Forced to Conform? Using Common Processes and Standards to Create Effective eLearning

Marion Manton, Belen Fernandez, David Balch and Michael Meredith

Abstract:

Working on multiple large-scale eLearning projects forces teams to try and standardise processes and procedures. Tools such as XML allow us to manipulate and exploit content in ways previously impossible. However, no academic from any discipline likes to imagine that their content is standard. And terms such as 'reuse' and 'repurposing' make academics even less comfortable. And perhaps they are right. This article describes a formalised development methodology created by one eLearning development team based at the University of Oxford, designed as a generic system flexible enough to cope with a wide range of subjects and audiences. This paper will also set this development process in the broader world of academic eLearning development across the disciplines, looking especially at the role of standards to consider future directions and the applicability of any development methodology to wider learning development contexts.

Keywords: eLearning development, project management, disciplines, flexibility, course design, XML

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1. Introduction

ELearning development has long been divided between the world of training with defined job roles and management techniques and the academic world where development was first pioneered by enthusiasts and only more recently supported by teams dedicated to the use of technology to support a university education. With larger scale adoption of eLearning by many universities and an increase in fully online programmes a growing professionalism has entered academic eLearning development; however, this has not been a straightforward process. Processes and practices from the training world are not always appropriate for academic contexts, whilst those from software development are arguably even less so. Yet at the same time there is pressure for academic teams to deliver content to the standard and cost norms of the better resourced training industry. This sits in sharp contrast to the individualistic focus of much academic endeavour, where disciplines are clearly defined and the idea of generic solutions to any aspect of academic life is viewed with distrust. (Becher and Trowler, 2001)

This article describes a formalised development methodology created by one eLearning development team based at the University of Oxford, designed as a generic system flexible enough to cope with a wide range of subjects and audiences. Although this process has been successfully implemented in several different contexts this paper will address its application only from the perspective of developing large-scale eLearning programmes (i.e. full Masters online). This paper will also set this development process in the broader world of academic eLearning development across the disciplines, looking especially at the role of standards to consider future directions and the applicability of any development methodology to wider learning development contexts.

2. Existing development methodologies for eLearning

The best-described methodologies for the development of large-scale eLearning come from the US training industry, with most practice being based on variations of the Instructional Systems Design. The most commonly used framework is ADDIE, which stands for Analysis, Design, Development, Implementation and Evaluation. It is possible to find numerous articulations of this process in literature and on the web (Hall, 1997) (Kruse, 2002). Usually represented as a cycle, perhaps the main criticism of ADDIE is the lack of flexibility between the stages as well as a tendency to result in identikit solutions. The main alternative is Rapid Prototyping, which could be described as ADDIE for the impatient: at some point all of the main stages

are adopted, but at a far quicker pace and with increased iteration between stages. Focussing on less analysis and more consideration of quick prototypes it gives faster initial results to allow clients to understand output better. Arguably a version of this is what most ad hoc academic eLearning development might be said to subscribe to, albeit unknowingly.

Software development faces many of the same issues as eLearning development and there are many well articulated project management tools to deal with the complexity of the process, which seem to offer concrete solutions to the eLearning world. Examples include PRINCE2 (Office of Government Commerce, 2003) and "extreme project management" (Yourdon, 2001). However, even the most flexible of these tools tend to be over complex and rigid to be a realistic solution for academic eLearning development.

Whilst it would be unfair and untrue to say that there is no exploitation of project management techniques or defined development methodologies in eLearning for Higher Education, project management is rarely mentioned directly in many of the better-known how-to books such as Weller (2002). Furthermore, much has been accomplished in the field using surprisingly ad hoc approaches. Where an acknowledged procedure is espoused this has tended to call upon variations of the tools described above, with constant mutation to fit the idiosyncratic needs of academia. Perhaps the most well known and well developed development methodology in academia is that of the UK's Open University for print materials, yet it is clear that even that institution has yet to transfer this to a fully articulated process for technology centred courses.

Universities are charged with delivering students high levels of educational experience with a workforce more usually employed for their research rather than their teaching expertise. Disciplines tend to be fiercely independent and will not accept being forced to conform to requirements they inevitably see as externally imposed. So the question remains - how do we get the benefits of well-developed project management methodologies whilst retaining the requirements of a more individualised, academically sensitive approach, especially when academics may not actually be able to articulate (or even know) what they want?

3.   TALL's development methodology

Technology-Assisted Lifelong Learning (TALL) was founded in 1996 by the Department for Continuing Education at the University of Oxford, to take

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advantage of the possibilities offered by technology to extend the mission of the department to make the scholarship of the University accessible to wider audiences. As a self-funded team TALL has always been under pressure to deliver courses on budget and in time, so from an early stage project management has been a significant part of the development process. Yet at the same time, there is a strong need to be sensitive to academic requirements. Core to TALL's success has been the development of effective partnerships with academic teams. This is characterised by TALL's recognition of their subject and teaching skills and a reciprocal recognition of the expertise TALL provides in both online pedagogy and the technological implementation of effective learning solutions.

TALL has worked extensively with academic partners within Oxford and other institutions such as King's College London, The University of York, and Columbia University on courses that range from Undergraduate diplomas, CPD courses, Continuing Medical Education, courses designed for personal development to full Masters degrees delivered online. Along with diverse audiences TALL has also worked across the entire range of disciplines, including science, medicine, the arts and social sciences.

The challenge has been to create a development process that saves reinventing the wheel for every course but which also allows TALL to be flexible enough to create the best eLearning course possible for each scenario encountered, both in terms of audience and discipline. The resultant development process is the culmination of 7 years experience of course development and continues to be improved. Emerging from the formalisation of ad hoc processes, a pick and choose approach to existing methodologies, and refinement over years of implementation, the process is the end product of close work and reflection primarily between project managers, web developers and learning technologists. Constant evaluation of real successes and failures as well as a creative approach to the adoption of innovation has resulted in a process that is owned by the whole team.

4.   Standard development process

The TALL approach to developing online learning has always put the teaching and learning rather than the technology at the centre. At the same time in purely practical terms it is often technical, financial and time considerations that drive the most efficient course development process. The challenge was to find a way to get the best from all worlds. The TALL development process (Figure 1) gives an overview of the total system; however it must be noted that this can change in detail between

projects and over time where appropriate: in fact the ability to customise is a core feature.
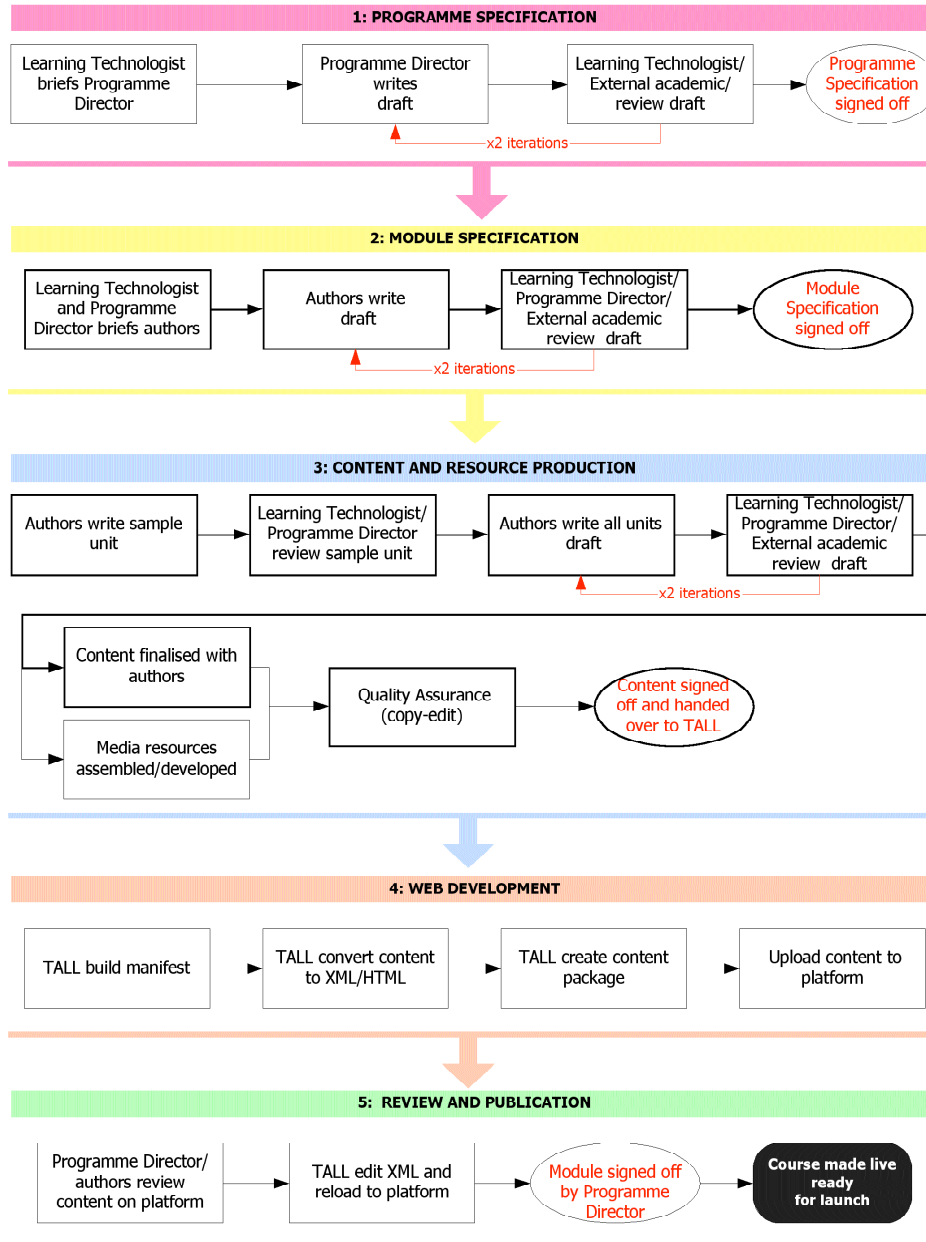
1: PROGRAMME SPECIFICATION

Learning Technologist briefs Programme Director → Programme Director writes draft → Learning Technologist/ External academic/ review draft → Programme Specification signed off

x2 iterations

2: MODULE SPECIFICATION

Learning Technologist and Programme Director briefs authors → Authors write draft → Learning Technologist/ Programme Director/ External academic review draft → Module Specification signed off

x2 iterations

3: CONTENT AND RESOURCE PRODUCTION

Authors write sample unit → Learning Technologist/ Programme Director review sample unit → Authors write all units draft → Learning Technologist/ Programme Director/ External academic review draft

x2 iterations

Content finalised with authors
Media resources assembled/developed → Quality Assurance (copy-edit) → Content signed off and handed over to TALL

4: WEB DEVELOPMENT

TALL build manifest → TALL convert content to XML/HTML → TALL create content package → Upload content to platform

5: REVIEW AND PUBLICATION

Programme Director/ authors review content on platform → TALL edit XML and reload to platform → Module signed off by Programme Director → Course made live ready for launch

Figure 1: The TALL Development Process

Key to understanding this flowchart is a clear articulation of roles. For all projects there will be a) a TALL team including: a project manager, web developers and a learning technologist[1] among others and b) an academic team (possibly from another institution) usually including: a programme director, academic authors, a project manager and a programme manager. There is a subset of other roles that can be performed or outsourced by either team. These include quality assurance (QA), copyediting, copyright clearance and graphic design. The most intense collaboration, especially in the specification stages is between the project managers, the learning technologist, the programme director, and academic authors calling upon other roles (such as web development) where necessary to answer specific questions.

What follows is a more detailed examination of key areas of the process (Figure 1), focussing on how it has been designed to take advantage of standardised procedures and tools whilst being flexible enough to work realistically in the world of higher education.

The specification stage is the foundation of the entire process, laying the basis for a successful project. It is here that the whole team considers and agrees the shape of the programme and records all the decisions. This is facilitated by a simple set of forms to be completed, ensuring that all the areas that need to be articulated for a successful eLearning programme have been discussed and that decisions taken can be accessed and understood by all involved throughout the process. Depending on the size of the programme to be developed the specification documentation can consist of one or many documents, each specifying the course in greater levels of detail. These stages are outlined below.

4.1   Stage 1: Programme specification

The programme specification takes place at course director level and may or may not involve the academics who will be authoring and/or delivering the material. This document contains very little that isn't found in programme level documentation for any award-bearing course: despite this it is surprising how often the process is new to teams TALL works with. At this stage the specification is so generic that we use the same document for every programme, collecting standard information. Much is purely structural such as Programme title, Programme length, Structure (number of modules and credits etc), Delivery (period and study hours) and Assessment. Much is content focussed, such as Programme description, Aims, Objectives, and Learning

[1] *Note in TALL a learning technologist is an expert on the pedagogical aspects of online learning (analogous to an instructional designer in training terms) not the more technically focussed person a learning technologist often is in many universities.*

outcomes (knowledge, understanding, skills). However we also require statements about desired pedagogical approach and target audience, arguably the two factors that most affect eventual programme design.

The programme specification does not contain a rationale for developing the programme as it is assumed that this has been completed before TALL becomes involved, however if this has not been undertaken, we strongly recommend this stage as a core requirement.

4.2 Stage 2: Module specification

The module specification is the most intensively used document in the whole process; initially used to articulate the learning design, it later acts as the blueprint for the developers and the definitive source of information about the module. Fundamentally it is the module specification that defines what is to be built.

Due to the many roles that this document has to perform it is customised for each individual programme, resulting in the creation of a document optimised for maximum utility and usability. The document and the methodology it encapsulates must be flexible enough for any discipline and pedagogy whilst capturing the information the TALL development team know is required for any eLearning course from a developmental and standards perspective. As such, module specification initially happens on two levels, that of designing the form and that of filling out the form, with much iteration between the two. In a programme with many modules, the format of the document itself will change considerably during the first module, but by later modules will be set in stone. By the end of the process ownership of the specification document belongs as much to the academic team as the development team.

At the simplest level the document format is articulated in terminology; 'module' has been used here as a generic term, but if the team want to call their standard unit of study a course, a unit, a section or a topic this is possible. However it is not just the terminology that can be adapted for individual courses but also more semantically and pedagogically significant information. Thus if a problem based learning model is being pursued one field is likely to be 'the problem', while a collaborative focused programme may have a field for group discussions. This can be summed up in the observation that the module specification process is aimed at capturing the learning design of a module as much, if not more, than the course content coverage. Clearly this is not a straightforward process and generally requires close work between a learning technologist and the academic team to establish requirements and suggest

how they can best be realised through the tools and the environment.

As well as capturing the learning design the module specification also starts to record much of the practical information required to build a course online: including both metadata (IMS, 2001) and resource information (including multimedia and copyright), each of which have major time and cost implications for any eLearning project.

The specification of the learning design in advance of the course content authoring is also core to exploiting the best from the medium of technology delivered learning. It allows authors to articulate their wishes independently from the medium, but also allows the learning technologist and web developers to interrogate these wishes at an early stage, advising on what is possible or desirable. In addition, it provides a realistic overview of the module for a project manager to use as a basis for cost and time calculations. Initial ideas may evolve, but with both sides clear about how and why this has happened and what the implications are for the real end product.

4.3   Stage 3: Content and resource production

If the specification stage of the project has been undertaken successfully then content and resource production should be simple, since the learning has been planned and all that is left is to write the words and collect the resources. Inevitably, this is far from the case, and this is the stage most responsible for project slippage.

Authoring within the process is currently controlled using an MS Word template customised with macros (See Figure 2: The authoring template) which can subsequently be converted into XML (extensible mark-up language) for content development. This process offers several advantages:

- Metadata is collected as the content is authored, improving the standard of the information and its conformity.

- The fields available in the template can be customised to fit the pedagogical model decided at the specification stages, making content more likely to be appropriate for online learning and (relatively) less likely to fall into the trap of being a text book online; terminology is also adjusted to suit the discipline and thus the authors.

- Authors are able to semantically describe their content, which reduces errors between the authoring and development stages.

- Significant automation of the content production process.

The MS Word template (see Figure 2) is admittedly far from perfect and eventually we would hope to have a WYSIWYG tool that allows authors to preview content; however with currently available tools it offers the best compromise between functionality and usability. This is very much a work in progress and the template is updated with every project.
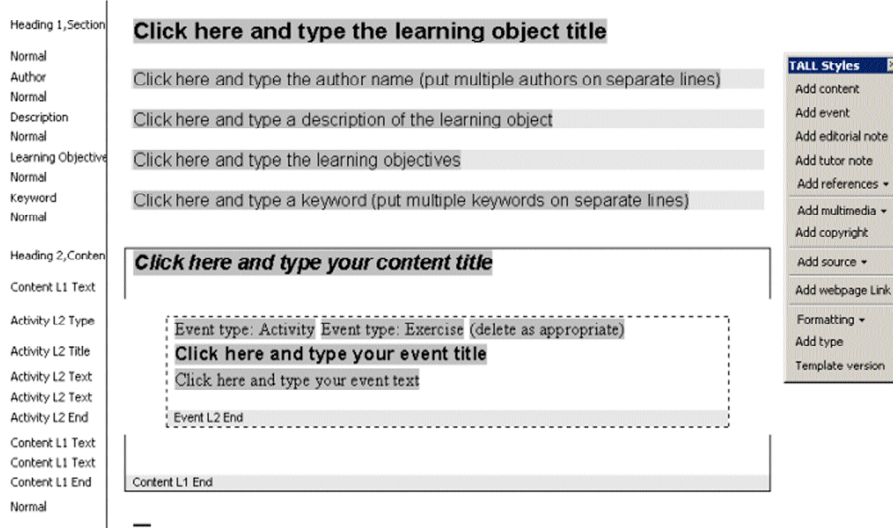

Figure 2: The authoring template

The success of this stage is largely dependant on the iterative nature of the development and the close working relationship between the content authors, academic reviewers, learning technologists and project managers.

4.4 Stage 4: Web development

The web development stage of course production necessarily remains flexible to accommodate the specific needs of individual projects and is finalised following the production of the course specification documentation.

Web development is a complex process but it can be summarised as follows:

4.4.1   Build manifest

The manifest file describes the structure of the content and incorporates much of the course metadata.

The programme structure is determined by the programme specification and, in this instance, adopts the following hierarchy:

Programme>Modules>Units>Pages

Once a structure has been determined and agreed it is incorporated into an IMS Content Packaging manifest file "imsmanifest.xml". The manifest, created using the RELOAD editor (http://www.reload.ac.uk), describes the structure of the course in a tree of "item" elements, with corresponding "resource" elements. Individual pages in the course structure have resource elements which identify the XML files that those pages will be created from.

Metadata for the programme, module and unit levels are also taken from the programme specification, and inserted into the manifest as IMS Metadata. Metadata for pages are dealt with in section 4.3 below

4.4.2   Convert content to XML/HTML

Content, authored in the MS Word templates, is converted in two stages: first to XML following a TALL designed schema and secondly from XML to HTML. The details of this process are outlined below:

Conversion from MS Word to TALL XML:

The OpenOffice.org office suite[2] uses a standard XML document format[3], and has flexible export facilities[4]. Each MS Word document is loaded into OpenOffice.org and exported via an XSL transformation that, in turn, recognises the MS Word styles and generates the corresponding TALL XML mark-up. However, to compensate for omissions in the MS Word template, errors in the transformation and to incorporate editorial changes that are unrelated to conversion the XML usually requires further hand editing.

[2] *OpenOffice.org office suite: http://www.openoffice.org/*

[3] *http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=office*

[4] *http://xml.openoffice.org/filters.html*

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Conversion from TALL XML to HTML:

Conversion of the TALL XML is managed using the Apache Ant build tool [5]. This enables all conversion tasks for the whole programme to be invoked with one command.Once invoked, Ant examines the IMS manifest file to determine which XML files need to be processed. The XML files identified are transformed into HTML, and copies non-XML resources such as images, video clips, and PDFs from staging directories into the HTML directories.

This approach supports the generation of multiple instances of the course from the same course content XML.

4.4.3   Create content package

Ant is used to manage the building of content packages, again using the IMS manifest file to marshal the process.

The ideal would be to generate fully SCORM and IMS conformant content packages. Unfortunately, to ensure that the packages will deploy correctly, any problems in the LMS implementation of content packaging have to be accommodated. One example of this is that the UKeU's LMS requires that in a programme package (the top hierarchy level), modules (the second level) must be packaged individually.

A fully conformant packaging process is under development in parallel to the more accommodating version.

The manifest created using RELOAD editor intentionally only contains the programme hierarchy and some metadata. Using Ant, a large number of steps required to build a complete package are automated and invoked with one command.

The content package build process performs the following operations:

1.   Splits the programme modules into individual manifests (to accommodate a LMS implementation issue).

2.   Modifies resource elements to refer to HTML files rather than XML files.

3.   Processes each XML file, adding dependency and resource elements to the manifest for images and other relevant files.

4. Extracts metadata from the manifest and XML files, creating separate metadata files (as mandated by the LMS).

5. Re-transforms any XML files where the HTML is out of date.

6. Copies HTML and images, etc. to the packaging area.

7. Creates zip files of each module.

8. Creates a final programme level zip, which is the completed content package.

4.4.4 Upload content to platform

Once created, the package is uploaded to the LMS and deployed using the platform's normal mechanism for handling content packages.

Each of these four development steps will typically be performed one module at a time, as the content becomes available. Periods of review throughout development inform modifications to the process, course content and design. The XML based process allows changes to be made quickly and easily, even significant changes to the whole course.

4.5 Stage 5: Review and publication

Once a unit of study has been processed and loaded to the platform or learning environment, the programme director and authors have the opportunity to see their content in its final format. So far, they have been working on Word templates with little formatting or style. This stage of the process gives them a chance to see the full module or unit structure, how the metadata is presented in the learning environment and the full range of working resources such as images, audio, video, flash animations, etc.

The programme director and authors compile a list of changes, which at this stage should be reduced to minor errors, and not new additions. Internally, TALL will carry out a click test to make sure all resources, media and links are all working. The web development team subsequently make the necessary changes and reload the package to the platform for the programme director's final review and sign off for launch.

5.   Discussion

With courses becoming ever more complex the TALL development process evolved out of a very real need to control the complicated set of interrelated factors that affect the success of an eLearning project.   The documentation and process articulated above is designed to give a picture of the project shared by all partners, but it is the process of creating this documentation that is where the strength of the system resides.   At every stage the process is flexible, contingent on the requirements of an individual programme. Initially what the documentation provides is a checklist to ensure that all the basic issues have been considered in the context of the real drivers that will shape a programme.

However, much of the success or failure of a project is based on eliciting a clear articulation of what an academic team wants to achieve in teaching and learning terms, independent of technology, only then taking this information and using the development process to build a course in the most efficient manner possible. The dialogue undertaken with project managers and programme directors is very different from that with academic authors, the space within which each role is allowed to shape the programme strictly controlled. Thus another key role of the documentation at the specification stage is as a starting point against which project managers and programme directors can react. Teams who have no opinion when presented with the idea of an eLearning programme suddenly have many when a generic programme is suggested against which they can position themselves.

Other factors come into play when working with content authors. Thus, in tandem with the documentation, standards such as IMS metadata are presented to authors *fait accompli* as part of the template. In this way the specification documents and templates guide authors to create a pedagogically sound online learning experience, a novelty for most. Undoubtedly the implied orthodoxy of a standard which must be complied to can be very helpful in encouraging desirable behaviours in academics who might otherwise reject being controlled. An interesting aside is that although for a long time TALL encouraged greater freedom among academics to define learning design (not wanting to encroach on their expertise) in programmes where the learning design is defined by the academic team at an early stage and authors have little say by the time their module is developed we have found that they seem to welcome the certainties of a defined pedagogical model. The one concern with this is that they will then go on to assume that all eLearning should be done according to the model with which they are familiar, which is far from the case.

Continued development of effective large-scale eLearning courses necessitates well-understood and articulated development methodologies. Undoubtedly the academic context requires more sensitivity to individual requirements than many other eLearning spheres, yet it is safe to say that these are not mutually exclusive. The reality is that however academic partners may choose to articulate their wishes for an online course, the reality of the development comes down to a limited set of tools and processes and the challenge is finding the best way to collect and record all the information that makes up a successful course. One potential tool for the future is IMS Learning Design (IMS, 2003), designed to encapsulate any pedagogy using the model of people undertaking activities with resources. As yet few are articulating their course design in these terms, and there are not any widely available tools to deliver learning design courses. Yet this framework does point to the ability of complex learning ideas to be encapsulated in simple machine readable terms in the near future. The TALL development methodology, and accompanying documentation does not yet abstract to this degree, but on a fundamental level is trying to capture the same information for identical ends. Furthermore this is currently happening in a way that is actually usable by teams now to output courses in a format that can be read by today's virtual learning environments, IMS Content Packages (IMS, 2003).

6.   Conclusion

The process examined above is far from complete and will undoubtedly change again in the years to come, however any major changes are now more likely to come from developments in standards, theory or technology rather than in light of current failures. Indeed, this process has been adapted applied to several different contexts. As described above the process can be applied to large-scale project or course development. However, TALL has also applied a modified version of the same process to the development of short, personal development courses which only represent 100 study hours. However, the fundamentals of the process remain unchanged (specification>development>review>delivery).

The process has emerged from a need to control complex technical development projects where the overarching requirement has been to create effective learning. Creating a process that allows the most efficient navigation between these two extremes has been fraught, but currently works well. New standards such as IMS learning design offer for the first time the possibility of capturing pedagogical requirements in technologically comprehensible ways, but there are not yet the tools to implement this for large-scale course development. However, as a 'learning

design' is the core to the information collected at the specification stages of the TALL development process, we would like to undertake further work to explore the IMS learning design standard as a viable semantic framework and development tool for the future.

Whilst it is easy to see technology and the differences within disciplines as the challenges to defined processes in online learning development, what is interesting is that it is actually the elicitation of teaching and learning aims that is the hardest to achieve. Offering a methodology that elucidates these aims means that academics are not forced to conform, but rather they are persuaded to participate in the deconstruction of their teaching with the aim of reconstructing a pedagogically sound online alternative. Indeed, provision of a strong framework appears to be positively welcomed by most academics TALL works with, as long as it is clearly situated in a negotiated process over which they feel and have some ownership.

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