

Analysis of Lithuanian LOM Repository Strategies, Standards and Interoperability

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Abstract. The main scientific problems investigated in this article deal with creation of Lithuanian national learning objects (LOs) metadata repository. This repository is a part of national educational portal and brings together LOs metadata suitable for Lithuanian primary, secondary and vocational education. The main issues here are general repository strategies and standards and interoperability. The authors' aim is to present Lithuanian national LO metadata repository's current state and to envisage its future development trends in conformity with eContentplus EdReNe network's repositories development priorities settled by network members and external experts

1 The Aims and Tasks of the Work

The main scientific problems investigated in this article deal with creation of Lithuanian national LO metadata (LOM) repository. This repository is a part of national educational portal and brings together LOs metadata suitable for Lithuanian primary, secondary and vocational education. The main issues here are general repository strategies and standards and interoperability.

The main *aims* of the article are:

- To present Lithuanian LOM repository's current state.
- To envisage its future development trends in conformity with priorities settled by EdReNe network's members and external experts.

To realize the formulated aims these *tasks* are to be solved:

- To present and analyse the key principles of creation and development of Lithuanian national LOM repository.
- To present Lithuanian national LOM repository current state.
- To present EdReNe network's repositories development priorities settled by network members and external experts during the last strategic seminar in Lisbon in June 2008.
- To analyse Lithuanian repository's development trends against these priorities.

2 Lithuanian Digital Library for Educational Resources and Services

Lithuanian national LOs metadata repository is an essential part of national Digital Library of Educational resources and services (DLE). DLE scheme based on flexible, modular architecture and as small as possible open source reusable e-content and e-services components proposed by the authors is presented in Fig. 1:

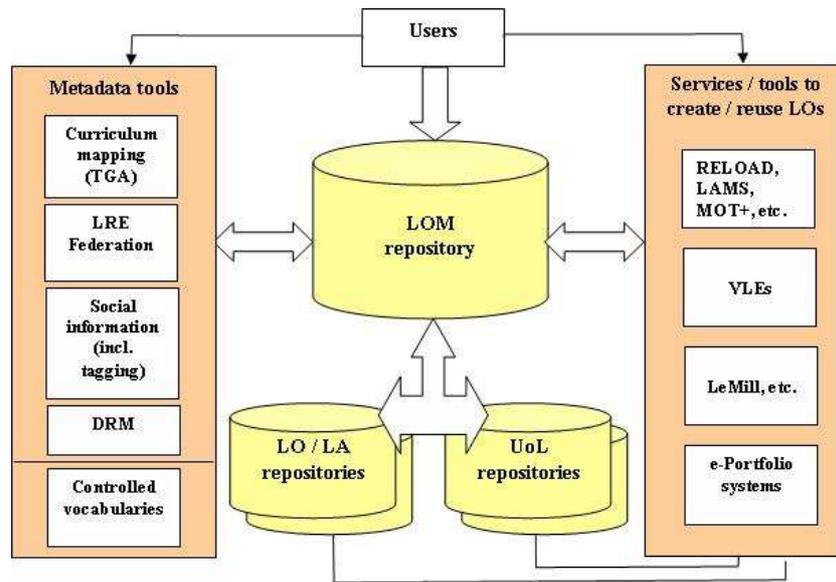


Fig. 1. The scheme of components of flexible DLE [10]

The flexibility of DLE and learning personalisation possibilities for its users are achieved by separating ‘content’ objects from ‘activity’ ones, separating LO metadata from LOs repositories which can be on different servers, usage of highly adaptable open source tools to create / reuse LOs and provide online learning environment (such as VLE Moodle), etc. On the authors’ opinion, DLE in principle could consist of:

- *National LO metadata repository*: (1) connected to European Learning Resource Exchange (LRE) service for schools [9]; (2) implemented tools for curriculum and vocational education programs mapping and linking to LOs; (3) incorporated digital rights management (DRM) system; (4) incorporated controlled interoperable vocabularies; (5) implemented social tagging, user comments, LOs rating etc.
- *LOs repositories*: (1) learning ‘content’ repositories; (2) Units of Learning (UoLs) – learning activity – repositories (incl. Methodical works / articles).
- *Services / tools to create / reuse LOs*: (1) tools to create / reuse LOs (e.g. CALIBRATE [1] LeMill toolbox); (2) tools to create / reuse UoLs (e.g. RELOAD [15], LAMS [13], MOT+ [14], etc.); (3) VLEs; (4) e-Portfolio systems based on controlled vocabularies (e.g. competences taxonomy).

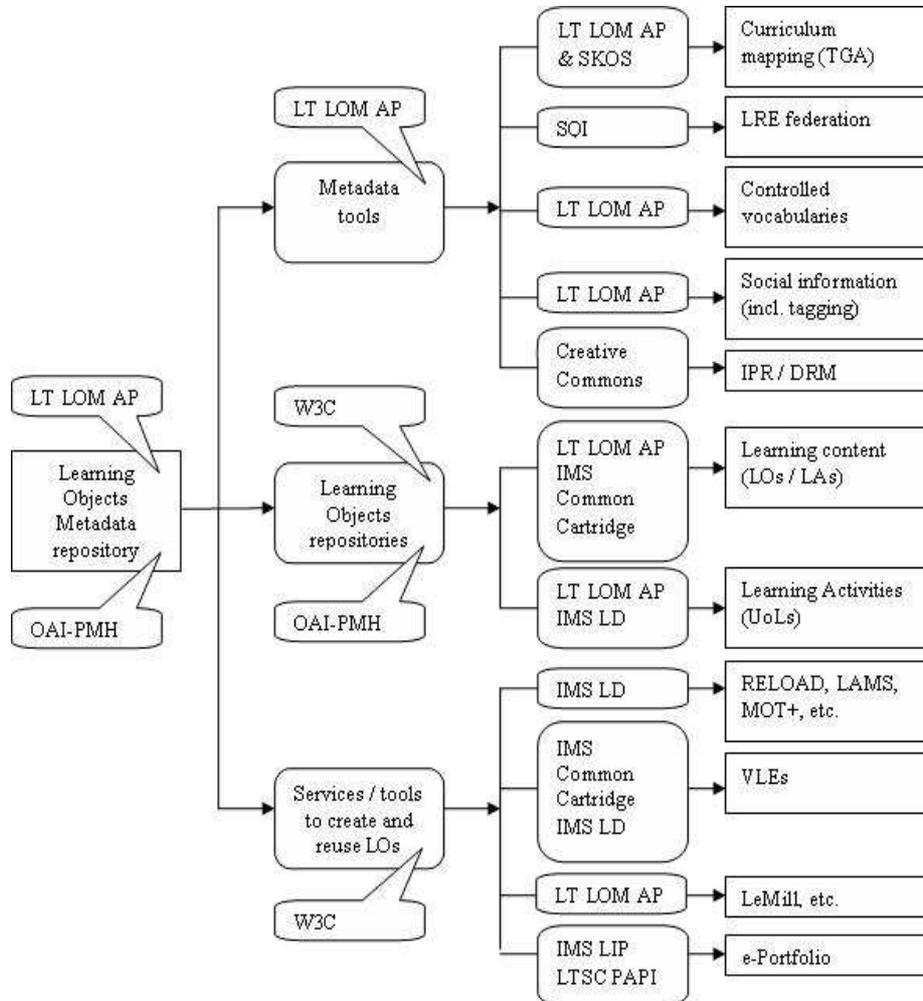


Fig. 2. The scheme of DLE components interoperability

Several important developments were carried out by the authors while implementing FP6 IST CALIBRATE project [1] in 2006:

- EUN [5] LOM application profile (AP) 2.0 was localised to Lithuanian.
- More than 1200 Lithuanian learning resources were described in conformity with this AP by specially trained LOs indexers.
- Centralized national LO metadata (LOM) repository [2] based on MySQL database management system, PHP software package and Java technology was created. Centre's for IT in Education [7] Apache web server and Linux operating system were used for creation of LOM repository.
- User-friendly interface to aggregate LOs metadata into LOM repository was created.

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- All LOs metadata were created and filled into LOM repository.
- All approved distance learning courses were disaggregated to LOs level and introduced as SCORM 2004 packages [16] to reuse them in different VLEs. These LOs are available in centralised LOM repository.
- LOM repository was connected to European LRE system via Simple Query Interface technology and Brokerage system.

In 2008 LOM repository was enriched by additional services.

Additional services of its open / informational part are: (1) LO searching and finding by subject (area) and key word; (2) extended search by desirable elements; (3) search by metadata creation period; (4) brief and extended (XML) metadata production for the users; (5) users' comments; (6) statistics of LO downloads and repository users; (7) LO ranking possibility; (8) automatic production of new LO metadata during the desirable period; (9) user's guide.

Additional services of closed / administrative part are: (1) metadata import in XML format; (2) fixation of LRE AP version used; (3) portrait of LRE AP versions' comparison; (4) classifiers' management by desirable elements; (5) metadata elements creation using classifiers; (6) management of users' comments; (7) extended LO search; (8) legal mark if LO could be exported to LRE; (9) administrator's guide.

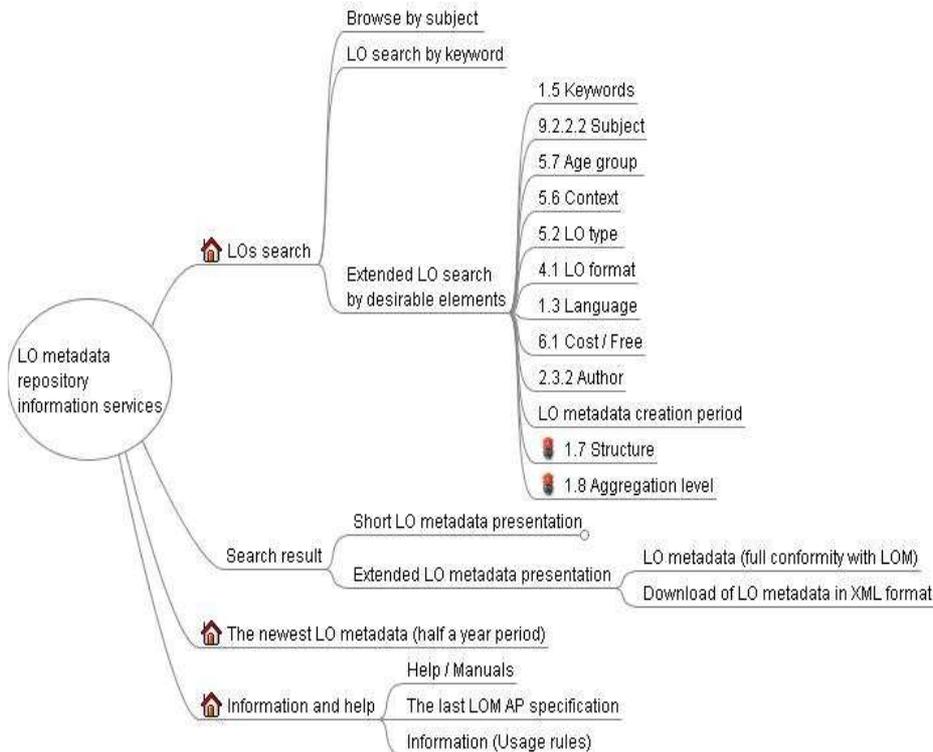


Fig. 3. LOM repository additional services scheme (open part)

At the moment social tagging tools and tools linking methodical materials (pedagogical methods / activities / scenarios / designs, lesson plans, didactical resources) with ‘content’ LOs are under implementation. Methodical materials are new authors’ research object dealing with all kinds of methodical works / articles (MA) and lesson plans usability improvement. It is relevant for Lithuania because of: (1) low level of MA usability at the moment; (2) lack of standards compliant relation between methodical works and “content” LOs such as learning assets; (3) lack of suitable complex APs to describe MAs. The main aim here is to create and implement complex MA metadata model to improve their usability [10].

To realise the formulated aim the following tasks are to be solved:

- To analyse several popular standards (e.g., [3, 6]) for MA metadata.
- To identify their limitations for description of metadata.
- To create complex MA metadata model (application profile).
- To design, implement and validate the model by implementation of MA metadata repository as a part of existing Lithuanian national LOM repository.

The practical value of this research would be: (1) improved MA usability; (2) quick and convenient MA discovery; (3) MA evaluation possibility; (4) usage for new MA creation; (5) possible relations with LO [10].

3 EdReNe Project Priorities

The EdReNe – Educational Repositories Network – brings together web-based repositories of learning resources / objects with content owners and other stakeholders within education in order to share, develop and document strategies, experiences, practices, solutions, advice, procedures etc. on the organisation, structuring and functionality of repositories. EdReNe currently comprises 23 founding members and 7 associate members [4]. The network invites new associate members. EdReNe is partially funded by European Commission’s eContentplus programme.

All members collaborate to provide the European community with more and better repositories of learning resources and to ensure wider use of existing ones.

EdReNe’s first year the emphasis was on: (1) identifying, studying and prioritising issues; (2) identifying relevant stakeholders and engaging them; (3) discussing access and use in relation to repositories of educational content.

EdReNe has arranged first strategic seminar and the first series of expert workshops. The expert workshops cover the themes:

1. Repositories strategies and resources (general level).
2. Standards and interoperability.
3. Engagement of producers and users – features and functionality (operational level).
4. Rights issues [4].

The most important ingredient in seminars and workshops is the sharing of experiences, good and bad, among members. All have a central role in their national environment. Some members may be experts on some areas and novices on others. External experts are also invited to provide input to the events [4].

The second project implementation year has started by strategic seminar in Lisbon on June 9 – 11. The main aim of this seminar was to collaboratively establish priorities for the following project implementation period covering all 4 aforementioned themes.

The following figures present the results of collaborative work of the network members and external experts in Lisbon on two main topics – repositories strategies and standards and interoperability.

Quantitative results were calculated by project coordinator (UNI-C Denmark). The authors present here only high priorities which were evaluated not less than 40 % as “Essential” and not less than 80 % as “Essential” together with “Important”.

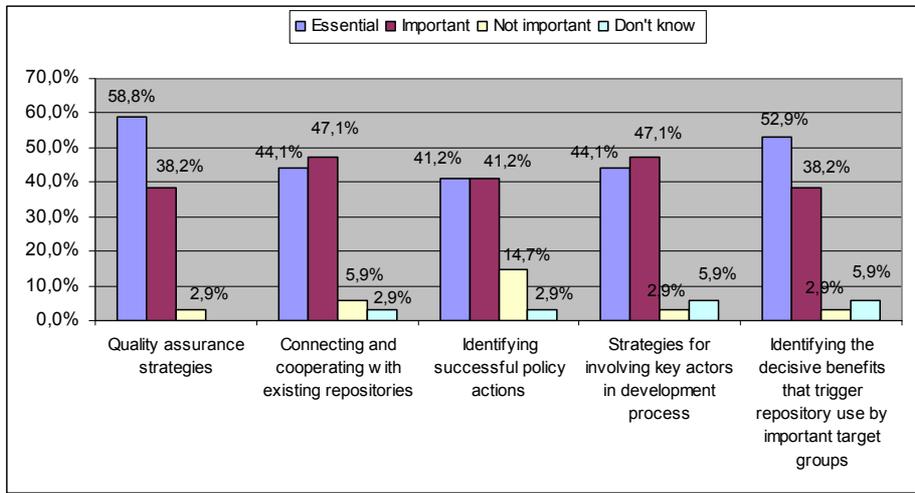


Fig. 4. Repository Strategies (general level)

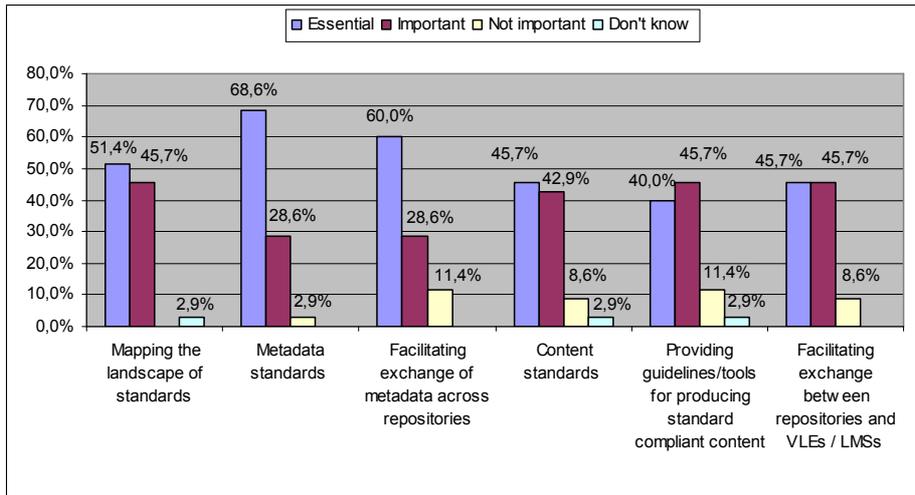


Fig. 5. Standards and Interoperability

4 National Lithuanian Learning Object Metadata Repository Development Trends

The following tables contain the results of analysis to what extent Lithuanian LOM repository development fits EdReNe members' and external experts' priorities concerning general repositories strategies and standards / interoperability.

Table 1. Repositories strategies development

EdReNe priorities	LOM repository development results / trends
Quality assurance strategies (editorial policies; technical quality assurance)	No special editorial and technical quality assurance strategies. Technical issues such as interoperability and quality assurance are based on the authors' research results (e.g. [8], [10], [11], [12]) and are usually described in Terms of reference (ToR) for repository software development.
Connecting and cooperating with existing repositories (including overcoming barriers such as language, IPR, technical issues...)	Lithuanian LOM repository is a part of EUN LRE federation. Part of LO metadata is produced both in Lithuanian and in English. Lithuanian LOM AP (currently under validation) is a simplified version of EUN LRE Metadata AP v3.0 [6].
Identifying successful policy actions (government support, public-private partnerships...)	Lithuanian LOM repository development is part of national ICT in education Strategy and Program for 2008 – 2012. It is a part of national education portal. Currently all the documents necessary for the repository usage are under validation by interested institutions.
Strategies for involving key actors in development process	Strategy and Program plan to stimulate active teachers to publish their LOs in LOM repository (special projects exist) and to solve IPR problems for publishers.
Identifying the decisive benefits that trigger repository use by important target groups: professional publishers, public institutions, teachers...	The special Method on repository usage is prepared by the authors and currently is under discussion with educational policy makers. Target groups of this method are public institutions and teachers. No special decisions concerning publishers.

Table 2. Standards and interoperability development

EdReNe priorities	LOM repository development results / trends
Mapping the landscape of standards (identifying current use; which standards help providing which functional requirements of educators / learners; best practice examples)	The Method project contains the requirement to describe all quality LOs purchased by governmental institutions while implementing state programs and different projects to include LOs metadata in LOM repository. But teachers consider metadata creation to be difficult extra work. More metadata creation training for publishers and teachers required.
Metadata standards (developing application profiles; strategies for vocabularies; curriculum mapping; interoperability issues; automatic metadata creation; including user	Proposed Lithuanian LOM AP is simplified EUN LRE Metadata AP v3.0 proposed by the authors while implementing scientific research (e.g. [8], [12]). Controlled vocabularies are currently under consideration to fit existing Lithuanian classifiers.

generated metadata; collection and service descriptions...)	Automatic metadata creation tool for teachers required. New ToR contains requirements to assure user generated metadata incorporation into LOM repository.
Facilitating exchange of metadata across repositories (harvesting; federated search; search protocol; query language...)	It is planned to ensure metadata harvesting from main publishers' repositories, but no special requirements for search protocols and query language exist.
Content standards (such as IMS Content Packaging / Question and Test Interoperability / Common Course Cartridge, SCORM...)	SCORM 2004 is the main content standard in Lithuania at the moment. There is a requirement to produce all distance learning courses content as SCORM 2004 packages. IMS CC is to be validated in Lithuania while implementing new ASPECT project.
Providing guidelines/tools for producing standard compliant content	Currently Centre for IT in Education usually provides ToR and LearnExact software as the tool for producing SCORM 2004 compliant content.
Facilitating exchange between repositories and virtual learning environments / learning management systems	New ToR for additional software creation has been prepared to make content exchange between national LOM repository and VLE Moodle more user-friendly. There is the authors' recommendation to localize the newest Moodle version formulated in national scale research for the MoE (currently localized Moodle v.1.6.3 is used).

Lithuanian LOM repository development is part of national ICT in education Strategy and Program for 2008 – 2012. The vision of the Strategy is to create qualitative new and flexible students and teachers learning environments which would provide them personalised (customised) learning possibilities in electronic space and stimulate creation and implementation of modern ICT based teaching and learning methods. There are four objectives emphasized in this Strategy:

1. To create digital learning content and to develop modern teaching and learning services.
2. To form digital teaching and learning infrastructure, to improve schools provision with hardware and software, and increase access to ICT.
3. To educate schools communities competencies, to effectively apply ICT for education, to improve teaching and learning quality, and to develop digital teaching and learning culture.
4. To apply ICT in educational process organisation and schools management.

The following tasks are planned to achieve the 1st objective:

1. To create convenient digital learning resources (objects) search system to integrate curriculum with resources (objects) and e-services.
2. To prepare interactive teaching and learning content with the help of different institutions, active teachers and scientists.
3. To create open and safe teaching and learning space for storage of curriculum compliant learning content for different subjects which would provide possibilities to consult, discuss and exchange ideas.
4. To implement international digital learning resources (objects) metadata standards, and to stimulate international cooperation to create learning content and e-services.

5. To prepare and confirm legal acts (to protect authors, publishers and users rights) which would motivate pedagogues and publishers to create and disseminate digital learning content and services.

Implementation of the 1st and 4th tasks requires large scale research and development on the topic of the article.

Lithuanian LOM repository is a part of national education portal. Currently all the documents necessary for the repository usage are under validation by interested institutions. The most important ones are special Method on repository usage and Lithuanian LOM AP based on EUN LRE Metadata AP v3.0 and 22 controlled vocabularies (classifiers) approved in conformity with Lithuanian legal acts.

On the basis on Tables 1 and 2 we may conclude that Lithuanian national LOM repository development current state in general fit EdReNe members' and external experts' priorities concerning general repositories strategies and standards / interoperability.

There are several topics where on the authors' opinion Lithuanian experience contradicts the EdReNe approach:

- It is planned to ensure metadata harvesting from main Lithuanian publishers' repositories, but currently no special requirements for search protocols and query language exist and there are no concrete plans to approve them.
- Currently no automatic metadata creation tool is implemented in Lithuania.
- Lithuanian repository development documents contain no special decisions concerning publishers and DRM.
- Finally, there is no special document on Lithuanian repository development strategy prepared and approved at the moment. There are no special editorial and technical quality assurance strategies.

5 Conclusions, Recommendations and Results

Lithuanian national LOM repository development current state and trends in general fit the European experience in the field. Its development is the part of national ICT in education Strategy and Program for 2008 – 2012 and based on existing Lithuanian scientific research in the field. Standards / interoperability issues are one of the main topics in Lithuanian scientific research and policy documents, but currently there is no special state repository development strategy approved by policy makers, and current Lithuanian national documents do not contain any decisions concerning metadata harvesting from main Lithuanian publishers' repositories, automatic metadata creation tools, DRM, and special repository editorial and technical quality assurance strategies. Lithuanian experts – EdReNe network participants – highly recommend their national education policy institutions to approve and further implement repository strategies and standards / interoperability development trends presented in Tables 1 and 2.

References

1. CALIBRATE (Calibrating eLearning in Schools) project web site. Available from Internet: <<http://calibrate.eun.org>>
2. Centralized national Lithuanian LO metadata (LOM) repository. Available from Internet: <<http://lom.emokykla.lt/nauja2>>
3. Dublin Core (DC) Metadata Initiative web site. Available from Internet: <<http://dublincore.org/>>
4. EU eContentplus programme's EdReNe (Educational Repositories Network) project web site. Available from Internet: <<http://edrene.org>>
5. European Schoolnet (EUN) web site. Available from Internet: <<http://www.eun.org>>
6. EUN Learning Resource Exchange Metadata Application Profile v3.0. June 2007. Available from Internet: <<http://fire.eun.org/LRE-AP-3.0.pdf>>
7. Centre's for Information Technologies in Education under the Ministry of Education and Science of Lithuania web site. Available from Internet: <<http://www.itc.smm.lt>>
8. Dagiënė, V.; Kurilovas, E. (2007). Design of Lithuanian Digital Library of Educational Resources and Services: the Problem of Interoperability. *Information Technologies and Control*. Kaunas: Technologija, 2007, Vol. 36 (4), p. 402–411. ISSN 1392–124X
9. Jevsikova, T.; Kurilovas, E. (2006). European Learning Resource Exchange: Policy and Practice. In: *Proceedings of the 2nd International Conference „Informatics in Secondary Schools: Evolution and Perspectives“ (ISSEP 2006)*. Vilnius, Lithuania, 7–11 November 2006. Selected papers, p. 670–676. ISBN 9955-680-47-4
10. Kubilinskiënė, S.; Kurilovas, E. (2008). Lithuanian Learning Objects Technical Evaluation Tool and its Application in Learning Object Metadata Repository. In: *“Informatics Education Contributing Across the Curriculum”*: *Proceedings of the 3rd International Conference “Informatics in Secondary Schools – Evolution and Perspective” (ISSEP-2008)*. Torun, Poland, July 1 – 4, 2008. Selected papers, p. 147 – 158. ISBN 978-83-60425-31-2
11. Kurilovas, E. (2007). Digital Library of Educational Resources and Services: Evaluation of Components. *Informacijos mokslai (Information sciences)*. Vilnius, 2007, Vol. 42–43, p. 69–77. ISSN 1392–0561
12. Kurilovas, E.; Kubilinskiënė, S. (2008). Interoperability Framework for Components of Digital Library of Educational Resources and Services. *Informacijos mokslai (Information sciences)*. Vilnius, 2008, Vol. 44, p. 88–97. ISSN 1392–0561
13. Learning Activity Management System (LAMS) web site. Available from Internet: <<http://www.lamsinternational.com/>>
14. MOT+ English version web site. Available from Internet: <http://www.unfold-project.net/general_resources_folder/tools/mot/english/>
15. RELOAD (Reusable eLearning Object Authoring & Delivery) project web site. Available from Internet: <<http://www.reload.ac.uk>>
16. Shareable Content Object Reference Model (SCORM). Available from Internet: <<http://xml.coverpages.org/scorm.html>>

Appendix

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