

# The Challenge of Content Creation to facilitate Personalized eLearning Experiences

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## Abstract

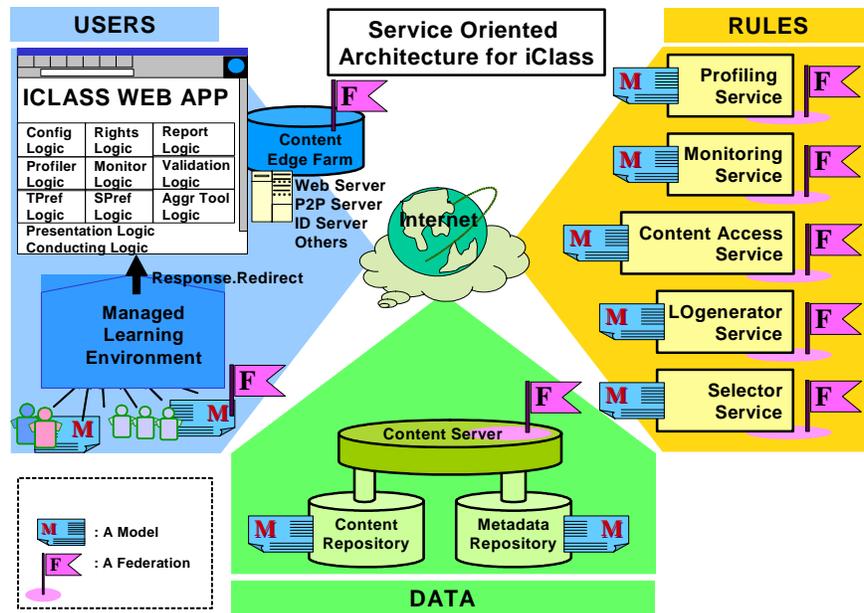
The runtime creation of pedagogically coherent learning content for an individual learner's learning preferences is a considerable challenge. By selecting and combining appropriate learning assets into a new learning object a learner's needs and preferences may be accounted for. There are a number key aspects that need to be addressed in order to perform this kind of personalization, such as the appropriate modelling of the learner's needs and preferences, representation of pedagogical strategies, representation of learning assets and the runtime reconciliation of these elements to produce effective and coherent learning experiences. iClass, an Integrated Project, funded by the European Commission under the auspices of the IST FP6, addresses this challenge with an innovative and ambitious suite of eLearning services. This paper introduces iClass and its objectives.

## 1 Introduction

iClass [iClass] has adopted the objective of formulating a new pedagogical approach by exploiting the potential of ICT to support a personalized, flexible and learner-centric approach. This pedagogical approach strives to facilitate empowerment of both learners and teachers, while producing personalized learning experiences. Based on this, the iClass project aims to establish a framework to deliver a personalized, adaptable and adaptive learning experiences in a collaborative environment for learners.

iClass comprises a number of services that facilitate the modelling of learner information, such as the Monitor and Profiler services, that are responsible for assembling a view of the learner's abilities, preferences and needs that iClass can utilise as part of the personalisation process. The complimentary service of the Teacher's Preference Tool enables teachers to control the personalisation features of iClass to ensure it may be used in conjunction with their classroom. These preferences form the boundaries and constraints under which iClass may adapt.

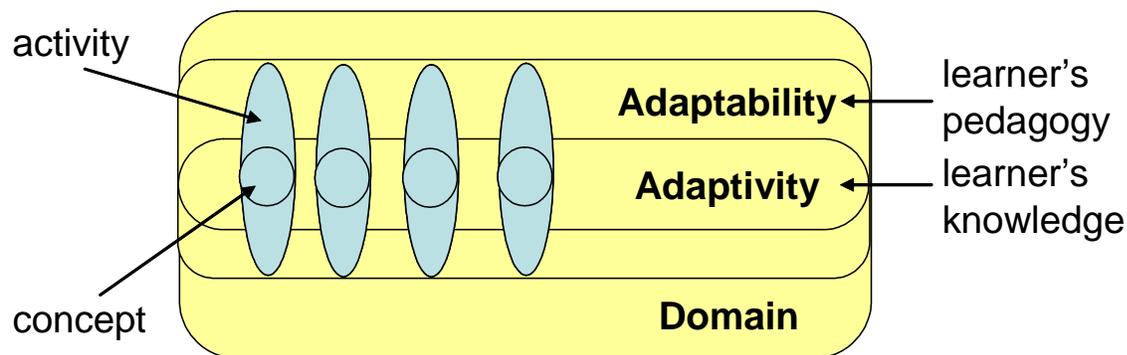
The key services for facilitating personalised eLearning experiences are the Selector and LO Generator. The Selector is responsible for formulating personalized high level strategies for facilitating learning. These strategies, or Personalized Learning Paths, comprise the set of concepts and learning activities that are appropriate for the learner's current goals and preferences. The LO Generator is responsible for assembling appropriate Learning Objects to fulfil the concepts and activities described in a learner's Personalized Learning Path.



**Figure 1, The iClass services and repositories**

This paper describes the objectives of iClass with respect to personalization of a learner's experience. Section two describes how iClass will cater towards a learner's needs by providing adaptable, as well as, adaptive solutions. Section three will look at the iClass framework and exemplify some workflows carried out by iClass. Section four will examine content issues that arise when developing personalized content. Finally, section five will conclude the paper.

## 2 Catering Towards Learner Needs



**Figure 2, Models of the learner effect the choice of concepts and activities**

Personalized learning experience is accomplished through personalizing the learning material according to the pedagogical and contextual parameters of the learners. Pedagogical parameters comprise the learning styles, habitual properties, and general aptitude of the learners. The aspects like cultural background, place of study, collaboration, timeliness and hour of study are some of the contextual parameters.

As for adaptivity, adaptive learning experience is accomplished by adapting the learning paths to the knowledge level and the acquired competencies of the learner. Learning paths are portions of the concept domain ontologies. These ontologies essentially represent the curriculum constructs. In addition, adaptivity will also have to take into account the learners having off-the-iClass experience so as to reflect to their iClass experience. In order to achieve this adaptivity, appropriate assessment techniques are continuously employed by iClass. Hence, the knowledge representation of the learner is continuously updated throughout his/her iClass experience.

Being adaptable implies that the learners assume responsibility within the designated limits, and have freedom, yet guidance based on their pedagogical parameters and preferences. Providing the learners with the suitable learning tools exemplifies this guidance. The extent of the adaptability provided by iClass frames the scope of how adaptive iClass will be towards the learners. The strategy of iClass is to be adaptive in its support of the learning activities while remaining adaptable to the learning style variations of different learners. That is, learners with different learning styles react in different ways and therefore they require different support when consuming the same learning object. This differentiation in support is not only in the sense of a search for an appropriate learning object, but it is also in the sense of consuming this learning object.

Being both adaptive and adaptable, iClass aims to create learners who have the ability to learn from different types of learning materials even if s/he has a preferred style, yet the learner must remain active in the process of decision making, which facilitates the learner to own the responsibility of his/her learning experience.

iClass employs preferences tools for both the teachers and the learners so as to reinforce the adaptivity of iClass by the provided parameters, such as contextual information, collaborative learning, or best practice activity structures. iClass also shares the learner models it forms with teachers and learners.

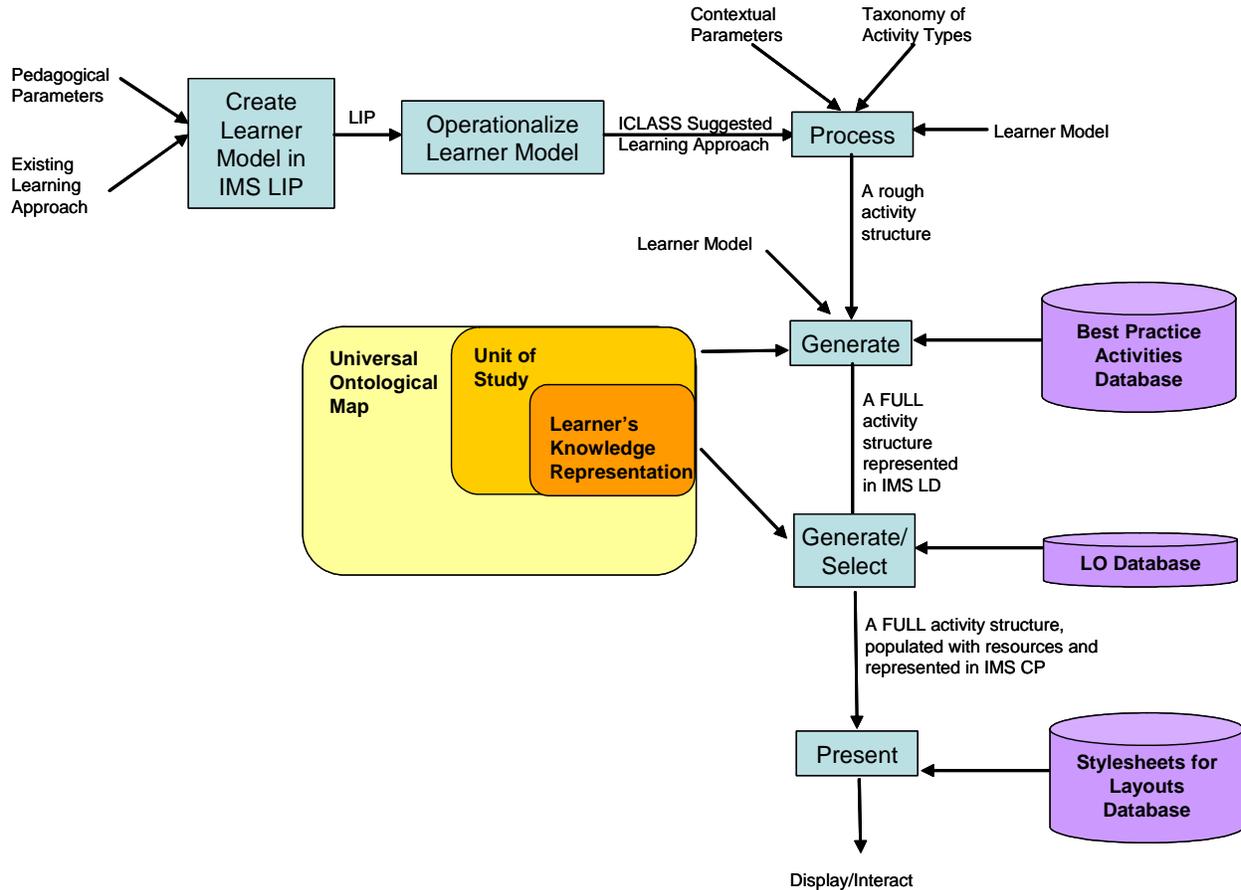
### **3 Example Workflow**

Utilizing the required services and the supporting tools to achieve the identified educational objectives, the potential iClass system reveals a framework accommodating the processes for providing unit of study creation and consumption.

iClass determines and employs a pedagogical scenario in order to create a structure of activities to cover a unit of study which represents a portion of the curriculum domain map. The identified portion of the curriculum domain map is adapted to the knowledge level and acquired skills of the learner. The type of activities in this chain is determined by using the pedagogical and contextual parameters. For each section of the activity structure, iClass searches and finds learning objects that suit the activities involved in the activity structure. Hence, these learning objects also suit the pedagogical and contextual parameters, and will have to suit the corresponding portion of the unit which is a set of concepts and skills.

The workflow represented in figure 3, below, highlights the personalization process performed by iClass. The process is both standards-based and pedagogically aware. The key stages in creating a personalized eLearning experience are modelling the learner, choosing an appropriate learning approach, selecting appropriate content and activities to perform teaching and finally populating those concepts/activities with customized learning objects. Pedagogical preferences of the learner

are accounted for in selection of learning approach and are utilized as part of the concept selection process.



**Figure 3, Utilization of content**

#### 4 Content for Personalization

Targeting personalization, being adaptive and adaptable constrain the learning content to be developed and exploited by iClass. The content publishers in iClass are in charge of providing both user-readable and system-readable content. Among the system-readable content are knowledge representations, ontological maps for representing curriculum, instructional and learning designs, metadata and sequences of learning objects, while the user-readable content comprise the learning objects, learning resources and learning tools. iClass employs content aggregation, ontological map editing and learning activities authoring tools for both type of content. In order to achieve the interoperability of learning systems, iClass exploits the standardized technologies, such as OWL for curriculum domain maps and knowledge representations, IMS LD for activity structuring, SCORM for learning objects storing, IMS LIP for learner profiling.

In order to properly execute the scenario above, both the user-readable and the system-readable content need to be created. The content creation, in this sense, covers the development of learning objects and learning designs that form the pavement of the introduced flow. The development of

learning objects and learning designs should be coherent in order to prevent from disharmony between these two. The mosaic effect to be caused by sequencing these learning objects at runtime with respect to a selected learning design implies a real challenge for content creation. Indeed, this mosaic effect reveals to be the accumulation of the structural effect caused by learning designs and of the visual effect caused by learning objects.

In addition to that iClass determines the sequences of the learning objects during the execution of the introduced flow, the tools for content aggregation are also used to sequence the learning objects to be employed within this flow. Hence, this nature of iClass necessitates a well-formed co-operation between the separate modules of iClass that are involved in content creation.

One aspect of content creation involves the curriculum analysis, and accordingly the development of the ontological domain maps. The curricular variations imply a real challenge for this process, particularly for the systems, like iClass, that work with various curricula.

Another aspect of content creation is the development of knowledge representations for both domain and user models. For this purpose, the evolving nature of the constructs (possibly questions) of the knowledge representations that are related to both domain and user models should be taken into account.

The learning objects are developed according to the created knowledge representations and ontological domain maps with respect to the domain model. The creation and generation of learning designs with respect to the user model are achieved by suiting the generic pedagogical scenarios introduced by iClass. Both learning objects and learning designs are created by taking into account the cultural and contextual adaptation.

Finally, learning tools complete the personalized learning experience, and provide feedback to the overall iClass system.

## **5 Conclusion**

This paper has described the role of content in creating an eLearning experience that is personalized towards the learner's needs as part of iClass. Specifically it has discussed how the iClass framework facilitates the tailoring of eLearning experiences towards learner's and teachers needs and preferences. The iClass IST project, funded under the European Commissions 6th Framework, is striving to provide educators and learners with a personalized learning environment built using pedagogically sound principles.

## **References**

[Brady et al, 2004] Brady, A.; Conlan, O.; Wade, V. Dynamic Composition and Personalization of PDA-based eLearning – Personalized mLearning. E-Learn 2004, World Conference on E-Learning in Corporate, Government, Healthcare and Higher Education, Washington, D.C., November 2004

[Conlan and Wade, 2004] Conlan, O., Wade, V. (2004) "Evaluating the Multi-model, Metadata-driven Approach to producing Adaptive eLearning Services", *Third International Conference on Adaptive Hypermedia and Adaptive Web-Based Systems (AH2004) Proceedings, Eindhoven, The Netherlands* (2004)

[iClass] iClass Integrated Project, Annex 1, Description of Work, <http://www.iclass.info>