DEVELOPMENT OF ACTIVE TRAINING AND EDUCATIONAL METHODS IN LOGISTICS

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ABSTRACT
The paper deals with description of integrated exploitation of simulation, case-studies and business games-based technologies for teaching logistics management, referring to the best practices at leading world-wide logistics companies, using the latest developments in logistics management and taking into account specifics of Latvian economic situation.

INTRODUCTION
Despite the comparatively high education levels among Latvian employees, there is still a lack of knowledge and practical skills crucial for competitiveness in market based economy. In order to ensure relevance of the qualifications and adaptability in the fast changing environment, training and re-training have a special importance. In today environment, companies need people who are flexible, team workers, good communicators and learners. Effective training is a key in delivering this type of workforce. In this context, regions are more suffered from a low level of training both in higher and continuous education. Recent developments in information technology and telecommunications call for a serious reconsideration of the actual training methods and provide a wide opportunities for developing a new educational methodology.

RESEARCH AND EDUCATION ACTIVITIES
Department of Modelling and Simulation (DMS) of Riga Technical University was founded in October, 1993 at the RTU Faculty of Computer Science and Information Technology on the basis of wide experiences in both education and research in the area of modelling and simulation of complex systems, already accumulated at the faculty by that time. The department is a basic unit for the Latvian Simulation Society. Among the international events, about six international conferences were held on the basis of the department during the period 1996-2005. The Latvian Center of the SCSI McLeod Institute of Simulation Sciences (MISS) operates on the basis of the department.

The main directions of DMS research activities are related to application of discrete-event simulation in different industries, mainly manufacturing and logistics, as well as simulation-based training.

![Figure 1. Courses and tools](image)

In the context of education activities, the department teaches various courses in modelling and simulation, including domain-oriented courses, concerning application of modelling and simulation in different areas (e.g., transport, logistics, economics). Master- and Engineer-level Curriculum "Industrial Logistics Management" is launched at the department in 1998. It is arranged within the TEMPU project "Industrial Logistics Management" of the European Training Foundation, with the University of Ghent (Belgium) and the University of Karlsruhe (Germany) as Western European project partners.
ACTIVE TRAINING AND EDUCATIONAL METHODS

Active training and educational methods like case studies, educational games, computer-based simulation games are widely used at the DMS for teaching logistics simulation and management. All courses are supported by modern software (see Figure 1) that has several advantages in both practical and pedagogical aspects.

The main accent in development of both training and educational methods is put on using simulation techniques in developing new teaching material such as simulation-based case studies, simulation games, etc (Pecherska and Merkuryeva, 2004). The application of simulation tools for teaching through seminars allows students to understand potential impact of various decisions on the supply chain network performance as various market conditions change.

Figure 2. Active educational methods

Simulation-based case studies

The use of case studies holds great promise as a pedagogical technique for teaching science, because it humanizes science and well illustrates scientific methodology and values. It develops students' skills in group learning, speaking, and critical thinking.

A case book “Cases in Industrial Logistics Management” was published in 1999 with the aim to support teaching for the above mentioned curricula. This book collects more than 15 case studies proved to be educationally very useful because of integration main pedagogical issues at the same time (Muller et.al., 1999).

Going forward in improving of quality of teaching, several new cases were developed at this moment. Illustratively, a simulation-based case study “Supply Chain Network Analysis: Comparison of Alternative Scenarios” is aimed to introduce students to the logistics analysis of a company case with making the right type of recommendations to improve the performance of a company’s supply chain (Burska et.al., 2004). The case study is divided into several stages, so an instructor has the ability to decide about the amount of teaching material he wants to use depending on time available. The following materials were developed: Instructor Material, Student Material, Power Point Presentation, SimFlex Model, and Solution. The instructor material is aimed to help the instructor in specifying objectives of the case and the way to teach it. The following issues are considered in this document: target groups, objectives, plot of the case, model structure, guidelines for teaching the case. The student material is developed as handouts to be distributed to students. It guides them through the case, as well as provides templates to be used while performing tasks. The Power Point Presentation provides slides as the main visual aid for teaching the case. Finally, the simulation model represents the situation students are working in.

Educational Games

Educational games have a great potential as they usually are designed to teach people about a certain subject (Pecherska and Merkuryeva, 2004). The application sphere of educational games practically is unlimited. The wide range of application has so called business simulation games that belong to educational games type. They may be defined as a simplified mathematical abstraction of a situation related to a business world.

Traditionally at DMS this teaching approach is widely used. As an example, Log_Dis Supply Chain game (Pecherska and Merkuryeva, 2004) could be mentioned. It was developed to introduce the concepts of system dynamics in supply chain. Log_Dis is a typical educational board game without a computer or any additional equipment.

Computer-Based Simulation Games

Simulation games provide an experiential learning process where knowledge is created by the transformation of experience. A computer simulation game may be interpreted as a sequential decision-making experience with a reality, which is simulated and animated on a computer. Trainees can see the impact of their decisions have upon the problem situation and future events and can react to these effects and make new decisions (Merkuryeva, 2000).

Business simulation games as a part of simulation games provides an opportunity for participants to practice, develop and to perfect their management skills. The most practised by simulation games are: analysis and diagnosis, decision-making, problem solving, handling ambiguity, handling uncertainty, critical thinking, managing dynamics, team working, business presentation.
The International Logistics Management Game (shortly, ILMG) has to be mentioned as a perfect example. This game is a computer simulation and Internet-based business simulation game covering different business areas such as marketing and distribution, production and purchasing, locations and inventories - that is, about logistics and what it means for the company’s success (Merkuryeva et.al. 2004).

One of the most important features of this game that differs it from others is its orientation to the Internet. It provides possibility of distance learning. Internet is a communication channel between educator and trainees. Game is accessible anywhere, whether participants are located, – next door or on the other side of the globe (see Figure 3).

**Figure 3. Structure of the ILMG**

The other important feature of this game is possibility of making scenarios that can simulate different markets under different economical circumstances. It means that game could be about Baltic region or Latvia as well. It provides a great opportunity for trainers to try to operate in environment familiar for them.

**Simulation-Based Case-Games**

Simulation-based case-games have features of both a case and educational simulation-based game (Pecherska and Merkuryeva 2004):

- A detailed and rather complicated situation description;
- A number of rules to be kept;
- An underlying simulation model that substitutes a real system;
- A spirit of competition, etc.

In particular, each game period could be designed on the case method.

As an example of simulation-based case-game played at the DMS the Fish Bank game can be mentioned. During the game, players receive information about the situation on previous year catch, fish sales, bank balance and fleet. Based on this information, players make their decisions for the next year: fleet enlargement or reduction, ship allocation among fishing areas. The goal of each team is to obtain the maximum possible assets at the end of the game.

After a ten-year period, the results are calculated and charted and the final discussion takes place. During the discussion, the winner’s strategy, optimal individual and group strategy, population and assets dynamics are analyzed. The discussion emphasizes the group strategy and helps participants to get a deeper insight into a sustainable management of renewable resources.

**SIMULATION-SUPPORTED TRAINING METHODOLOGY**

To improve the efficiency of education and training, the Department of Modelling and Simulation of Riga Technical University is now working on development of a simulation-supported training methodology. It is aimed to support both academic and post-graduated, post experienced training.

The main objective of this methodology is development and practical implementation of simulation-supported training in the area of logistics management, based on use of cases-studies and business games, in order to promote professional knowledge and skills in the logistics sector in Latvia. Following are the main expected results:

- Training methodology that will integrate simulation, case-studies and business games-based approaches to teaching logistics management;
- Implementation of the above-mentioned methodology by development of education tools to train in solving typical logistics management problems;
- Internet-based access to developed education tools.

Besides development of the above-mentioned methodology, analysis of advantages of web-based learning is performed. If learning efficiency is expressed like

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\text{Learning} = \frac{\text{Revenue} - \text{Costs}}{\text{Time}},
\]

it could be increased by decreasing either time or costs (or both of them), that now is available owing to explosion of ICT. New training and educational methods like e-learning, m-training and any web-based learning become more and more popular, also in Latvia. Web-based learning and teaching (in association with simulation-based methodology) have a great potential for the distance education. Since new web technologies are very applicable to e-learning, we would like to use them to make the e-learning environment more effective and useful.
M-training

During 2000-2002, a training course in Logistics Information Systems aimed to improve ICTE skills among students and employees of logistics companies was worked out within the framework of the Leonardo da Vinci project LOGIS LV-PP-138.003 “Long-distance tutorial network in “Logistics Information Systems” based on WEB technologies” (Merkuryev and Ginters, 2001).

Currently the department is involved into a new project LOGIS MOBILE “Competence Framework for Mobile On-site Accelerated Vocational Training in Logistics Information Systems”, that is aimed at further development of results achieved within the LOGIS project. It is aimed at designing, testing and disseminating a new m-training methodology combining a concise training dictionary in Logistics Information Systems and the latest mobile telecommunication technologies based on GPRS/GSM/UMTS mobile Internet WAP/WML applications. The novelty of the project, especially essential for the regions, is in using of mobile telecommunications in learning and training in the area of logistics information systems, combining them with m-training and e-learning methodologies. Geographically unlimited access to lifelong m-training and consulting, using only a mobile phone, provide wide opportunities for all trainees like students, logistics professionals, trainers, managers, etc.

The basic result of the project will be a concise m-training dictionary in Logistics Information Systems (first in English, French, German, and Spanish, hereafter also in Latvian), which will involve a concise version of the newest material in logistics informatics. Conciseness and preciseness will be achieved by a special method when project partners weight submitted keywords in order to find essentials with the highest value. Trainees will be able to check their knowledge by answering specific questions attached to each of terms.

A structure of the dictionary is currently under discussion. It is proposed to divide all terms into categories by an application area; thereto a term can be referable to more than one category from which the main one will be defined. Definition of a term could differ in some categories, but not always. The main category of the term is indicated firstly, and then all the rest. For the moment, 17 main categories, which capture all essential tracks in Logistics Information Systems, are proposed (illustratively, transport in general, maritime, railway, air, road and pipeline transport modes, inland navigation, customs, information exchange & security, software, hardware, insurance, modelling & simulation, e-application, business processes, inventory & warehouse, legislation).

Blackboard

To facilitate educational process and make it more efficient and interactive, as well as for distance learning purposes, such systems as Blackboard and WebCT could be efficiently used. These systems provide different means for educator and students that allow performing day-to-day operations in a much more efficient way, for instance

- publishing announcements for students;
- providing lectures materials and handouts;
- giving assignments for practical work and making tests.

In this case students can access all necessary materials and information from anywhere at any time where Internet is available. Also it is possible for students to stay in a permanent contact with their educator that is important when personal communication is impossible (for instance in the case of distance learning).

The Blackboard Learning System™ is an industry–leading software application used to power virtual learning environments, supplement classroom education and as a platform for distance learning study programmes. Featuring a robust core set of capabilities that enable instructors to efficiently manage courses, author content, create assignments, and foster collaboration, among other key functions, the Blackboard Learning System helps institutions to accomplish mission-critical objectives related to instruction, communication and assessment (www.blackboard.com).

The RTU Department of Modelling and Simulation successfully uses the Blackboard system (see Figure 4), supported by the university Distance Education Study Centre, in the educational process. Currently the following courses are supported in this way:

- Systems Simulation Tools
- Introduction to Modelling and Simulation

Figure 4. Sample Blackboard screen

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CONCLUSIONS

Recent developments in the information technologies and telecommunications facilitate development of new training and educational methods and tools, like described above, making them available for wider scope of concerned persons. This provides possibilities for organizing educational processes not only in the traditional way, but also by means of distance learning, exploring e-learning and m-training approaches. This is of special importance for vocational training, when trainees have to combine their studies with conventional work. Also, this opens new horizons for regional development, providing people with wide education possibilities within their residence and working areas.

The paper discusses experiences of combing modern didactical approaches and technological achievements for teaching Logistics Management in general, and Logistics Information Systems in particular, at the Department of Modelling and Simulation of Riga Technical University. Future developments of the discussed approaches are planned in the following main directions:

- Further development of simulation-supported training methodology, combining simulation with case-studies and business games, and widening accessibility of developed education tools through the Internet;
- Further development of the m-training methodology, providing access to education sources through conventional business tools, like a mobile phone and pocket PC.

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