Spatial Knowledge Management in Land Administration

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ABSTRACT

The paper deals with the experiences of a European Union sponsored LEONARDO da VINCI project, Land Information Management for Executives (LIME), co-ordinated by the College of Geoinformatics, University of West Hungary (GEO).

LIME aimed:

(1) to identify skill and qualification needs, particularly in relation to jobs in the new information and communication technologies, specifically in land information services; this produced a new profession of 'land information manager assistant ';
(2) to develop, test and analyse new validation / certification methods for skills and qualifications, including key skills and skills acquired through work experience; this will result in the accreditation of the course by the National Course Register in 2002;
(3) to develop innovative approaches to attaining a standardized, equal quality of training; this was achieved by setting up 7 local centres (with the provision for more centres to be established). These centres allow the distance-learning participant to access additional services and help during their course of study.

The outcomes were a knowledge resource centre and an Internet-supported distributed education service for the Hungarian Land Administration. The results of the investigations and future plans are presented in this paper.

The project created an even more flexible and widely applicable staff development resource that can be used by individuals from many civil service disciplines. The provision of such a resource is essential for adequate staff development to support those preparing for Hungary's accession to the EU. The LIME project updated and improved the structure and developed a new short course in land information management, creating an EU conform new profession called "land information manager assistant".

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1. CHANGES AND NEEDS

Due to advances in digitisation, processing speed, storage and communications, we are living in a networking revolution. Higher education will have a crucial role in developing these capabilities as well as educating the people who will use them. New job opportunities will be created in the processing, organizing, packaging and disseminating of spatial information. The networked world is changing the way we create products and provide services. All around us we find new tailored products, targeted marketing and customisation. Consumer demand for more choice, higher quality, lower cost, better service and convenient access is a dominant force affecting all industries, including higher education (Oblinger – Verville, 1999).

The Hungarian Government is investing in information technologies and services, by building up e-government. Some areas of activity are closely related to the land administration sector:

- development of digital procedures for internal administration, to make government offices cheaper to run, quicker and more effective;
- introduction of digital access for citizens contacting government agencies;
- creation of databases for legislation, policy formulation and information dissemination;
- encouraging organizations to close the information gap between national and local authorities, and urban and rural areas.

The efficient handling, updating and maintenance of the spatial data infrastructure needs highly qualified, properly trained staff. Learning and working are more and more similar. The concept of the 'learning organization', including 'lifelong learning' for staff, is now recognized as a key element in corporate strategies. This will reinforce consistency, common identity, shared corporate culture, common actions, clear responsibilities, coordination and dissemination of good practice.

2. RESPONSES

The urgent task for educational institutions is to reorganise resources for professional development services. In extending existing education and training programmes, the main objectives should be:

- to develop still further the corporate dimension of education;
- to improve the quality of training and foster innovation in education by increasing exchanges of experience and information on good practice;
- to establish an area of training by obtaining recognition of its qualification;
- to promote the virtual mobility made possible by new communication technologies ;

- to develop common databases and other sources of knowledge on skills needs;
- to conduct comparative research on methodologies used and policies implemented;
- to improve the interoperability of systems of distance learning and increase the level of standardisation.

In generalising access to skills through Information Society tools in the context of lifelong learning, LIME has the twofold objective of developing information and communication technologies in order to assist the process of giving access to lifelong learning, and of meeting new demands for qualifications and skills in connection with industrial change and the emergence of the Information Society, by:

assisting the development of land information management within the Information Society; here the courses were designed to give a practical element to the theory behind each module. Each module contained both a theoretical and a practical element, allowing the participant to use information technology and computing packages;

developing innovative training products and methods to help the less qualified in different areas needing land information in general; here, the training contains a significant practical element and this allows the less qualified to visualise the process. Allowing for practical examples and exercises gives participants hands-on training.

The first LIME project objective was the creation of a program of education for continuing professional development for Land Information Management in Hungary based on an existing program developed under the TEMPUS OLLO project and other projects in Hungary and the EU. Particular attention was paid to common European concerns. This program will utilize the existing Land Information Infrastructure. In seeking to achieve its objective, the project developed a knowledge resource centre in land information management matters, which can be used in a flexible manner as part of a staff development program tailored to individual requirements.

The project has created an even more flexible and widely applicable staff development resource that can be used by individuals from many civil service disciplines. The provision of such a resource is essential for adequate staff development to support those preparing for Hungary's accession to the EU. The LIME project updated and improved the structure and developed a new short course in land information management, creating an EU conform new profession called “land information manager assistant”.

For quality management reasons, three pilot courses were carried out. The first pilot was aimed at tutors in order to disseminate the project results and build the critical mass of users. The second pilot tested the course's distance learning character. The students were selected from tutors and managers, thus helping to enlarge the tutoring network and provide a complete first run of the course. The distance learning materials were developed in the first year. The resulting lecture material, including PowerPoint presentations, was then linked to the 3 workshops, allowing participants to gain an overview of the subject material for the next term of study. The third pilot designed the assessment of the distributed course delivery.

Table 1 illustrates the breakdown of the course programme, giving the split between practical and theoretical elements within the modular structure. Each module is supplied with a detailed breakdown of learning material (approx 80-100 pages for each module). The materials are supplemented with information from the distributed learning centres and the knowledge resource centre (GEO). Participants can create individual study groups. Information is provided on CDs containing course materials and on the Internet site. These provide an up-to-date professional knowledge base of all the conceptual and practical modules defined in the professional and exam requirements.

Table 1. LIME CURRICULUM

Subject	*Theory*	*Practice*	*Ws*	*Length*
1. GIS applications			*22*	*3 days*
2. Office Automation	*40*	*30*		*6 weeks*
3. Data Acquisition and Integration	*30*	*30*		
4. Introduction to GIS	*20*	*20*		
5. Project Planning and Management			*22*	*3 days*
6. Digital Cartography	*20*	*20*		*6 weeks*
7. From Data to Information	*30*	*20*		
8. Administrative, Legal and EU issues	*30*	*0*		
9. Project Documentation and Presentation	*20*	*10*		
10. Decision Support			*22*	*3 days*
11. Optional module ▪ *Land and Property Valuation* ▪ *Rural Development* ▪ *GIS in Local Government*	*20*	*20*		*6 weeks*
12. Software ▪ *ArcView, ArcIMS* ▪ *Mapinfo, MapXtreme* ▪ *AutoCAD, MapGuide* ▪ *GreenLine GIS Tools* ▪ *Colibri Map*	*30*	*30*		
13. Thesis	*0*	*40*		
14. Exam				
	240			*240*
		220	*66*	*286*

3. DISTRIBUTED LEARNING ENVIRONMENT

A distributed learning environment is a learner-centred approach to distance education, which integrates a number of technologies to enable activities and interaction between students and tutors. Our model is based on amalgamating appropriate technologies with aspects of local learning centre-based workshops and co-operative Internet-based distance education. This approach gives tutors the flexibility to meet the needs of diverse student populations, while providing both high quality and cost-effective learning. There are 7 LIME local learning centres throughout Hungary at present, include the use of Technical High Schools as a resource base.

Within the LIME project, a collaborative delivery system for continuing professional development, based on a course management system and distance education technology and concepts with a comprehensive credit system, has been completed. The operation of a knowledge resource centre depended on the creation of a database of education resources and on a metadata system that would provide the flexibility needed for supporting professional development.

The resulting system has three layers:

(1) an open layer giving general course information, a demonstration module, details on distance learning, frequently asked questions, and registration details for both tutors and professionals;
(2) a protected layer for the actual participants that includes all the learning material and case studies and practice sessions, free software and databases, basically all they need to complete the course and prepare themselves for the examinations. There is also a dedicated news board, the facility to create study clubs, an interactive job page, relevant references (both text based and internet), a dictionary of geographical information terminology, and learning guides, with each participant being given a dedicated LIME email address and password to the site;
(3) an administrative level. Here access is limited to the staff of learning centres and GEO. This level deals with the course administration, including enquiries, student records, progress reports and fee status, etc.

The technical side was emphasized above. However, the distributed learning environment is a social system too, consisting of the continuous development of knowledge, skills and competences in which subsystems can occur, distributed in time and place, and in which information and communication technology ensures collaboration. The ability of students to connect with experts around the country, as well as their group members, also opens new opportunities for learning and professional development. Students and tutors find these opportunities motivating. Distributed instruction, the explosive expansion of networks, and the trend to move bits instead of people and products will continue to erode the domination of traditional educational institutions. GEO and its project partners already have considerable experience of the education technology needed to deliver the proposed programme. The UNIGIS network of universities is a major provider of professional education in GIS and an active developer of web and other education technologies that are available to this project.

4. KNOWLEDGE MANAGEMENT

Learning technology is rapidly changing. In previous years we focussed on Content Management (CM): content creation, electronic publication, Internet-based communication and student support, taking into account the special pedagogy of distance education. However, we realized the need to move from CM to Knowledge Management (KM). The differences between CM and KM are in the business components, including strategy, processes, and organization.

By using a Knowledge Management System (KMS), organisations increase returns, save time and money, are more adaptable, and have a far better understanding of partners, processes, customers, competitors and their business. To benefit from every customer or partner interaction, corporations must give employees opportunities to record what was learned. Efficient knowledge management needs not only document knowledge but must provide tools for collaboration to all contributors to the knowledge pool. Then, other employees must have access to the data and the means to understand it in context. Knowledge management helps an organisation gain insight and understanding from its own experiences. When employees use this KMS, best practices are stored throughout the organization, and each employee accessing the system has similar power to the best employee (ArsDigita, 2001).

We realised in Hungary that educational institutions have multiple reasons for loss of essential knowledge that evolves through time and experience: experienced teachers and tutors retire or change jobs. By providing access to the global knowledge base, the consortium members become more effective and competent. LIME KMS aims to fulfil the above-mentioned functions. LIME developments are continuing within the NODE MINERVA project. The new system functions as a gateway to user and course level services. The gateway brings all relevant course information to the learner on a unified home page. The tutor has extensive control over the course page and additional administrative options.

The Internet platform was designed to foster collaboration. Some of the potential functions are as follows:

- Password protection and access control
- Personalised view of all relevant information
- Content presentation and distribution (lecture notes, assignments, samples, tests, quizzes, etc)
- Course management and administration (student records, calendar, curriculum, tracking, announcements, etc)
- Communication (online collaborative presentations, discussion forums, shared file storage, group e-mail, etc)
- Uploading (multiple choice and true/ false quizzes), file submission (homework or project).

Metadata will be crucial in implementing similar systems. Whilst learning units form the building blocks of a networked and inter-connected environment, metadata is required to bind the units together and allow them to interoperate. Metadata is required to describe what learning units look like, how to build a learning route from them, what if any refinements or value adding operations have been carried out on a unit, and in a networked environment what services a tutor/learner can request from a server and what parameters the teacher/student should send to the server to request the service. Adopting a standards-based approach makes it easier to change system components in future. IMS (IMS Global Consortium, previously known as Instructional Management Systems) IEEE and Dublin Core provide a range of specifications that yield a standardised data format, allowing different systems from different vendors to work together. For seamless searching to work, the world has to agree on the specification of educational metadata (Markus, 2000).

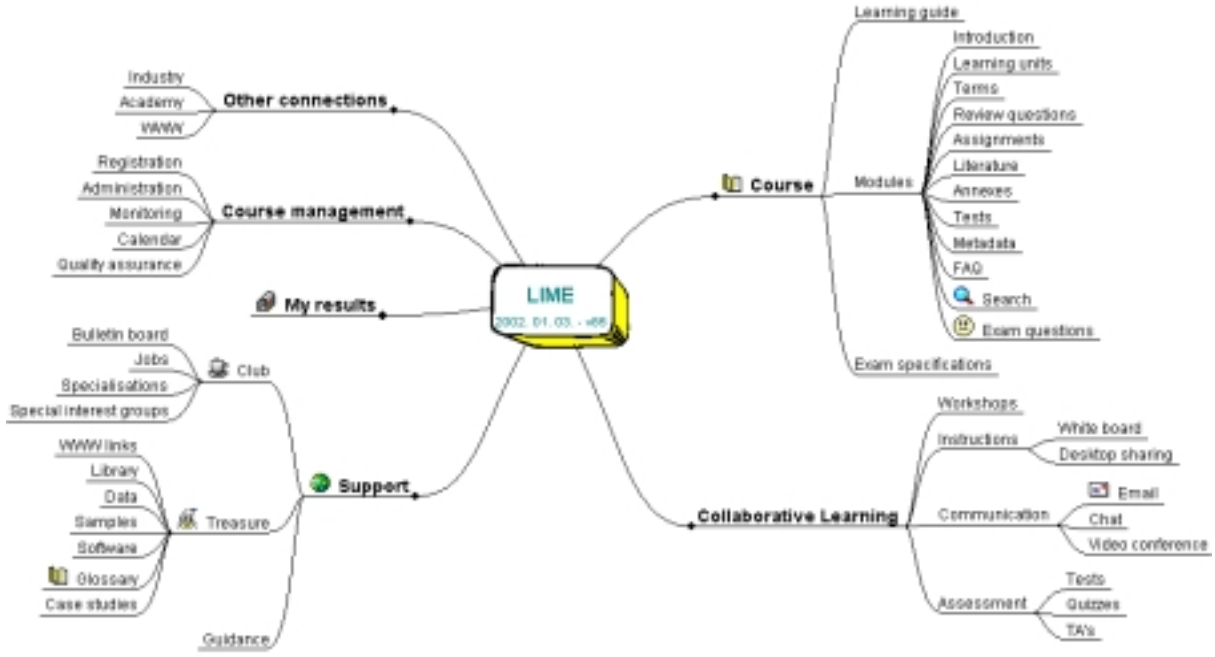

Fig. 1. LIME functions

Furthermore, the last outcome of LIME was the creation of a network of EU centres: education and data / information providers with the objective of participating fully in EU activities. The partner institutions are each active in the field of professional development and there are other institutions in the EU, which have long standing links with GEO. This network will be used to establish the dialogue necessary for planning the maintenance of quality in professional practice throughout the EU. This is ongoing and is expected to make use of the UNIGIS and GISIG existing networks.

5. CONCLUSIONS

Information and communication technologies as driving forces in the network revolution will have a dramatic impact on our daily life, working routine and education. Information technology will become essential everywhere. The IT revolution holds great promise and presents great challenges. It will be difficult to control but impossible to resist.

We must transform all traditional institutions of learning in order to prepare students for their future, not for our past. In addition to basic professional skills, every learner should master communication, collaboration, and creative problem solving. These are the very important skills and attitudes needed to be a lifelong learner.

The LIME project greatly improved the knowledge transfer in land administration in Hungary, and allows us to really participate in the educational development arena, rather than becoming late users of systems and regulations invented by others. LIME aimed to increase

collaboration between EU and Hungarian institutions and the sharing of learning resources. Co-operation will support specialization, improve quality, increase choice, and lead to a better fit with changing vocational demands in Land Administration.

The job market in general will become much more dynamic, complex and heterogeneous. The increased complexity will add to the difficulty of optimising job offers and job demands. LIME helps us to avoid these problems and to develop more market oriented education and training services. Since the strategic aim of LIME is to directly support European accession, the project will improve interaction beyond national boundaries and will facilitate the development of standards. Potential clients of LIME include not only Land Office staff but professionals in land surveying, local government, regional offices etc.

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BIOGRAPHICAL NOTES

Bela Markus is a land surveyor, M.Sc., Ph.D., professor of Geoinformatics, and director of the College of Geoinformatics, University of West Hungary. He has 30 years teaching experience in surveying, 15 years in teaching GIS and 7 years in development and organization of open, distance learning professional courses for land administration. Prof. Markus has over sixty published papers on various aspects of using GIS. He is actively involved in many national and international academic programmes, is chairman of the Hungarian UNIGIS Course Board, of the Educational Affairs of the Scientific Committee in Geodesy at the Hungarian Academy of Sciences, and of the Working Group on Geoinformatics of Association of Hungarian Surveyors and Cartographers, and is the national representative of FIG Commission 2.