Title: Meta learning: Experiences from the inclusion of mlearning in a standards-based and corporate-wide learning content management policy.

Abstract

'Learning and innovation go hand in hand. The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow' (Pollard 1996).

At the Lisbon Summit in March 2000, European heads of state and government set a new goal for the European Union - to become the most competitive knowledge-based society in the world by 2010. However, one of the major obstacles facing individuals and organizations as they strive to retain and grow their competitiveness is that of acquiring relevant knowledge from the mass of information available today to anybody with an internet connection.

A large multinational like Ericsson is no exception to the problem of managing the information at its disposal for competitive advantage and for the benefit of its customers. In response, Ericsson Education, the training division of Ericsson, has championed the use of global standards and reference models in its learning content management policy. The goal of this learning content management policy is to ensure reusability of learning objects as well as appropriateness of learning objects to the target audience.

Mlearning, as a new and innovative delivery mechanism, is included in the policy framework of learning content management at Ericsson Education. In this regard it is treated as another viable form of content delivery as part of a blended learning strategy, much the same as standard elearning, synchronous elearning (virtual classroom training) and instructor-led training. This paper explores the background and development of Ericsson's content management policy with specific reference to mlearning and meta-tagging structures based on global reference models (SCORM 1.2).

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Meta learning: Experiences from the inclusion of mlearning in a standards-based and corporate-wide learning content management policy

1. Introduction

'Learning and innovation go hand in hand. The arrogance of success is to think that what you did yesterday will be sufficient for tomorrow' (Pollard 1996).

At the Lisbon Summit in March 2000, European heads of state and government set a new goal for the European Union - to become the most competitive knowledge-based society in the world by 2010. However, one of the major obstacles facing individuals and organizations as they strive to retain and grow their competitiveness is that of acquiring relevant knowledge from the mass of information available today to anybody with an internet connection.

A large multinational company such as Ericsson is no exception. This paper describes the experiences gained by Ericsson as it strives to make sense of the mass of information at hand, to put order on this information and to optimize it for delivery as learning content. The emphasis of the paper is on mlearning and particularly the experiences Ericsson has had in this domain over the past five years.

1.1 Ericsson Education

Ericsson Education is amongst the largest global suppliers of IT and Telecommunications training. Ericsson Education is a key organization with Ericsson's Global Services division. This division provides services to the IT and telecommunications industry, primarily to Ericsson's extensive installed customer base. Global Services, in turn, is a key Business Unit within the overall Ericsson organisation. The following illustration visualizes the overall structure of Ericsson:
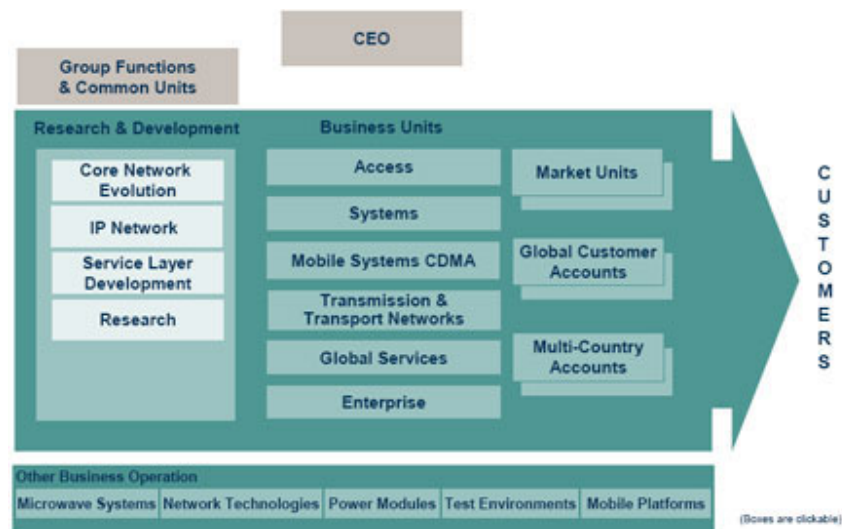

Figure 1: Structure of Ericsson

Today, Ericsson is the largest supplier of mobile systems in the world and supports all major standards for wireless communication. The world's 10 largest mobile operators are among our customers and some 40% of all mobile calls are made through our systems. We have been active worldwide since 1876 and we are today present in more than 140 countries. Our headquarters are located in Stockholm, Sweden.

Ericsson Education has trained more than 800 000 students since year 2000. Our portfolio is divided into two overall product lines; Training Programs and Learning Solutions.

Through Training Programs Ericsson offers globally standardized training flows to customers. This service includes pre-defined training flows according to job categories. The course participants can attend these training flows at their own site through the Remote Training Lab service, via Virtual Classrooms and web portals, or at one of the 26 Education Centers spread worldwide. The Training Programs portfolio includes more than 500 course titles, covers all of Ericsson's technical solutions and are based on years of experience working together with customers. The portfolio covers major job categories including network operations, field maintenance, system administration, network development, application development and business management

Learning Solutions on the other hand is a coherent end-to-end service designed to optimize the operator's competence development investments with a clear line of sight to the bottom line. Such solutions focus a lot on visualization of return on investment where meaningful Key Performance Indicators are used to measure the impact of the total solution.

For a more thorough review of Ericsson Education's complete portfolio please visit www.ericsson.com/learning

1.2 Ericsson Education and mlearning

Both Training Programs and Learning Solutions make use of both traditional course delivery techniques as well as state-of-the-art delivery techniques. Mlearning naturally fits into the latter and Ericsson Education has experimented for more than 5 years now with mlearning content development and delivery.

Ericsson Education's first major involvement with mlearning came about in 2000 when we initiated a joint research program with a pan-European consortium to research the boundaries of mlearning. The project ambition was stated as follows:

The project sets in place the first stage in the creation of a global provision of training on the wireless internet. It sets in place the first building block for the next generation of learning: the move from distance learning (d-Learning) and electronic learning (e-Learning) to mobile learning (m-Learning) (Keegan 2000)

The project received part funding from the European Union (Leonardo da Vinci program) and the consortium was made up of Ericsson Education (Dublin), NKI (Norway), FernUniversität (Germany), University of Roma Tre (Italy) and DEI (Ireland).

The project concluded in late 2002 with a conference in Dublin entitled mlearning: The Cutting Edge. The participants at the conference were able to see innovative courses designed for PDAs, perhaps the first training courses in the world on mobile phones as well as insightful presentations and information sharing on the techniques, didactics and technical challenges of presenting training material on wireless handheld devices.
This information is still available on the web today:
http://learning.ericsson.net/mlearning2/project_one/index.html

Included below is a sample screenshot of the mlearning courseware produced at this time. As you can see the device used is an Ericsson R380, one of the first 'smart phones' on the market. The large screen-size gave it a distinct advantage against standard phones for mlearning purposes. This was borne out in trials conducted with students during this project.
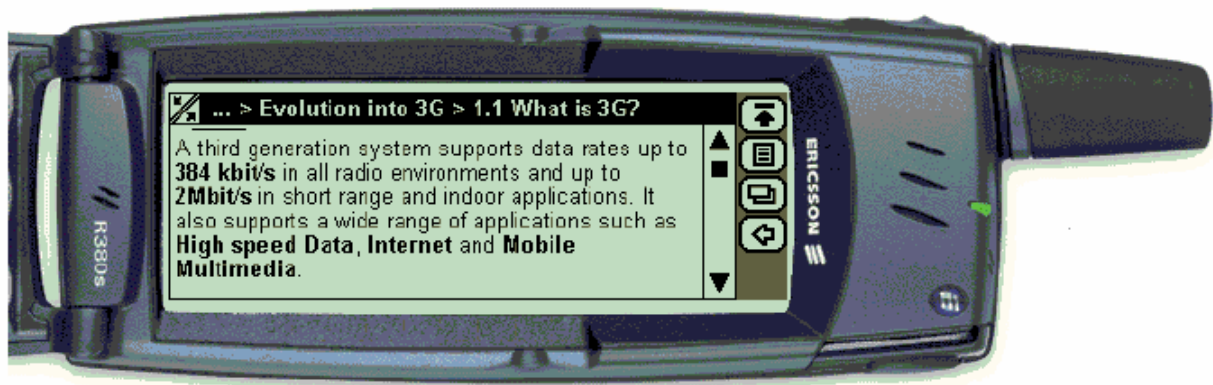
Figure 2: mlearning on an R380 smartphone (2001)

Despite the technology limitations of 2000 to 2002 the results of the project were quite positive as summarized by Keegan: 'The mixing of distance learning with mobile telephony to produce mLearning will provide the future of learning' (Keegan 2002).

After the conclusion of this project Ericsson Education continued to experiment with mlearning and in late 2003 a new research project was initiated with a similar consortium to the 2000 project. This project had the following aim:
To develop and trial mobile learning (mlearning) courses for current and new mobile handsets where mobile learning is defined as the provision of training courses via wireless devices – PDAs (Personal Digital Assistants), smartphones and mobile telephones. These courses will be developed as part of a fully functional mobile Learning Management System (mLMS) and the courses will be trialed and evaluated and the results widely disseminated. (Landers 2003)

The final results of this project were presented in Dublin on Sept 9th 2005 at the 'mlearning- the Future of Mobile?' conference. A summary comparison of the results on display between 2002 and 2005 indicate a huge jump in the functionality and capability of hand-held mobile devices when it comes to mlearning. The figure below indicates the huge improvement in functionality (screen resolution, color etc). However, some of the same issues remain such as how best to optimize the limited screen space and what learning model and business model works best for mlearning.
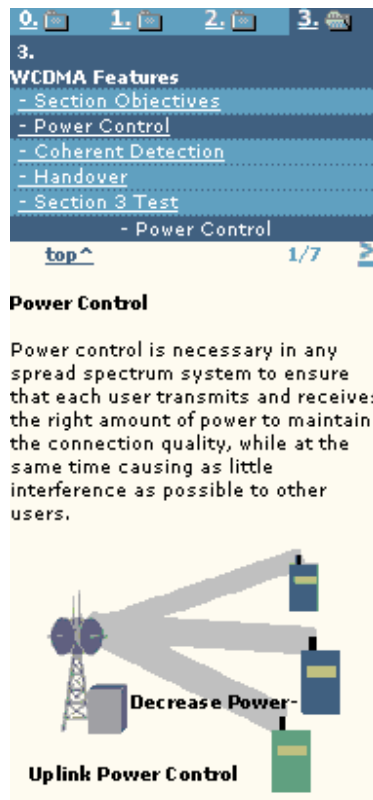
Figure 3: mlearning on a P900 smartphone (2005)

In summary, Ericsson's research in the world of mlearning has taught us a lot, not least how to manage the training content we produce in such a way that it is 'future-proofed' for delivery via hand-held mobile devices.

2. Development of a Learning Content Management Policy

The nature of the IT and telecommunications training market has changed over the past 5 years. This has partly been caused by the downturn in the industry, which happily now seems to be firmly behind us.

Corporate training budgets were not immune to the general cutbacks experienced in the IT and Telecommunications industry in recent years. Lower budgets, but not necessarily lower training requirements, meant that both suppliers and receivers of training had to manage their costs in a more efficient way. One outcome was the general requirement that an individual only takes the minimum training necessary that he/she requires in order to proficiently carry out their role and associated responsibilities. This put new requirements on a training supplier such as Ericsson Education. Whereas before a customer might be quite happy to enroll a group of students on the best-fitting off-the-shelf course from Ericsson, the requirement had now changed to where the general requirement is just for those parts of a training course or courses that match exactly a particular competence gap at that time. In other words a generic, global training course was not accepted unless it fitted the customer requirements 100%. If it did, well and good but if it didn't then the course required a specific customization for that particular customer.

Customization of training material can be expensive, especially if the structure and nature of the material is not designed in such a way that it can be easily customized. At Ericsson we found that while we had a very efficient and comprehensive course development process we weren't always able to customize the material in a cost-efficient and timely manner. Thus we initiated a review of our entire course development

process for all delivery formats (elearning including synchronous training, instructor-led training, and mlearning).

The outcome of this review indicated that we should develop a more modular based structure to our courses. However, developing such a structure is not as easy as it first sounds and there are many considerations that must be taken on board before a modular based structure can be launched across a global corporation. The results of this process have resulted in Ericsson's new Learning Content Management process and some of the principles behind this policy are shared with you here, particularly where they concern mlearning.

2.1 Learning Content Management Basics

First of all, any comprehensive learning content management policy must take into account all possible delivery formats of the material. At Ericsson, the majority of our material is delivered in the traditional manner as Instructor-led training. However we have a growing elearning sector and we are positive towards the use of mlearning as a viable delivery method. Therefore it was essential that whatever structure we put in place could handle all delivery formats.

Other initial considerations were that we would most likely need a new software support system to manage and administrate the new structure on our content. A feasibility study into the use of our existing system indicated that it would not measure up to the new requirements we were developing. This we initiated a vendor selection and approval process to test the marketplace to select the most appropriate learning content management system.

Of most concern though was the consensus that the most important criteria had to be that we future-proof the content. In other words we required all the content developed according to new principles to be reusable in the short, medium and long term. Therefore we avoided any kind of bespoke solutions and concentrated on the growing global development and acceptance of standards and reference models for learning content. Although these are primarily developed with elearning in mind (e.g. SCORM) we conducted a feasibility study into which standards and reference models that we could use for all of our content including mlearning.

2.2 Frameworks for Learning Content Management

The result of this feasibility study pointed towards the use of SCORM as a baseline requirement. In other words we would apply SCORM standards to our content, regardless of delivery format, and we would only consider content management systems that supported the required standards.

We also made the decision to produce modules of learning rather than complete courses. We defined criteria for a module as follows:
•A module is a self-contained part of a course covering a specific topic and/or a reusable chunk of information.
•A module is an indivisible, independent unit of training.
•A module is built upon one or several Main Learning Objectives. Each Main Learning Objective is based on Detailed Learning Objectives.
•A Module should have a recommended duration of 3 hours up to 1 day (ILT), and 1 hour (elearning) and 30 minutes (mlearning)
•A module will have metadata attached to it, making it possible to uniquely define and describe the module.

Of course we did not want to fall into the trap of developing different modules for different delivery formats. However we did have to take account of our current situation where the majority of the content is developed for Instructor-led training use. To avoid falling into this trap we included within the meta-date

model the primary delivery method for each module as well as secondary delivery methods. We also knew that the ability to be able to publish content to different formats depended a lot on the capabilities of the content management system that we would choose.

In this new content management scenario we apply a SCORM framework that enables us to manage the content in a much more systematic way than before. Firstly, for every piece of content that we develop, regardless of delivery format, we apply a SCORM supported meta-date model. This model is very comprehensive and the following illustration indicates the kind of meta-data that we record per module. The model we developed is in conformance with SCORM 1.2.

Information	*Informal description*	*SCORM metadata category and element used*	*Multiplicity*	*Type*	*Sample/ vocabulary*
Title	Title of the module	General/title	1	Lang string	"How to install base station XYZ"
Identity	A unique identifier	General/identifier Catalog = "Ericsson Education" Entry	1	Char string (Ericsson principle to be defined)	Entry="LZM 123 456"
Description	A description of the contents (to be used in course description)	General/description	1	Lang string (Ericsson guidelines to be defined)	"This modules describes how to install base station XYZ, maintenance and configuration"
Author	Responsible author of the module	Lifecycle/contribute Role = "author"	1-*	Role Entity Date	Entity = "Karl Karlsson, HQ 123" Date = "2004-08-09"
Owner	The owner of the module	Lifecycle/contribute Role = "publisher"	1-*	Role Entity Date	Entity = "Jim Boss, HQ 456" Date = "2004-08-06"
Language	The language(s) of the	Educational/language	1-*	ISO639 :1988 string	Language = "en-GB" This field

	module content			("en-GB","en-US" etc)	should not be visible to end-users.
Version	The version of the module	Lifecycle/version	1	Lang string	Version = "R1A"

This is only a sample of the meta-data used for one individual module. The total number of fields used is currently 31. We develop one such meta-date master file for every module in our portfolio. The flexibility to customize the model to our own specific needs whilst retaining the integrity of the data over time was a big factor in choosing the SCORM model for Ericsson's content management strategy.

3. Application of a Learning Content Management Policy

Once we had agreement on the meta-date framework to use the next step in the progress was to finalize a contract with a provider of a learning content management system. Perhaps the key requirement was that the preferred content management system would support SCORM 1.2 in full. This was crucial as our meta-data model was so completely derived from SCORM. In synchronization with this vendor selection process we have had to undergo a large change-management process and this process is still very much on-going.

3.1 Tools and systems

An analysis of the leading learning content management systems on the global marketplace threw up some surprises for us. Firstly, most did not support SCORM 1.2 to the level of detail required by us. We hadn't expected this as an earlier preliminary feasibility indicated widespread support for SCORM amongst all LMS and LCMS providers. But we quickly learned that there is widespread support for part of SCORM, perhaps a number of key meta-data fields, but there is very little support for all of the possible fields. We quickly narrowed the list of potential suppliers down to three and we are in final negotiations to purchase one of these. We have conducted detailed 'sand box' trials with one vendor and the indications are very positive for the validity of our approach.

3.2 Learning content management and mlearning

As part of the on-going work at Ericsson we are applying the SCROM-based meta-data model to our mlearning courses. We have a sample course publicly available today at this address:

http://learning.ericsson.net/leonardo_courses/stand_alone_version/WCDMA_RAN_Overview/index_WCDMA_RAN_Overview2.html

This course is optimized for delivery to mobile devices such as the Sony Ericsson P900. However it is accessible by any mobile device with a web browser. A sample screenshot of this course is included here:

From the point of view of content management this course is considered to be a single module as it matches the criteria that it is considered to be an indivisible, independent unit of training. Some of the meta-data for this course/module appears as follows:

Information	Informal description	Sample/ vocabulary
Title	Title of the module	WCDMA RAN Overview
Identity	A unique identifier	Entry="LZM 123 457"
Description	A description of the contents (to be used in course description)	"This modules describes the radio access network for WCDMA
Author	Responsible author of the module	Entity = "Sean Smith" Date = "2005-02-09"
Owner	The owner of the module	Entity = "Paul Landers" Date = "2005-02-09"
Language	The language(s) of the module content	Language = "en-GB"
Version	The version of the module	Version = "R1A"
Primary Delivery Format	**The recommended delivery format**	**''mlearn''**
Secondary Delivery Format	**Other viable delivery formats**	**''elearn''**

As you can see I have highlighted the delivery format fields. There are some distinct advantages in having our content so finely described and tagged. Firstly, it is possible for our learning architects to quickly search for content to fit a specific purpose. They can search on any of the meta-data fields. If they require learning content on the subject of WCDMA that is preformatted for mlearning then they just have to use the two search criteria 'mlearn' and 'WCDMA RAN overview' in the relevant search fields. They will immediately get a hit on this course and any other courses and modules that match these search criteria. They can then browse this content to confirm that it is suitable and include it in customized courses and/or curriculums for our customers. Obviously this is a much more efficient way of managing the vast information we have at our disposal.

4. The Future

So where does this work with SCORM, modules, meta-date standards etc leave Ericsson and its work with mlearning? The answer is quite simple. We have been working on this meta-data model for 12 months and through trial and error we have refined it to suit our specific needs whilst still ensuring the longevity of learning content developed in accordance with its principles. We are now entering the next phase of the endeavor which is to begin to create all new content according to structures in our meta-data model. We also plan to convert specific old content to the new model, particularly content that is foreseen to have a medium to long-term lifespan.

Specifically regarding mlearning, Ericsson Education is currently working to refine the content development process for mlearning. We have evolved from the production of basic mlearning content specifically for WAP 1.1 enabled handsets in 2000 to the use of much more evolved technologies such as Flash and specifically Flash Lite. More importantly, mlearning is considered as a viable delivery format, hence its inclusion in the learning content management framework as demonstrated earlier.

However that is not to say that the future is clear and well understood for mlearning. There are still obstacles to be overcome and questions to be answered. For example, what is the business model behind mlearning? What is the optimum pedagogical experience when using mobile devices? How should we handle simultaneous development of elearning content and mlearning content? Do we develop once and expect content management systems to render according to the device requirements? Or do we develop content in parallel?

It will take further research and development to answer these questions. However one thing is clear; the importance of an innovative systematic approach to learning content management is crucial for a company like Ericsson to harvest the vast information at its disposal for its own benefit and for the benefit of its customers. Survival in a knowledge-based industry and a knowledge-based society demands such innovation particularly in the area of education and learning where access to the right information and knowledge at the right time (and on the right device) is crucial to success.

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