

# Chapter 19

## A Framework for Developing and Implementing u-Learning Models

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### ABSTRACT

*The advent of u-learning environments requires the development of appropriate u-learning models to inform the use of such environments. As there is no single u-learning model to suit all environments and learning situations, there is a need to develop a methodology for developing models appropriate to various environments and situations. This chapter outlines such a methodology as a useful framework on which to base the derivation of particular models for specific situations. The study then illustrates the use of this methodology to derive a particular model: a task-based u-learning model, incorporating well-bounded learning content. Following this, the study proposes a system architecture to embody this derived u-learning model, and, then describes the implementation of this architecture through the development and deployment of the Walkabout u-Learning Environment.*

### INTRODUCTION

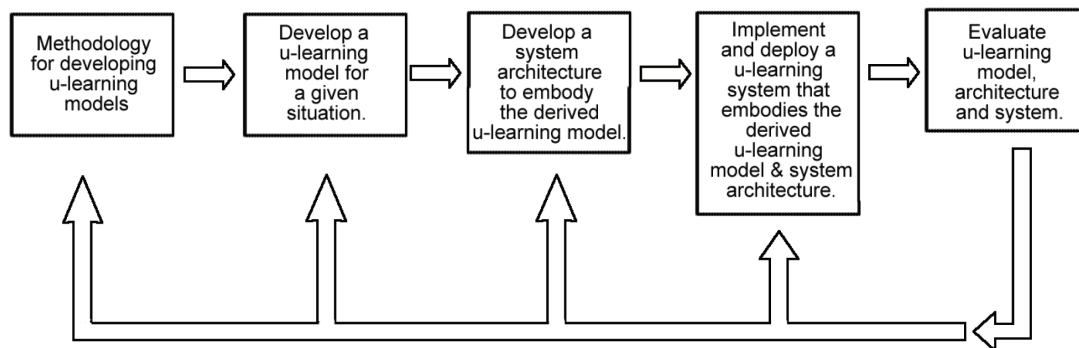
The advent of networked mobile devices has made the deployment of online learning environments to such devices technically feasible. E-learning environments can be utilised by multiple devices: desktops, laptops, tablets, PDAs, Pocket PCs and mobile/cell phones. Extending traditional desktop e-learning environments to mobile learning (m-learning) environments has created ubiquitous learning (u-learning) environments.

An appropriate u-learning model needs to precede the development and deployment of any u-learning environment. The system architecture for the u-learning environment should be derived from this u-learning model. The deployed u-learning environment, then, needs to be informed by a sound u-learning model, and to operate within the technological constraints of the available desktop and mobile delivery devices.

Figure 1 illustrates the main components of this study. The study first proposes a methodology for developing u-learning models. This methodology

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*Figure 1. The u-learning system development cycle*



features five factors proposed by the authors as a useful framework on which to base the derivation of particular models for specific situations. The study then illustrates the use of this methodology to derive a particular model: a task-based u-learning model, incorporating well-bounded learning content. Following this, the study proposes a system architecture to embody this derived u-learning model, and, then describes the implementation of this architecture through the development and deployment of the Walkabout u-Learning Environment. The evaluation of the methodology, the particular u-learning model, architecture and system completes the process, and while this evaluation has been done, it is not reported here.

This iterative approach illustrates an application of design science methodologies. The design science approach is described by Hevner, March, Park & Ram, (2004) as fundamentally a problem solving paradigm which has its basis in engineering practices. This methodology posits that knowledge is generated through action and is accumulated for the purpose of producing new and innovative artefacts, rather than for producing theories (Owen, 1997). The aim of this paradigm is to improve the use of Information Technology within organisations by producing innovative ideas, practices and technical capabilities that can be used for improving the design and development of useful artefacts. The creation of these artefacts

relies on existing root theories which can be then be applied, evaluated, modified and adapted through the implementation of the artefact (March & Smith, 1995, Walls, Widmeyer, & El Sawy, 1992, Markus, Majchrzak & Gasser, 2002).

Design science, therefore, encompasses two expansive activities: building and evaluation, where building is the process of constructing an artefact for a specific purpose and evaluation is the process of determining how well the artefact performs in the situation for which it was designed (March & Smith, 1994). The authors followed this iterative sequence, where subsequent iterations of the development cycle provided data to enable further refinement and validation.

Various authors have written on this approach (McKay & Marshall, 2001, Hevner, March, Park & Ram, 2004, Jarvinen, 2007).

## **METHODOLOGY FOR DEVELOPING U-LEARNING MODELS**

The first step in the u-learning system development cycle (see Figure 1) is to propose a methodology for developing u-learning models. There has been much research in the field of general learning models and, recently, the development of online learning models has gained some popularity (Haythornthwaite, Bruce, Andrews, Kazmer, Montague, Preston 2007, Bonk and Zhang 2006,

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