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Half Year Study Report

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Executive summary

Recent years have witnessed Linked Data establishing itself as the de facto means for the publication of structured data over the Web. There has been a steady increase in the number of organizations committing to use Linked Data core principles for exposing and interlinking data sets for seamless exchange, integration, and reuse. As a result, there is an increasing demand for data practitioners possessing skills and detailed knowledge in this area. EUCLID aims to provide a comprehensive educational curriculum, supported by multi-modal learning materials and highly visible eLearning distribution channels, tailored to the real needs of Linked data practitioners.

The work plan of EUCLID consists of two complementary parts: one focusing on the production of educational and training content and its delivery over the most effective and relevant channels, and the other, equally important, ensuring the learning materials are presented, adjusted and improved through feedback and engagement with their intended audience, and the Linked Data community in general. These two parts form the work of two EUCLID Work Packages, that is, WP1: Course production and delivery and WP2: Community building and outreach respectively.

This deliverable will report the working progress of WP1 complemented with the working progress in WP2, summarizing the generated content, feedback and lessons learned from the first course production-cycle that has taken place during the first six months of the project. By now, the first learning module, out of the total seven modules, as initially planned for the project, has been produced. The module production process is implemented, evaluated, refined. Once matured, it will be followed for the production of the remaining modules.

The production of training materials in various models is strictly following the guidance of a curriculum plan, the first version of which has been finalised by the end of month three and reported in D 1.1.1 [1]. The curriculum is composed of seven modules to cover all the major aspects of the Linked Data consumption lifecycle organised in ascending learning levels, i.e. introductory, advanced and expertise. This deliverable reports the first production cycle of training materials, in forms of webinar, online content, and eBook, for the first module of the curriculum plan, i.e. the introduction and application scenarios. Firstly, an introduction about the planned production process is given in Section 1. In Section 2, we describe the implementation of the production process for webinar and online content as well as the content being produced, what feedback has been collected and how the production process and the produced training content are improved as a result. Through the implementation of the production process, some general lessons have been learned which led to the revision of the curriculum plan and the way to prepare and collect raw materials for the production of training materials. These are reported in Section 3.

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Abstract (for dissemination)	This deliverable reports the first production cycle of training materials, in forms of webinar, online content, and eBook, for the first module of the curriculum plan, i.e. the introduction and application scenarios. Firstly, an introduction about the planned production process is given in Section 1. In Section 2, we describe the implementation of the production process for webinar and online content as well as the content being produced, what feedback has been collected and how the production process and the produced training content are improved as a result. Through the implementation of the production process, some general lessons have been learned which led to the revision of the curriculum plan and the way to prepare and collect raw materials for the production of training materials. These are reported in Section 3.
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Abbreviations

DL – Description Logic

FOAF – Friend of a Friend

HTTP – Hypertext Transfer Protocol

KIT – Karlsruhe Institute of Technology

KMi – Knowledge Media Institute

LD - Linked Data

OA – Ontotext AD

ONTO – Ontotext

OU – Open University

OWL – Ontology Web Language

OWL-S – OWL for Services/ OWL-based Web Service Ontology (formerly DAML-S)

RDF/S – Resource Description Framework / Schema

SPARQL – SPARQL Protocol and RDF Query Language

URI – Uniform Resource Identifier

URL – Uniform Resource Locator

WP – Work Package

XML - Extensible Markup Language

1 Introduction

EUCLID aims to provide a series of training materials including eBooks, webinar and so on for Linked Data practitioners. The structure and the content of the training materials are guided by a curriculum plan. Initially, seven modules have been planned in the curriculum plan, as reported in D 1.1.1 [1], to cover all the major aspects of the Linked Data consumption lifecycle. The production of training materials forms the major part of the work in WP1: course production and delivery.

Meanwhile, EUCLID has a strong focus on the community and encourages community engagement in the course production process through collecting user feedbacks via Webinar, online distribution of content for example. It combines online and real-world presence, and attempts to integrate with on-going activities in each sphere such as mailing lists, wikis. EUCLID engage with the Linked Data community, developers and academics, through the community engagement activities described in WP2, which collects user requirements as well as provides feedback to the materials so that the course can be tailored to what the learner really needs and the course production process can be improved for effectiveness.

The primary target audiences of EUCLID's training materials and events are data practitioners who, as part of their daily jobs, are interested in using Linked Data technologies for facilitating integration and easy access, technology enthusiasts who plan to broader their expertise in using Linked Data technologies for Big Data management and analytics, and Computer Science researchers who intend to gain a basic understanding of proven and tested Linked Data usage concepts.

This deliverable reports the progress and lessons learned during the first half year of the project in the work of course production and delivery. The concrete work carried out during this period includes the creation of the curriculum plan, and then, guided by the curriculum, the production of training materials in forms of webinar, online content, and eBook for the first module. The first versions of webinar slides and written content were distributed first to collect comments and feedback before reaching final and being used to produce an eBook.

1.1 Course Production Process

The main objectives of WP1: course production and delivery are to define an education curriculum and then, following the guidance of the curriculum, create training materials of various modalities, e.g. webinar and eBooks, about the usage of Linked Data. The initial version of the curriculum is composed of seven modules to cover all the major aspects of the Linked Data consumption lifecycle organised into three levels of topics – introductory, advanced and expertise. Figure 1 visualizes the individual modules and their grouping into the three levels of expertise gained (top: introductory, middle: advanced, bottom: expertise)

1. Introduction and Application Scenarios

2. Querying Linked Data
3. Publishing, Interlinking and Cleansing Linked Data
4. Visualizing Linked Data

5. Analyzing and Mining Linked Data
6. Creating Mash-ups and Linked Data Applications
7. Scaling-up

Figure 1: EUCLID Curriculum Plan

As can be seen, the curriculum is designed in such a way as to gradually build up trainee's knowledge. Furthermore, it enables course participants with previous knowledge or a specific area of interest to only briefly go over the introductory materials and directly dig into one of the more advanced modules. The proposed curriculum will provide a basis for the development of professional training courses, to ensure an organized guidance for their content, focusing on the necessary skills and technologies for Linked Data processing and use. In an effort to provide high-quality training, suitable for the data practitioner's needs, the first delivery of the curriculum in [1] has been through several revisions on structure, arrangement and content after presenting to a number of experts

and gathering their feedback. After the report and publication of the first version, it has been through further revisions and re-organized from seven modules to six. Details of the change are given in Section 3.1.

The eBook series is one of the major outcomes of WP1, which will be published and promoted in multiple channels, including through EUCLID Web site, iTunes U, and the Open University SocialLearn[1] platform. The eBooks will be produced sequentially according to the modules prescribed by the curriculum. Each module will include associated exercise materials to enhance the training process. There are three basic steps planned to create each module and its exercises. First, following the curriculum, the draft of the training material will be created, which includes slides for Webinar and HTML content for online distribution. Secondly, feedback on the drafts will be gathered and analyzed. Finally, based on the comments and feedback, each module will be refined before delivering an eBook encompassing all the training materials, which include written documents, examples, presentation slides as well as the video recording of the webinar. Figure 2 depicts these basic steps

Figure 2: Materials Production Approach

Following the basic steps, Figure 3 shows how the course production process is materialised in practice through the distribution of tasks undertaken by respective partners. As can be seen, the training materials in the form of slides and HTML content will have gone at least one round of revision through collecting comments and feedback from the broadcasting of the first webinar and the publication of the first version of HTML content. Webinar will be recorded again after finalising the slides. Finally, the eBook can be produced from all the finalised content.
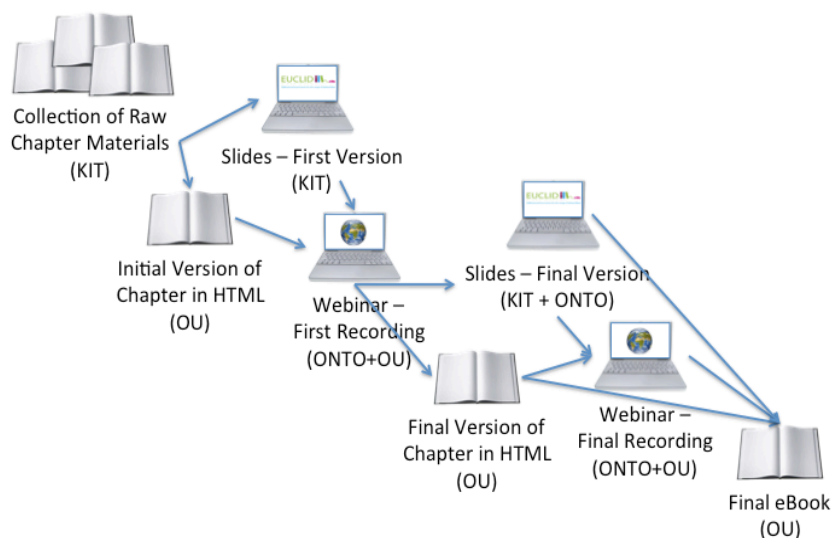

Figure 3: Materialized Course Production Process

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[1] http://sociallearn.open.ac.uk

1.2 How Does the Community Get Involved?

Centred on the learning materials, we aim to create a learning community that support rapid feedback, forming an active learning environment online throughout the course development. Thus, comments and feedback can be collected from potential trainees even before the design of the curriculum plan and can be consolidated in the form of requirements for updates to the learning materials once course production process has started. Various social media channels are actively monitored such as mailing lists, discussion forums, Twitter and relevant blogs to have a better understanding of potential trainees' learning focuses, difficulties and needs.

In the course production process, after the webinar is given, comments and suggestions will be gathered from the audience online and in-person. Furthermore, each draft content of the modules will be made available online and community feedback will be actively gathered. As a result, the final version of training materials will have undergone at least one round of improvement and revision.

2 Implementation of the Course Production Process

Based on the extensive experiences that EUCLID project partners have obtained from numerous past and on-going Linked Data projects as well as organizing and tutoring Linked Data training events, together with analyzing numerous sources in order to get a better understanding of the needs and knowledge gaps of those who want to use Linked Data for their benefit, the first version of curriculum plan has been delivered and reported in D 1.1.1 [1]. It has been through the scrutiny of a number of experts whose feedback has led to several revisions to the structure and arrangement of the modules as well as the adjustment of some of the outlined content, though it is still subjected to be extended with specific outlines and topics in future deliverables. In the curriculum plan, the first module was described in greater detail than the other modules because it would be the pioneer module to be used in the first production cycle, in other words, to testify the effectiveness of the production process. Specifically, it would be used to deliver the first webinar and the first online content and then to produce the first eBook. Therefore, it is further along than the other modules in terms of preparing the outline, the content materials, the used examples and the interactive elements, such as a SPARQL endpoint for test query execution. The other modules currently only consist of a detailed outline of the covered topics and a set of gathered relevant materials and use cases. In the remainder of this report, all descriptions about the course production process will surround the first module, that is, the "introduction and application scenarios" module.

Guided by the curriculum, training materials in various forms will be produced in accordance with the targeted means of delivery. EUCLID considers the forms of webinar, online content and eBook for delivering the training materials. In following, we will provide the details of how they are produced and delivered.

2.1 Webinar

A webinar is an online lecture with some interactive elements. This online training includes interactive presentation, lecture, workshop or seminar that is transmitted over the web. Participants can directly interact by giving, receiving and discussing material of the course in real time.

In accordance with the curriculum, some raw materials from papers, whitepapers, and book chapters etc., or references to them were collected, based on which, slides were produced for the webinar. The webinar for the first module took place on 9th, August 2012 at the OU KMi podium and was webcasted at http://stadium.open.ac.uk/2035, where replay of the webinar was enabled afterwards. Various channels have been used to publicize the occurrence of this event, such as the podium website, email list etc. Mainly the project personnel from consortium members attended the webinar either in person or via webcast, as it is the first one of the series and expected to have a nature of rehearsal.

2.1.1 Webinar content structure

The topic of the first module is "introduction and application scenario", which is basically the first step to understand Linked Data. The slides for the webinar should organize content in a gradual manner from technologies that lead to Linked Data, such as Internet, the Web and its technologies, to the very basic technologies of Linked Data, such as RDF and SPARQL. To be specific, the outline of the slides is as follows:

- *Motivation Scenario*
- *Linked Data Foundations*
- *Introduction to Linked Data*
- *Linked Data use case scenarios*

In the *Motivation Scenario*, we use, as a motivation scenario, the provision of a music-based portal that brings together a number of disparate components of data-oriented content, such as musical content, music and artist metadata, review content and visual content (pictures of artists and albums). In *Linked Data Foundations*, we introduce Internet, the Web and its evolution, Web technology basics (HTTP, URL, URI, request-response model),

describing and exchanging data on the Web (formats such as XML, vocabularies such as FOAF[2]), and then semantics on the Web (RDF, RDFS, OWL, OWL-DL, SPARQL). This is followed by the *Introduction to Linked Data*, where we introduce the Linked Data Principles, the Linked Data Cloud and the ways of exploring Linked Data (browser, mashup, search engine). Finally, we introduce, in *Linked Data use case scenarios*, some use case scenarios, such as Linked Government Data USA[3] and UK[4].

2.1.2 Comments and feedback

During and after the first webinar, we had collected some really useful comments and feedback from consortium members regarding the structure of the slides for the first module. That is, in terms of ordering material, it's important to focus initially on RDF, RDF-S and SPARQL and leave OWL for later. The current slides introduced OWL too early and in too much detail for learners who usually start with this module with little background knowledge. Following our experiences here at the OU in teaching programming and ONTO's experience in training Linked Data practitioners, the best way to teach beginner-level of learners is to first start with a loop focussing on the most basic RDF and SPARQL only as follows and gradually introduce RDF-S and OWL:

a) RDF;

b) SPARQL;

c) Go to a).

Where a) and b) include activity from the learner, i.e. write some RDF triples and query them. The learner goes around this loop gradually being exposed to more RDF and SPARQL constructs. Later, the loop takes in RDF-S and becomes

a) RDF-S;

b) SPARQL;

c) Go to a).

And then later, with learners having a good knowledge of RDF and RDF-S, it introduces OWL

a) RDF-S;

b) OWL;

c) SPARQL;

d) Go to a).

To support the looped learning, a Sesame[5] RDF repository server were setup and hosted at http://km.aifb.kit.edu/services/euclid/sparql where, with some pre-configuration and pre-installed datasets, learners can submit through a web form a set of RDF triples and a SPARQL query to be evaluated.

2.1.3 Revised webinar content

Based on the comments and feedback, the slides were revised. The revision of the slides also took into consideration of the feedback from the delivery of the online content, as described in next section. That is, to have a focus on and be driven by learning outcomes. Based on the revised slides, the webinar for the first module was re-made and webcasted on 1st, October 2012 at http://stadium.open.ac.uk/2056 , where replays are available.

The outline of the slides for this webinar remains the same. The major revision lies in the *Introduction to Linked Data* where the introduction of OWL is much shortened, i.e. from eleven slides in the previous version down to three slides in this version. OWL-DL is removed from this module, as it is too complex to understand for beginner

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[2] http://xmlns.com/foaf/spec/

[3] http://data.gov

[4] http://data.gov.uk

[5] http://www.openrdf.org/about.jsp

level of learners. Also fixed are small technical prints in the slides, some of which are not necessarily incorrect, but could potentially lead to misunderstandings or ambiguities thus hampering the learning effectiveness of learners.

2.2 Online Content

Along with the preparation of webinar and also governed by the curriculum, online training material is being prepared and will be made available which, complementary to the slides for the webinar, includes a far richer description of the training content equivalent to that of a course textbook, examples, exercises and self-assessment questions. Learning materials are structured according to learning outcomes, which are made explicit for the learner. Embedded questions, strategically apportioned throughout the course text, support the validation of learned outcomes.

According to the plan, the first version of the online content, i.e., the chapter for the first module, was produced in HTML format shortly after the first webinar. It was then distributed to consortium members for comments and feedback before it is published for public comments and feedback.

2.2.1 Chapter structure

In alignment with the organization of the content for webinar, the chapter content is laid out from background knowledge of Linked Data to the very basics of Linked Data. The table of content is as follows:

Introduction

Learning outcomes

1.1. Motivation for the course

1.2. Background technologies

1.3. Background standards

1.4. Linked Data

1.5. Case scenario: a music portal

Exercises

Links

Further Reading

The chapter content is written as a course material. Therefore, it has a focus on learning outcomes which drive the organisation of the content. That is, the ultimate purpose of the learning material is to help the learner achieve the specified learning outcomes. For the first module, the learner should be able to understand

- The goals of the course
- The enabling technologies for Linked Data
- The current status of Linked Data technologies
- The aims of the motivating scenario (a music portal)

In the *Background technologies* section, we provide introductions of Internet, Hypertext, World Wide Web, Web 1.0 (static) Web 2.0 (dynamic), Social Web, Web 3.0 (semantic) Ontologies. The *Background standards* section introduces HTTP, URI, XML, RDF, RDFS, SPARQL, OWL. The *Linked Data* section provides the description of principles, rating published datasets, growth of Linked Data on the web.

2.2.2 Comments and feedback

After the distribution of the first version among consortium members, comments and feedback have been received with regard to mainly the quality of the content to ensure the very correct knowledge is delivered to learners in the most effective manner. Here summarizes a few.

1) All resource URIs used as examples should be real Linked Data resources, such as those from Freebase[6], DBpedia[7], MusicBrainz[8], as an advocated practise for publishing Linked Data [2], rather than being made up.

2) It is better to comply the modelling examples with the MusicBrainz dataset used in the motivating scenario.

3) Best efforts should be made to clarify the confusions commonly observed in Linked Data and its technologies. For example, there is a widespread confusion among representation formats N3[9], NTriples[10] and Turtle[11]. More emphasis should be given to explain better the features of the most widely accepted one, i.e. Turtle in this case. Another example of common confusion is "resource" vs "individual".

4) Description Logic is also, as in slides, given way too much prominence for Linked Data.

6) For any given exercise, there must have corresponding content to assist learners finding the answer. For example, if the exercises are going to include SPARQL queries, then basic queries such as SELECT and basic graph patterns of RDF need to be introduced.

2.2.3   Revised chapter content

Following the comments and feedback and in alignment with the revision made to the webinar slides, the chapter content is being revised. As soon as the final version of the first chapter is ready, it will be published on the project's website. Furthermore, it will be available on the Euclid's community portal, which will enable viewers and course participants to provide feedback, discuss the content and ask question. This input will serve as input for improving the quality of the eBook, as will be introduced next, for the first module.

2.3   EBooks

An eBook is planned for each curriculum module, based on the online content and the webinar. It encompasses all the content to a particular module, in a structured and interactive way. The eBook serves very well as the basis for self-learning as well as for revisiting certain topics after a training is completed, as part of an EUCLID event for example. After the delivery of webinar and online content for each module, the gathered feedback is used to restructure the module content for final delivery as an eBook. Therefore, the eBook represents the final outcome of the training materials revising process.

An eBook can be produced, directly from the online content, webinar slides and webinar video, using an eBook production toolkit, such as Apple iBooks Author[12] mainly for books distributed on Apple devices, such as iPhone and iPad, or other third-party tool, such as WordPress[13] for distributing on most of eBook reading platforms including Apple platform. When produced using Apple iBooks Author, the eBook can be distributed through iTunes U[14] to enable learners being taught anywhere with an experience comparable to that of learning a course in a classroom. Interactive components like communicating to a Sesame server from a SPARQL endpoint to support exercises can also be embedded.

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[6] http://www.freebase.com

[7] http://dbpedia.org

[8] http://musicbrainz.org/

[9] http://www.w3.org/TeamSubmission/n3/

[10] http://www.w3.org/2001/sw/RDFCore/ntriples/

[11] http://www.w3.org/TeamSubmission/turtle/

[12] http://www.apple.com/ibooks-author/

[13] http://wordpress.org

[14] http://www.apple.com/education/itunes-u/

3 Lessons Learned on the Course Production Process

Six months into the project, besides the comments and feedback to the produced content, a few lessons have been learned on the production process during the first cycle of course production. Next, we describe what we learned and how we refined the course production process accordingly.

3.1 Curriculum Development and Availability of Materials

During the production of the first introductory module, we realised that there is some input that needs to be available as a prerequisite for completing the written version of the chapter. Initially, the foreseen production processes expected that "raw" materials in the form of papers, white papers, books, tutorials and presentations are to be used to generate the slides for the webinars as well as to create the written content. However, we discovered that, in order to provide a well-structured and practice-oriented training module, we need to define the expected competencies that the student is supposed to gain though engaging with the content of the module, which then drive the preparation of raw materials and the production of the training content. For example, the competencies defined for the first module are the following:

After the completion of the course, participants are expected to:

- Be able to state the Linked Data principles;

- Have a general understanding of the RDF data model, RDFs, OWL, and SPARQL;

- Recognize classes and predicates introduced in the lecture;

- Differentiate between the Semantic Web and the WWW;

- Recognize the notion of an Ontology;

- Be familiar with the main technologies behind the Semantic Web;

- Be able to write a simple Turtle statement;

- Be able to write a SPARQL query with a select and conjunction over basic graph patterns.

Furthermore, we identified the need for defining a set of hands-on examples that are to guide the skills development. As a result, the curriculum plan was refined and developed in more detail in order to include a number of expected outcome competencies and some exercises and examples.

These realisations also triggered the revising of the complete curriculum, which is now updated to contain six modules, which are much more coherent and whose content is better aligned and supports a smoother process of skills built-up and development. The redefined modules are shown in Figure 4, also organized in the order of three learning levels, similar to that in Figure 1:

1. Introduction and Application Scenarios

2. Querying Linked Data
3. Providing Linked Data
4. Interaction with Linked Data

5. Creating Linked Data Applications
6. Scaling up

Figure 4: Revised Curriculum Plan

As it can be seen, the current version of the curriculum plan is based on chapters that are each targeting at addressing a different crucial task related to Linked Data. While having an individual objective, each module contributes to further developing the skills and knowledge gained by the previous one thus aiding to acquiring an

overall understanding and expertise in the field. The current version of the curriculum is available on Euclid's website[15].

3.2 Course Production

During the implementation of the first course production process, the planned steps to create each course module were followed. That is, the raw materials were collected, based on which the draft training materials were created including slides for webinar and HTML online content. Then, feedback on the drafts were gathered and consumed. Finally, an eBook was produced. In the process, we have made the following important observation that relates to the course production process.

Since raw material is key to preparing draft training material, the quality of raw material plays an important role in the usefulness of the training material to be delivered to the trainee. What we found out is most useful raw material is the set of exercises - the questions and answers - that the students should be able to complete by the end of the chapter, which ensures that the training material gives the trainee the required competency to answer these. The exercises thus form the concrete learning outcomes for the trainee for each training module. For example, based on the following RDF statements, expressed in the Turtle[16] syntax, we design the exercises that follow.

```
@base <http://www.euclid-project.eu/examples/module1#> .
@prefix vocab: <http://www.euclid-project.eu/ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .

vocab:ResearchProject rdfs:subClassOf foaf:Group .
vocab:consortiumMember rdfs:subPropertyOf foaf:member .
<barry> a foaf:Person ;
        foaf:givenName "Barry" ;
        foaf:familyName "Norton" .
<euclid> rdfs:label "The EUCLID Project"@en, "Das Project EUCLID"@de ;
        vocab:consortiumMember <barry> .
```

Exercises:

1) Re-express the statements in NTriples (i.e. remove all prefixes and abbreviations to give full triples in absolute URIs).

2) Add a resource representing yourself, attaching your name using the FOAF properties.

3) Execute the following SPARQL query and consider why the class has members, even though none are explicitly asserted in the data: *SELECT ?agent WHERE {?agent a foaf:Agent}*.

4) Add a property to 'consortiumMember' to assert that all subjects, should be research projects (members of the ResearchProject class).

5) Adapt the query from 3) to ensure that EUCLID is now a research project.

6) Create a new property to relate training participants to research projects and use it to relate yourself with EUCLID.

As can be seen, the exercises focus on practising learners' knowledge on basic constructs of RDF(S) and basic syntax and usage of SPARQL. With exercises triggering learners to think and practise while learning, learning effectiveness can be significantly improved.

There are some other learned lessons that, being more to do with the quality of training content than the actual production process though, have been discussed and exemplified in Section 2, including

- The training content should be organised in an order that ensures a smooth learning experience thus maximizing learning effectiveness for learners.

- The training content should be written coherently and to clarify any common confusion or ambiguity.

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[15] http://www.euclid-project.eu/

[16] http://www.w3.org/TeamSubmission/turtle/

4   Conclusions and Future Work

This deliverable reports the progress and lessons learned during the first half year of the project in the work of course production and delivery. The concrete work carried out during this period includes the creation of the curriculum plan, and then, guided by the curriculum, the production of training materials in forms of webinar, HTML content, and eBook, which went through at least one iteration of revision with the collection of comments and feedback after the delivery of the first versions of the produced materials.

Most comments and feedback being received are related to the quality of the training content, such as technical correctness and material ordering, which is no doubt of the uttermost importance to ensure delivering the correct knowledge in the most effective manner to learners. For example, the material should be organized in a way such that no too complex components should be introduced too early for learners at beginner level. Also, in terms of technical correctness, not all the proposed revisions are due to incorrectness, rather to prevent potential misinterpretations or ambiguities among learners which could hamper their learning effectiveness.

As to the course production process, during the implementation process, we learned that, in order to provide a well-structured training module with maximum learning effectiveness, we need to define the expected competencies that the learner is supposed to gain though engaging with the content of the module. Related to this, we found out that the most useful raw material for producing a course is the set of exercises - the questions and answers - that the learners should be able to complete by the end of the chapter, which ensures that the training material gives the trainee the required competency to answer these. The exercises thus form the concrete learning outcomes for the trainee for each training module and drive the organisation of the content.

With the training material reaching a wider range of audience once it is made publicly available, it is likely that there will be more comments and feedback coming along the way, which we will constantly monitor and consume to improve the quality of the training material until when the eBook is finally being released. The production of the second module is under way and the production process can always be improved along the way.

References

[1]   M. Maleshkova, M. Acosta, and E. Simperl, "Deliverable 1.1.1-Curriculum Plan", July, 2012.

[2]   C. Bizer, T. Heath, and T. Berners-Lee, "Linked data - the story so far", International Journal on Semantic Web and Information Systems, 5(3):1–22, 2009.