses and a one-handed keying input device (Mann, 1996). Mann's photographically-mediated reality was an early attempt at augmented reality in a wearable device (Mann, 2013). By 1989 the smart glasses concept evolved into the commercially available Private Eye. Doug Platt introduced a hip-mounted computer incorporating the Private Eye and a palmtop keyboard in 1991 (Amft & Lukowitz, 2009; Rhodes, n.d..; Starner, 1994). Platt and Starner combined the functionality of the Private Eye and the Twiddler, a commercially available one-handed keyboard, into the first context aware system in 1993. This design became the basis on which the Lizzy at the MIT Media Lab was established.

In 1991, students from Carnegie Mellon University's Engineering Design Research Center developed VuMan 1, a wearable computer to view blueprints (Bass et al., 1997). BBN Technologies produced the first wearable computer with GPS, the Pathfinder system, in the Fall of 1993 (Rhodes, n.d.). Steve Feiner, Blair MacIntyre, and Dorée Seligmann presented a prototype augmented reality system called KARMA (Knowledge-based Augmented Reality for Maintenance Assistance) (Feiner, Macintyre, & Seligmann, 1993). The system used a HMD to present and explain printer maintenance for the end-user. By the end of 1994, Mik Lamming and Mike Flynn developed "Forget-Me-Not," a wearable device that records interactions with people, places, and devices (Lamming & Flynn, 1994); Edgar Matias and Mike Ruicci of the University of Toronto, built a wrist computer with a half-QWERTY keyboard (Matias, MacKenzie, & Buxton, 1994); and Mann went on to develop the Wearable Wireless Webcam, a camera he used to transmit live images to the Web (Mann, 1997).

Since the initial robust innovation in wearable computers at the MIT Media Lab, iterations have continued. A current implementation of a wearable computer is Google Glass (Norman, 2013). While smartphones may currently offer many capabilities, they do not capture reality as it happens in the moment it happens. Reducing the time between intention and action is potential benefit of wearable computing.

WEARABLE INTERACTIVE DEVICES

Electronic devices have made the transition from portable to wearable over the past 20 years (Pentland, 1998). "Wearables are more personal than traditional communications tools because they are a constant part of one's physical presence: they are not only part of what you wear but also part of who you are" (Pentland, 1998). At the time of this writing, according to Vandrico (n.d.), the wearable technology market includes 436 devices, with 253 devices used for lifestyle applications and an average cost of $290 (USD). The accelerator is currently considered the most popular component included. The database is constantly updated and has been available since 2008. Wearables range from health monitoring devices to everyday clothing. There are even wearables designed for working dogs (Valentin, Alcaidinho, & Jackson, 2015). Most wearables are still in the research and development phases but continue to make their way to the market. Wearables currently available are watches and armbands that track health and fitness statistics and eyeglasses with computer displays.