

## Conveyor Belt Production of Course Material – a Case Study in Sri Lanka

Peter Mozelius<sup>1</sup> and Mathias Hatakka<sup>2</sup>

<sup>1</sup> Stockholm University, Stockholm, Sweden

<sup>2</sup> Swedish Business School at Örebro University, Örebro, Sweden

[mozelius@dsv.su.se](mailto:mozelius@dsv.su.se)

[mathias.hatakka@oru.se](mailto:mathias.hatakka@oru.se)

**Abstract:** In this paper we study the content development process for an external bachelor degree in information technology (eBIT) at University of Colombo School of Computing (UCSC) in Sri Lanka. The eBIT degree program was started in the year 2000 and has since 2004 been funded from both the European Union (EU) and from the Swedish International Development Cooperation Agency (Sida). Since the start of the project one of the main focuses has been on content development. Content development at UCSC is instrumental and hierarchal where different actors are responsible for different parts of the content development process. The different roles are Subject Matter Experts (SME) who decide what material that the course should be based on and what knowledge that should be transferred to the students; Instructional Designers (ID) are responsible for organizing the course and material, they decide the pedagogy to be used and how the instructions should be structured; Content Developers (CD) are the ones that create the actual content based on the instructions and material provided by the SMEs and IDs.

This study is mainly based on observations that have been done since 2005 but also on interviews, both formal and informal, with UCSC staff. Since 2005 12 field trips have been done altogether by the two authors - each lasting between two and three weeks - so an extensive understanding of the development process has been achieved over the years. The study is mainly descriptive as we explain the development process at UCSC which can be seen as a conveyor belt production of course material, but we also analyze the benefits and disadvantages this approach results in.

Findings show that benefits of this approach are a high production of material and the model has also proved to be both time and cost effective. To further speed up the production the development process is highly dependent on templates, e.g. flash templates for learning activities and SCORM templates to design course and lesson structures. The use of templates to speed up the productions does, however, pose a disadvantage as there is a low degree of variety in activities in the produced material. Because of this the content does not fully support the pedagogy strived for in the eBIT program.

**Keywords:** e-learning, content development, learning objects, templates, Sri Lanka

### 1. Introduction

This paper is situated in the field of Information and Communication Technology for Development (ICT4D). The concept of ICT4D can be defined as the use of Information and Communication Technologies (ICT) to enable progress and growth towards an economic, social and political “better good” (Unwin 2009). Development can have many different meanings (see e.g. Simon 1997, Sen 1999) but following Unwin’s definition of ICT4D, development refers to a positive change in people’s life situations by providing means for increased control over their everyday life. Increased control to transform their lives can be enabled by access to information and education (Unwin 2009, Narayan 2000). Education is seen as a major key for development (WSIS 2008, Bada and Madon 2006, Selinger 2009) and UN has as goals to achieve universal primary education and to increase the quality in the education by the year 2015 (UNESCO 2008, UN 2008). Education in developing countries does, however, pose a lot of challenges (Andersson 2008, Heeks 2002, Rajesh 2003). E-learning in developing countries has been rapidly growing and many open universities annually enroll hundreds of thousands of students (Dhanarajan 2001) and universities can now reach a population that they before the introduction of ICT were not able to educate. Developing e-learning content of high quality is, however, both time consuming and costly (Pagram and Pagram 2006, Boyle 2003, Vargo et al. 2003) and educational organizations in developing countries need to deal with the cost and time issues to be able to deliver education of a high quality. Attempts to solve these issues often include transferring of open content created in the west to contexts often very different from what it was designed for. The risk with this is that it will lead to a dysfunctional education (Albright 2005) instead of helping the educational situation and the need for locally relevant content is well documented in the literature (Albright 2005, Selinger 2004, Unwin 2005). If the educational system in developing

countries should be sustainable they cannot be confined to being consumers of knowledge, they also need to be producers and a balance needs to be found in content consumption and production (Albright 2005).

The content development process can be very different between countries and between universities. All educational organizations need to find a model for their content development that not only is economically sustainable but it also must be effective in developing content of a high quality. The content developing process in this paper is for an external bachelor degree in information technology (eBIT) at University of Colombo School of Computing (UCSC) in Sri Lanka. At UCSC different actors are responsible for different parts of the process. This can be contrasted against the model commonly used in Sweden where the teacher is responsible for all parts of the content development process alone.

As development of high quality content has proved to be a hinder in many developing countries due to time and cost issues the aim of this paper is to add to this discussion as a model for content development is presented that is both cost and time effective. The content development model is assessed in terms of strengths, weaknesses, opportunities and threats.

The paper is organized as follows. First the method used in the study is presented, including a case description of UCSC. The e-learning content development process at UCSC is then analyzed in detail and strengths and weaknesses with the model are analyzed. Finally a discussion and conclusion based on the analysis is presented.

## **2. Method**

The methodology used in this paper is case study research (Benbasat et al. 1987, Yin 1994). This study is mainly descriptive as the content development process at UCSC is explained, but also evaluating as the process is analyzed based on its strengths and weaknesses.

Since 2005 12 field trips to UCSC have been done by the two authors - each lasting between two and three weeks - so an extensive understanding of the development process has been achieved over the years. The author's role at UCSC has varied between visits and both authors have been involved as external experts, lecturers, researchers and evaluators. This means that we have become close and friendly with most of the informants but we have always recognized that the research part of the projects has been that of an "outside observer" (Walsham 1995).

The study is mainly built on observations that have been conducted during our visits but also on interviews with staff at UCSC. 9 content developers (CDs) and instructional designers (IDs) have been interviewed and the questions concerned how they work with content development and what material they use in their development. The interviews were broader than the aim of this study but relevant information has been extracted from the transcripts. Each interview lasted between 30 minutes and one hour. During our visits several informal interviews have also been conducted as the content development process has been discussed at meetings, symposiums, lunch breaks, etc. that we have taken part in. The observations have only in part been structured. Many times the observations have been conducted unstructured without having the specific aim of this study as a guide; example of this can be when we sit with the CDs and IDs in the UCSC e-learning centre and observe and discuss their work, but also when evaluating the developed content for project reports. Second hand data has also been used in this study as project descriptions and evaluation documents have been included to find the aim of the content development process chosen, aim with the course, pedagogy used etc.

The data was analyzed in two steps. The first step involved identifying and describing the content development process at UCSC (see 3 Content Development Process). This allowed us to explain in detail how they work. In the second step we analyzed the strengths, weaknesses, opportunities and threats (SWOT) that we indentified with the content development model (see 3.1 Strengths, weaknesses, opportunities and threats). A SWOT analysis was chosen since we want to be able to identify the strengths and weaknesses with the model they use, but we also want to be able to identify which opportunities we can see with the model as well as possible threats. This gives us an understanding of not only the model used today but also how the model can be made even more efficient and what issues that needs to be considered in the future.

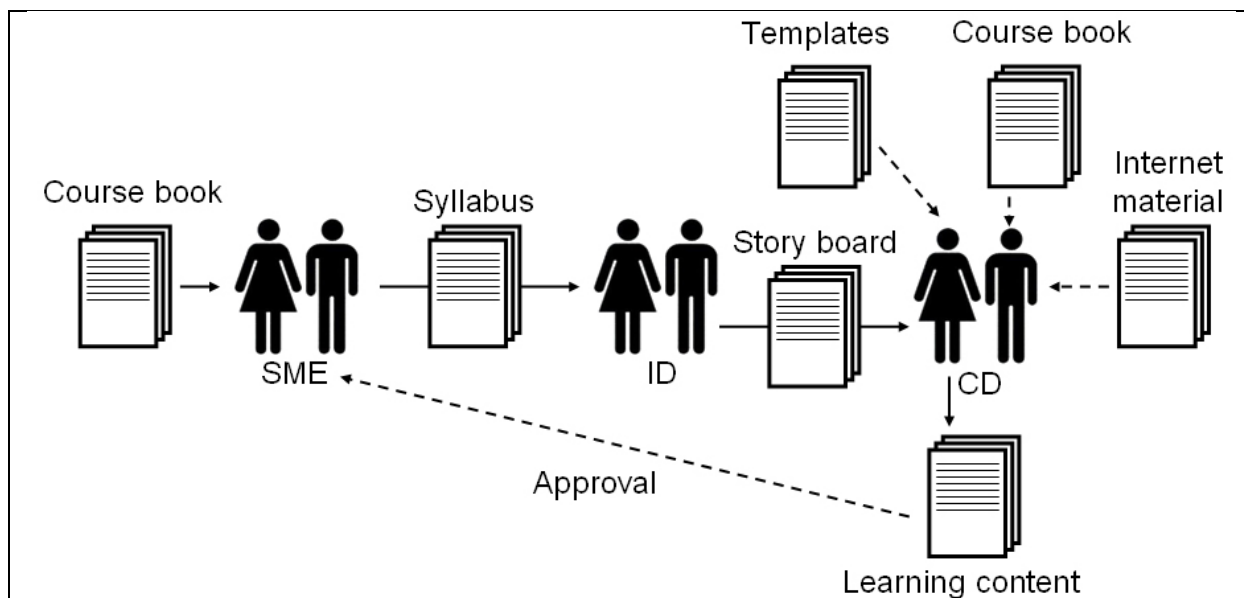
## 2.1 Case description

E-learning in Sri Lanka is a young phenomenon and not much older than the establishment of UCSC in September 2002. UCSC was the result of a merge between The Institute of Computer Technology and The Department of Computer Science at the University of Colombo in the capital of Sri Lanka. During the last years the traditional Bachelor of Information Technology (BIT) has been transformed into its new e-learning correspondence eBIT. Since the start of eBIT there has been several changes done in regards to content development, technology used for delivery, pedagogy etc. and several methods and processes have been implemented and tried (Hewagamage et al. 2005, Wikramanayake et al. 2007). The aim with eBIT was to provide education to rural parts of Sri Lanka and to “facilitate the paradigm shift from teaching to learning” (UCSC 2004, p.4). The hopes are to increasing the level of interactivity in education and to increase the number of graduating students by using collaborative pedagogical methods (SU 2004). Since the start more than 18.000 students have registered to the program.

In 2002 the e-learning centre was established at UCSC (UCSC 2009). The e-learning centre is responsible for transforming the content from the internal BIT course to e-learning content that can be delivered via the Moodle based learning management system (LMS) used for external students. The staff at the centre also create content for a preparatory course for the BIT project called Foundation of Information Technology (FIT).

## 3. Content development process

At UCSC several different actors that have very strict and defined roles are involved in the content development process. Their model is instrumental and hierarchal and can be defined as a conveyor belt model for learning content development. The different roles are Subject Matter Experts (SME) who decide what material that the course should be based on and what knowledge that should be transferred to the students; IDs are responsible for organizing the course and material, they decide the pedagogy to be used and how the instructions should be structured; CDs are the ones that create the actual content based on the instructions and material provided by the SMEs and IDs. The content development model is summarized in figure 1 and explained in detail below.



**Figure 1:** The content development process at UCSC

The eBIT program has been developed semester by semester where every semester is aggregated by four courses. Developing the courses in a semester normally starts by a group discussion among the SMEs involved in the semester and the IDs that will be their collaborators in the developing process. As a first step the overall learning objectives are stated and a sketch of the syllabus is made. Which course books that should support the process are then decided on by the SMEs, and usually it is the structure of a book that is aligned to the overall objectives that will serve as a blue print for the detailed syllabus. As a quality assurance every course always has its own specialized SME that creates the

syllabus and makes the course outline. Another important task for a SME is to check and approve all the developed digital learning objects before they are put on-line and used in the UCSC programs. What makes the SMEs in the eBIT program a bit different from SMEs at many other universities is that they never do any teaching.

When all parts of the syllabus has a general outline for course sections and topics for activities the skeleton is passed on to the ID. In the next step the ID makes a storyboard for activities, lessons and exercises.

*"They [SMEs] pick the reference books but we [ID] have to prepare the activities."*  
(Instructional designer at UCSC, 2008)

An ID can to a certain degree elaborate the basic ideas from the SME and make improvements, but the changes should always be cross checked with the SME before they are used.

*"There is a Subject matter expert, we also can decide up to some extent but it is always the Subject matter expert who takes the final decision."* (Instructional designer at UCSC, 2008)

Depending on the activity, the storyboard will be discussed with a CD that has the right technical knowledge to implement the sketch into an interactive digital object. Literature is in general expensive in Sri Lanka and a majority of the students in the eBIT program cannot afford to buy the course books that are recommended, and for that reason it is of great importance to transform the central concepts in the course material into learning objects that will contain interaction and will work on-line as well as on a CD-ROM. Bandwidth and high fees for Internet access (only 3,6% of the population have access to internet, (CIA 2009)) is still a big problem for Sri Lankan e-learning programs even though the fees in some cases was halved in the beginning of 2009. A problem since the eBIT program started has been that the CDs at the e-learning centre in Colombo are better equipped and connected to Internet with higher bandwidth than the average student. This means that it sometimes can be hard for them to assess and create content that is accessible for users with bandwidth and computer access that is superior to their own equipment and bandwidth.

Creating quality content from storyboards is time consuming and a way to speed up the process and keep the deadlines is to reuse open content from the Internet. Considering exercises this is more or less the standard behavior.

*"If we are using exercises we take it from the Internet and then according to our requirements, the things that our students use, we modify it and then we have to show it to the SME who also sometimes makes modifications to it, then we can use it"* (Content developer at UCSC, 2008).

In some of the eBIT courses the SMEs have been very committed and involved in the developing process but in others the SMEs are mainly occupied with work on the programs for traditional education. To keep the deadlines are very important and for that reason IDs as well as CDs sometimes have to take shortcuts and decisions on their own as it is not always possible to get the SME approval for all single activities.

*"[Interviewer] Can you decide any material yourselves?  
[ID 1] Yes sometimes, sometimes we get guides to use and sometimes we prepare a plan or design and they have to accept that, the SME have to accept.  
[ID 2] Yes often the SMEs are very busy so we have to prepare some activities and then we shove it to them and they can say what we have to change or if we can use it. After their approval we can publish it. "  
(Instructional designers at UCSC, 2008)*

As one of the most important objectives with this conveyor belt model is time efficiency and to keep the deadlines, the idea of giving the IDs and CDs some autonomy can be seen as necessary. Since the IDs and CDs have some autonomy they can also develop more diverse content with material from different sources (i.e. compared to the book that the SME base the syllabus on).

*“According to the syllabus we select some pages from the reference books. Main references and some supporting references. Other than that some internet resources like Wikipedia or something else which relates to that subject. And video clips, the lectures the video lectures.”* (Content developer at UCSC, 2008)

A way of making the content development faster and more efficient is to use a variety of templates on different aggregation levels. Flash animations are mostly built from a set of Flash templates and activities built in JavaScript are based on other templates. Templates will always add a certain amount of overhead and during the period when all eBIT activities were built with the e-learning content authoring tool *Toolbook* ([http://www.sumtotalsystems.com/products/content-creation/tb\\_index.html](http://www.sumtotalsystems.com/products/content-creation/tb_index.html)) the basic template was as big as 7 Megabytes. From this default template e-learning content was developed very rapidly but with a size that was too big for standard Sri Lankan student Internet connection. Because of that the staff developed their own templates that generated content of a smaller size. For the structure of the courses they use SCORM templates, this helps to make a consistent structure for all the courses but it also means that they are restricted in their structuring. All courses independent on the objective will use the same template with limits the flexibility and diversity in content development. As previous studies also have shown the rigidity of SCORM often serves more as a hinder than a help for content developers (AUTHOR 2007). All courses in the eBIT and the FIT programs are stored in a Moodle LMS (see figure 2) where all enrolled students have their own account and access to the course content.



**Figure 2:** The Moodle LMS at UCSC

### 3.1 Strengths, weaknesses, opportunities and threats

Based on the above description of the content development process at UCSC we summarize the strength, weaknesses, opportunities and threats (see table 1).

The strengths with the model are that the model is very time and cost effective, all roles in the production chain are clearly defined and all actors are experts in their specific role. The use of templates also helps to speed up the process as new content quickly can be developed. It also helps to create a consistent course structure between courses and between semesters. Template usage can, however, also be seen as a weakness as the structure becomes stereotypical and there is also a risk that it will lead to a low variety and diversity among the learning activities. Another weakness is the dependency of often absent SMEs, and more independence for the CD and ID would help to further speed up the process.

Opportunities with the model are mainly that the content is locally created and that they have full control over the developed content. This means that they can scale up the production as needed and they are also well equipped for future changes in the infrastructure. Another issue that has been discussed at UCSC but not yet implemented is the export of the eBIT program and content to other universities and countries. If they can find a suitable business model for this they have a lot of high-quality content that can be adapted to fit in other contexts. As they create the content themselves it also helps with the capacity building of skilled professionals at UCSC.

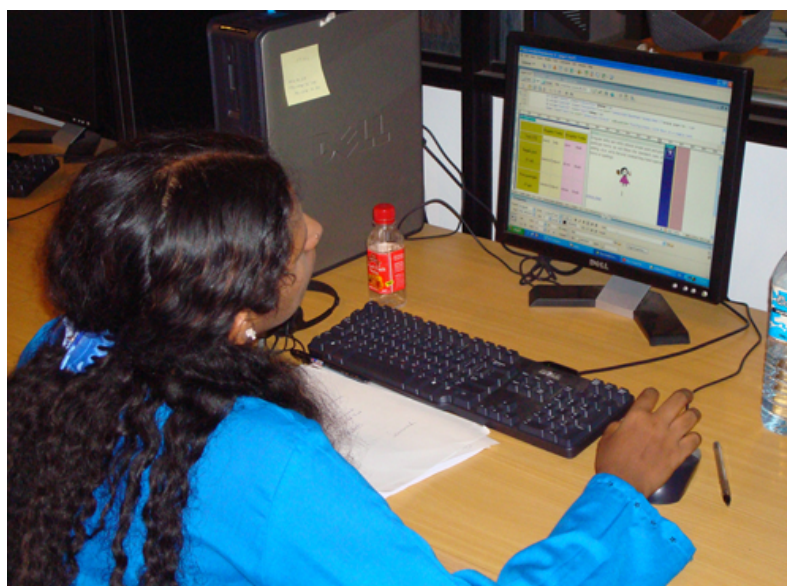
The main threat with the model is the optimistic time planning with strict deadlines that have to be met. The UCSC staff does not always have time to use their full capacity in the content development process.

**Table 1:** SWOT analysis of the content development process

<p><b>Strengths</b></p> <ul style="list-style-type: none"> <li>• Clear distinctive roles</li> <li>• Reuse of templates</li> <li>• Time efficiency</li> <li>• Cost efficiency</li> <li>• Consistent course structure</li> <li>• CD and ID independency</li> </ul>	<p><b>Weaknesses</b></p> <ul style="list-style-type: none"> <li>• Reuse of templates</li> <li>• Stereotype course structure</li> <li>• Dependency on absent SMEs</li> <li>• Bandwidth problems in the access to the content</li> </ul>
<p><b>Opportunities</b></p> <ul style="list-style-type: none"> <li>• Scalability</li> <li>• Design for the future infrastructure</li> <li>• Development tools are improving</li> <li>• Local capacity building</li> <li>• Export of e-learning content</li> </ul>	<p><b>Threats</b></p> <ul style="list-style-type: none"> <li>• Stereotype activities</li> <li>• Monotone ID and CD work situations</li> <li>• Access problems decrease the pass rates</li> <li>• Lower quality than in traditional learning</li> <li>• To optimistic time planning</li> </ul>

#### 4. Discussion

The shift from traditional teaching and learning to modern technology enhanced distance learning can be done for several reasons. At some universities e-learning is introduced for economical reasons where large student groups will generate high income. In other places e-learning is the new alternative for cost effective mass education and sometimes the only way to provide appropriate education that will satisfy the need for a trained workforce in the industry. In the Sri Lankan case there has been a huge demand for programmers and system developers during the last decade. A shortage that they hope to be able to, at least to some extent, solve with the eBIT program.



**Figure 3:** Content developer and subject matter expert at UCSC, 2008 (Source: Mathias Hatakka)

A conveyor belt model with strict roles is by several means professional and time efficient but maybe not always the optimum for transforming learning objectives into interactive digital content for deep learning. It is often very hard to set exact rules for how far the use of templates and prefab student activities should go. In the same way there is no general recipe for making the digital learning objects attractive and entertaining to the students but without collaboration between the SMEs, IDs and CDs this will definitely not be the result. In the new UCSC support program FIT where students can get their prerequisites for the eBIT program a somewhat different model is the case for the course on *English for Communication and IT*. Here the two SMEs are both working as CDs as well as IDs (Figure 3) with a successful result. As an example there can be advantages if the SME is involved in the recording of exercises with pronunciation details in a language course.

## 5. Conclusion

As many other developing countries Sri Lanka sees the opportunity with a shift to a modern knowledge based society but has problems with the implementation. In the beginning of the 21st century the economy has been expanding very fast in the South Asian region and if Sri Lanka should be able to go from a developing country to a developed one ICT can play an important role. But fast expansion is seldom the same thing as high quality and quality as well as individual adaption in higher education will always have their costs. In the same way as quality assurance in traditional learning never can be taken for granted or comes for free the same goes for high quality e-learning.

A conveyor belt model is very useful when it comes to economical and efficiency aspects but if the content development is done without adaptation and variation the result can be stereotype and decrease the e-learning potential. UCSC has a highly skilled staff, but their focus is not always on how to develop creative and innovative activities. Frequent use of templates has both its strengths and its weaknesses, it helps with the time aspect, but as can be seen, the variety and diversity of learning activities becomes very limited. The staff at the e-learning centre is, however, still creating content for the first round of the program and once all the content is created they will hopefully be able to start improving the content and activities and but their skills to better use.

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