Chapter 10

Specification of an Adaptable and Inclusive E–Learning Support System

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ABSTRACT

The chapter outlines the problems associated with inclusive e-learning and the role that user profiles and an adaptation service can have to support personalization. The chapter introduces the idea of an Adaptable Personal Learning Environment (APLE) and looks at how one component, the Transformation, Augmentation and Substitution Service (TASS), can be formally specified using Prolog. The compliance with a range of standards is identified: in particular the IMS ACCLIP and ACCMD standards for accessible learner profiles and learner object metadata and the AccessForAll proposals. The chapter also considers issues of IMS and SCORM content packaging, learner information profiles and the JISC definitions for a Personal Learning Environment, all within the context of inclusive e-Learning support.

INTRODUCTION

User-Centred Design, Learning Management Systems, Electronic Performance Support Systems and Formal Specification are all terms commonly applied within Computing, but they are not normally used together nor applied to the same context. Despite this these ideas are integral here within a chapter dealing with the definition of adaptable e-learning support based on accessibility standards.

There are few educators, web designs or software developers these days totally ignorant of the need to make web-based content accessible to the widest possible audience. The majority are aware of the importance of ALT-tags for graphical images and the need to consider the possibility that someone with a sensory, motor or cognitive disability may be attempting to access the site. Typically web designers will claim to follow the W3C Web Content Accessibility Guidelines (W3C WCAG 1.0, 1999) and may even claim conformance level triple-A: that should mean conformance with all three priority levels. These

levels relate to what a content developer *must*, *should* or *may* satisfy. However even if it were true that WCAG compliance was enough to ensure that content is accessible that would not guarantee that all instance of e-learning support are inclusive. Firstly there are real issues with the application of WCAG 1.0 in a variety of contexts. Typically conformance is subjective and difficult both to achieve and measure. Also it does not guarantee that content is fit for purpose or context or that it is presented in a way that makes appropriate use of the individual's environment or support tools. An often quoted criticism of WCAG is that it is based on a model of the world which assumes every browser conforms to the standards and the most common disability a person may have is visual impairment (Sloan et al., 2006). Clearly this is a gross misrepresentation of the contribution that WCAG 1.0 has made to the web and certainly WCAG 2.0 promises much more but the world of inclusive e-learning support goes well beyond the contribution of WCAG 1.0 or 2.0.

If we move beyond web accessibility guidelines when defining inclusive e-learning support there are a confusing range of standards, guidelines, models and frameworks. A number of these standards relate directly to e-learning content such as IEEE LOM (Learning Object Metadata), ASL SCORM (Schareable Content Object Model), IMS CP (Content Packaging), IMS LTI (Learning Tools Interoperability) and IMS QTI (Question Test Interoperability). Others relate specifically to accessible applications or content such as W3C/WAI ARIA (Accessible Rich Internet Applications), CEN-ISS APLR (Accessibility Properties for Learning Resources) and the W3C/WAI WCAG (Web Content Accessibility Guidelines) themselves. However this chapter will concentrate primarily on the IMS *AccessForAll* standards ACCMD (*AccessForAll* Metadata Information Model) and ACCLIP (Accessibility for IMS Learner Information Package). The aim of this chapter is to provide an overview of *AccessForAll* and the related standards and to indicate how a localized form of AccessForAll service can be embedded into an inclusive e-learning support environment, formally specified and defined using the logic-based programming language Prolog.

INCLUSIVE E-LEARNING SUPPORT

This section explores the issues of learning technologies, learning management systems, accessible e-learning content and accessibility guidelines and standards. The aim is to consider what current resources, thinking and standards can be incorporated into our e-learning support model.

Learning Technologies

Learning technologies refer to the range of hardware devices and software applications which are used in the learning context. These technologies might include personal computers, laptops, netbooks, mobile phones, PDAs, ipods, the web, wikis, blogs, learning object repositories, e-learning resources, e-learning activities, discussion tools, virtual learning environments, e-books, e-assessments and a whole range of electronic performance support systems.

In the context of inclusive e-learning support it is likely that the learner may also have access to assistive technology: this is '*any technology which can be used to help someone with an innate (or acquired) disability to overcome the limitations typically associated with that disability*'. Common examples are spectacles and hearing aids but they could also include mobility devices, interface devices and communication technologies (see Table 1). In the sense that assistive technologies are designed to allow individuals to overcome limitations or improve access, they can be seen as being an agent of fairness and equity - which is important from the perspective of education and employment.

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