



Ambient Learning: a new paradigm for e-learning

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Abstract: This paper presents the innovative e-learning service, ambient Learning, which aims to empower the lifelong learners and vocational trainees. Ambient Learning provides access to high quality e-learning material at a time, place, pace and context that best suits the individual learner. To achieve this aims ambient learning utilises multimodal broadband access, and context management. Moreover, ambient learning through the provision of content integration allows access to, new e-learning material as well as existing catalogues/e-learning resources.

Keywords: ambient Learning, e-learning, use cases, .context and content management

1. Introduction

The shift to the information society poses new challenges for learning and knowledge. In a society where information is becoming a strategic raw material and knowledge a fundamental production factor, how this resource is used is critical for the performance potential of companies and of employees. The new information and communication media provide the necessary technology to make knowledge available world-wide and create an unprecedented abundance of data and information. To respond to individual needs, it is becoming increasingly important to select information and to systematise knowledge (see [1], [2]). A falling “half-life” for knowledge makes life-long learning necessary and how up-to-date information is becomes the critical factor in competition. In times of increasing globalisation and networking, flexible access to information must be guaranteed anywhere and at any time. Ever increasing competitive pressure contrasts with an increase in the number of requirements, requiring a reduction in costs for training and occupational training measures.(see [3])

Therefore, one would have anticipated that e-learning would have been embraced since it offers the promise of meeting all above requirements. However, a recent report surveying [4] the use of e-learning in Europe has drawn a rather concerning picture. In that report it is revealed that 61% of all respondents felt that the quality of e-learning was fair or poor. Moreover, the whole take-up is further hindered by factors such as fear of miss-investment, lack of time and expertise, inadequate accessibility and usability and failure to integrate e-learning with the work and life process or even inadequate low-quality learning content [5]. Ultimately, as reported in [4] and [5], the key points that appear to be obstacles for the deployment of e-learning are: time and money.

Ambient Learning addresses exactly these two key obstacles through the usage of recently established technologies enabling ambient intelligence as well as context aware services. The objective being to provide a pragmatic, easy to use e-learning service, allowing any time any where, any how, access, that is being adapted to individual needs, to high quality learning material.

To achieve this objective, ambient learning uses multimodal broadband access, context management and content integration. These features and the whole ambient learning concept will be demonstrated on 3 use cases that will provide an initial impression about the service.

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In section 2 that rationale of ambient learning is examined and the framework for its development is being presented. In section 3 the use cases demonstrating the service are presented

2. The rationale of the ambient Learning Service

The rationale of ambient learning is to provide a pragmatic, easy-to-use eLearning service, which allows any time, any where and any how access to personalised, high quality learning content. The main distinguishing features of the *ambient learning service* to other e-learning approaches are shown in figure 1 and described in details below.

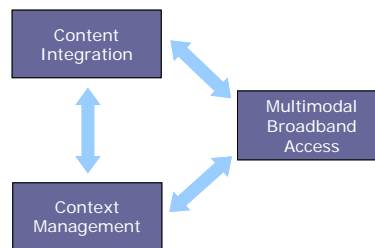


Fig 1 The main distinguishing factors of ambient learning.

2.1 Multimodal Broadband Access

This mode of access allows the user access to eLearning objects any time, any where and any how. (The user can use the eLearning system via different existing broadband networks (e.g. LAN at the office, WLAN at a specific hotspot, GPRS/UMTS on the move) employing the most suitable modality (interactive learning objects on the Office-PC, text-to-speech read-out while driving in the car, mobile PDF while sitting in the train etc.)).

To maximise cost-effectiveness and to reach the widest possible user base, the architecture of the ambient learning platform is based on a powerful central server with multiple 'thin' clients. (see [6]) This provides an excellent level of security for the customer organisations. In addition, it allows end-users a wide choice of low-cost client terminals. This component allows the user access to the e-learning content any time, any where and any how. The users can access the ambient learning web services through a peer-to-peer arrangement over various networks (broadband access like DSL, UMTS, WLAN, GPRS etc) employing the most suitable modality.

The transport type is the protocol that is used to transfer data from your client to your service. A Web server uses Hypertext Transfer Protocol (HTTP) to transfer data. HTTP is also used with Web Services to transfer service requests. The benefit of HTTP is that requests to a service are not blocked by company firewalls. A request that is transferred via HTTP is the most interoperable of all protocols because of the firewall issue. However, there are a huge number of transport types that can be used for service invocation. The attributes of the service you are building will determine the most appropriate transport type. The Learning Management Service (LMS) is responsible for the delivery and management of the learning content. The Learning Management Service is distinguished from a typical 'LMS' by its flexible support for multiple pedagogic models [1], [7] through static and adaptive Reusable Learning Object sequences. It is, in effect, a neutral delivery and tracking tool which will 'play' whatever content is fed into it (from the LCMS or from any third party provider) so long as it conforms to standard XML protocols.

2.2 Content Management and Interoperability

The Learning Content Management Service uses a workflow-driven approach. Learning Objects are discovered and assembled using a meta-data language allowing flexible course usage. The learning mate-

1 rial can be imported from other Content Systems using IMS interoperability standards and similarly
2 exported to the Learning Management Service for learning delivery.

3 Content Integration allows access to existing knowledge catalogues and e-learning resources. It en-
4 ables fast conversion of existing content and powerful course assembly. It is possible to quickly and
5 easily create Learning Objects-based courses and integrated testing using content that can come in the
6 form of Word, text, SCORM-conformant content and any HTML documents. The system can integrate
7 already existing e-learning objects and other high-quality content.

9 2.3 Context and Profile Management

10 As far as possible, an e-learning platform must adapt the services [1], [2] and the service delivery accord-
11 ing to the needs and situation of the user. This component enables the provision of e-learning objects
12 based on the context of the user. The context of the user includes factors like schedule, tasks, personal
13 profile, previous experience, available device and interests etc. It allows personalised and context based
14 usage. Personalization is the process of tailoring pages to individual users' characteristics or preferences.
15 It is a means of meeting the users' needs more effectively and efficiently, making interactions faster and
16 easier and, consequently, increasing users satisfaction and the likelihood of increasing the e-learning
17 activities. Based on the context and the profile, the learning content, which suits the user perfectly can be
18 delivered context-specific using the best suitable multimodal broadband access.

19 All services in the framework delegate the task of managing users and groups to the central services
20 Context and Profile Management. This Management Service provides the backbone for the user authen-
21 tication and authorisation for all services in the framework. All services have access to a single schedule
22 management system controlling both synchronous and asynchronous messages between the services and
23 the users. Examples include reminder messages to chase the progress of a student application for enrol-
24 ment, a student for an assignment, or a tutor for responses to student queries and so on. User calendar
25 functionality is also supplied by the Schedule Management Service.

27 3. Uses cases demonstrating the service of ambient learning

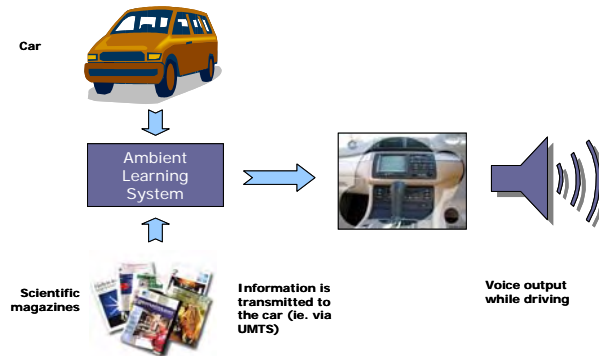
28 The *ambient learning service* can, for example, be implemented as a B2E portal. In contrast to traditional
29 intranet solutions, the focus here is less on the company and more on the individual. To reach this goal,
30 the B2E portal is designed to include not only everything that an employee might hope to find on an
31 intranet (such as a corporate directory, or customer support information), but also any personal informa-
32 tion that the employee might want (such as stocks information, or any field of interest), based on his
33 context. In addition, an Application Service Provider (ASP) will provide the Ambient Learning Service
34 via public networks (e.g. internet, WAP) and take over the entire service (e.g. user support). The Ambi-
35 ent Learning Service is less a disseminator of basic knowledge and more a node point for all further
36 training initiatives. The following case studies give an initial impression about how the Ambient Learn-
37 ing Service works:

39 3.1 Ambient learning assisting the busy professional to be trained according to their schedules

40 An empirical study see [2], identified that busy professionals lack time for vocational training. Moreover
41 the busy professionals prefer articles out of scientific or professional magazines as their main source for
42 vocational training. Exactly this problem is addressed within the first application example of the ambient
43 learning project.

- 44 • Example: Mrs. Taylor is a partner in a consulting company, which is specialised in high-
45 technology consulting. Due to her busy schedule and her attempt to achieve a good work-life
46 and private-life balance, and because of her personal dedication to assure a good upbringing of
47 her children, she lacks time for vocational training. The ambient learning service allows her to
48 structure and define her personal training needs. Based on her context (such as driving to a cus-
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1 tomer with her car) and her personal interest the learning content is downloaded from a scientific
 2 magazine database to her mobile device and is read to her with a TTS engine (text-to-
 3 speech) while she drives to her customer.
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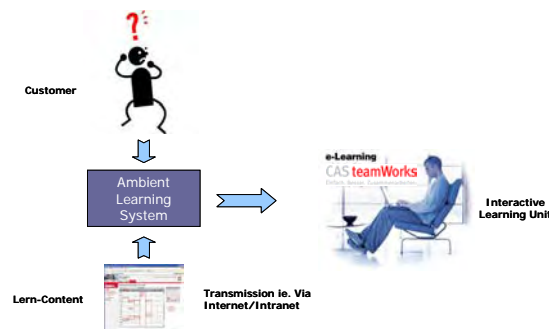
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18 **Fig 2** Ambient learning enabling a professional to define personal training needs.

19 The *ambient learning* service allows Mrs. Taylor to actively train and improve her knowledge in a
 20 concurrent approach, which does not negatively affect her daily schedule. If she has a free evening
 21 she can study from home using a secure broadband access to the *ambient learning* service and
 22 choose ad hoc which type of media (e.g.: SCORM-based interactive learning unit, PDF, WWW-
 23 based learning unit, TTS, Flash) she wants to use for her learning activities.
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25 3.2 Ambient Learning assisting the professional to be trained using innovative solutions as a 26 service 27

28 Innovative software-based solutions and applications are not widely deployed in European SMEs. This is
 29 mainly due to the digital illiteracy and lack of financial resources to employ consultants, which could
 30 tailor the software applications to the specific needs of the SMEs. The second example tackles this issue.

- 31 • Example 2: Mr. Frey is a trainer for a small software house and instructs customers how to install,
 32 adapt and use innovative information management solutions. Due to a lack of qualified
 33 consultants, his employer is not able to deploy the useful information management solution to
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46 **Fig. 3** Accessing innovative solutions via the ambient learning platform.

47 the European market. The ambient learning service allows delivery of an interactive learning
 48 unit to potential customers, where the functionalities of the information management solution
 49 are explained. An integrated assessment tool allows for interactive testing of the customers
 50 know-how and suggests context-based in-depth training or repetition of specific areas.
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3.3 Ambient learning assisting the busy professional to be trained based on their context

Service employees who are mainly on external duty, have often no time or opportunity to participate in standard training activities or state-of-the-art e-learning applications due to their different and often changing environments (different devices, different communication networks etc.). The ambient learning allows context-based access to important learning units, like new functionalities or services.

Example 3: Mr. Fernando is a travelling salesman for a mechanical engineering company. His company is able to implement innovations quite quickly into the machines. Therefore Mr. Fernando can always offer highly innovative products, which are described in technical specifications. Due to his extensive travelling with different means of transportation he needs to learn about the new functionalities of the machines using different means. If he is travelling by train the technical specification is downloaded from the intranet as a PDF-document to his Notebook. During the train-ride he has the chance to read the specification. If he is travelling by plane, the technical specification is converted to mobile flash and he can access the learning content on his PDA, while he is flying to the customer. If he is on his way by car, he is informed about the main new features via TTS (text-to-speech).

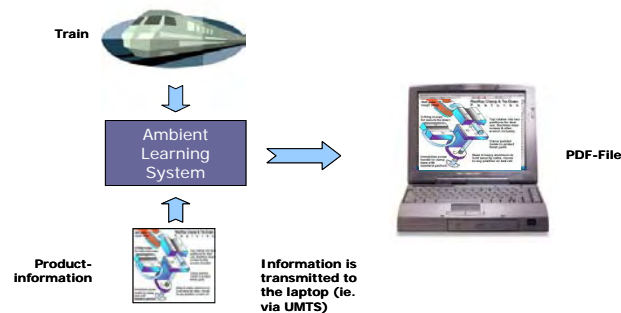


Fig 4 Ambient service assisting accessing information based on the context of the user's profile

4. Conclusions

The ambient learning service is an innovative one offering access to new as well as existing resources that can be tailored to suits the needs as well as the circumstances of today's busy professional according to circumstances. Moreover, such a service will be assessed in 3 EU countries in 34 different settings.

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