MSEE
Manufacturing Service Ecosystem

D 72.2 – The e-Learning module
"Concepts and categories of manufacturing services"
M18

Document Owner:	Jean-Charles AKIF
Contributors:	Guy DOUMEINGTS, Yves DUCQ and all MSEE partners of WP72
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VERSION HISTORY

VERSION	DATE	NOTES AND COMMENTS
V 1.0	18/03/2013	First version of the Deliverable D72.2.
V 1.1	24/03/2013	Version integrating the comments of I-VLAB and UB1 partners. (modification of all sequences of the training module and addition of references)
V 2.0	30/03/2013	Second version integrating the comments of WP 72 partners. (Precision about the targeted learners and the use of the training module in sequence 1 and addition of examples on service modelling in sequence 5).
V2.1	05/04/2013	Version integrating the comments from Guy Doumeingts
V2.2	15/04/2013	Version integrating the comments from Alexios Pagkozidis (Reviewer)

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1. Executive Summary

The work described in the deliverable D72.2 (e-Learning module M1 "Concepts on Manufacturing Services and Servitization") of the MSEE Project concerns the first training module of the MSEE Vocational Training System (VTS).

For the development of this first training module, we have used the general specifications defined in the Deliverable D72.1 (General specifications of MSEE Vocational Training System).

We have applied the e-LITE Method developed by CNAM of Pays de la Loire and presented in the deliverable D72.1 for the development of the MSEE VTS. The e-LITE Method is made up of four development phases (understanding of the training domains and needs, design, development and experimentation of the e-Learning system).

We describe in this deliverable the application of the development phase for the training module M1. We have realized the following actions:

- Design of a pedagogical form,
- Collection of pedagogical resources and elements from partners,
- Design of a pedagogical scenario for the training module,
- Production of the pedagogical resources (in fact the e-learning module),
- Collection of the first impressions of the partners.

Today, pedagogical resources about M1 module are available via internet access on the MSEE web site.

These pedagogical resources are about the following topics:

- Context of the training module (MSEE Project and its VTS),
- Concepts/Definitions on servitization,
- Marketing and organizational aspects of the servitization,
- Life cycle management,
- Service system modelling,
- Performance evaluation of the service system,
- Illustration of the concepts by MSEE test cases.

After, the first feedback of partners about this version of the Training module, we consider that the pedagogical resources developed in the frame of the D72.2 may be considered in two ways:

- As a training module ready to be used by persons with a background in Engineering,
- As a kernel of pedagogical resources on the main topics about Manufacturing services which must be adapted to the various category of trainees.

In the first case, the training module is targeted toward people involved in servitization project, IT or consulting companies.

In the second case, MSEE Partners will have to adapt these pedagogical resources to build customized training modules dedicated to specific learner's audience characterized by different criteria (level of education, industrial experience, size, activity sector and maturity of company,…).

2. Introduction

2.1 Objectives and content of the deliverable D72.2

In the Work Package WP72 context which will be described in the following section, the deliverable D72.2 has two main objectives:
- The first objective is to present how the e-Learning module M1 "Concepts on Manufacturing Services and Servitization" has been designed and developed.
- A second objective is to describe this e-Learning module, the different pedagogical resources produced and how these resources may be used.

After the Executive Summary, the introduction presents the main objectives and the plan of the deliverable D72.2. Then, we recall the objectives, the organization and the expected results of the WP72 and we present the context in which this deliverable has been developed.

The third section describes the development process of the e-Learning module M1 and the application of the development phase of e-LITE Method to the design and the realization of this e-Learning module.

The fourth section is a synthetic presentation of the seven sequences constituting the e-Learning module M1. It gives information about the content, the development of these sequences and the difficulties encountered.

We conclude by a description of the different ways to exploit the pedagogical resources produced for a best dissemination of the results of the MSEE Project.

2.2 Context of the MSEE deliverable D72.2

The MSEE Project aims to develop new concepts, methodologies and tools around Manufacturing Services with an industrial finalities. It is the reason why, during the design phase of the project, it was decided by the managers of the project that the WP72 (Vocational Training and Education) would be dedicated to the development of a VTS designed to support the dissemination of the new concepts produced by the MSEE Project.

The WP72 and the associated MSEE Vocational Training System (VTS) have two main objectives:
- To disseminate the basic concepts of the MSEE Project in order to improve the understanding by the end-users of the Service and SLM (Service Life Cycle Management),
- To provide an adapted pedagogical platform supporting the two training modules:
    - Concepts on Manufacturing Services and Servitization (Module M1),
    - Methodologies and tools for Service Modelling (Module M2).

In the frame of WP72, the production of three deliverables was planned:
- D72.1: General specifications of MSEE Vocational Training System,
- D72.2: e-Learning module "Concepts on Manufacturing Services and Servitization",
- D72.3: e-Learning module "Methodologies and tools for Manufacturing Service modelling".

The general specifications and the development method of the MSEE VTS have been defined in the deliverable D72.1 produced at M9 (Month 9 of the MSEE Project). On the base of the choices made in the deliverable D72.1, we have developed the e-Learning module "Concepts on Manufacturing Services and Servitization" described in the present document, the deliverable D72.2. The third deliverable D72.3 (e-Learning module "Methodologies and tools for Manufacturing Service modeling") is planned to be produced later, in M30.

In the WP72, among all the partners of the MSEE Project, the following organizations will be involved in the development of the MSEE VTS:

- BIBA (with a workload of 2 Persons * Month),
- DITF (with a workload of 2 Persons * Month),
- FhG-IAO (with a workload of 2 Persons * Month),
- POLIMI (with a workload of 2 Persons * Month),
- TECHNALIA (with a workload of 2 Persons * Month),
- UIBK (with a workload of 2 Persons * Month),
- I-Vlab/CNAM Pays de la Loire (with a workload of 8 Persons * Month).

All partners involved in WP72 are bringing their specific competencies in the domain of Manufacturing Services. These competencies are useful for I-VLAB and CNAM of Pays de la Loire.

All partners participate to the specifications of the VTS and the definition of its two training modules by indicating suggestions and comments about deliverables. They can give to I-VLab/CNAM, their pedagogical resources (courses, documents, media,...) related to the topics of the training module in order to integrate them in the modules, after an eventual adaptation. They participate to the experimentation of the two training modules producing evaluations and feedbacks.

3. Description of the development process of the e-Learning module

We are going to present the application of the e-LITE Method to the different steps of the development of the e-Learning module "Concepts on Manufacturing Services and Servitization":
- **Step 1:** Design of the pedagogical form of the e-Learning module,
- **Step 2:** Collection of pedagogical resources or elements from partners,
- **Step 3:** Design of the architecture and pedagogical scenario of the training module,
- **Step 4:** Production and test of the pedagogical resources of the module.

These steps of development of the e-Learning module are based on the general specifications described in the deliverable D72.1.

3.1 Step "Design of the pedagogical form of the e-Learning module"

The step "Design of the pedagogical form of the e-Learning module" is based on a good understanding of the training needs and the general specifications of the training module. The completion of the pedagogical form obliged us to answer to some questions about:
- Pedagogical objectives,
- Prerequisites
- Detailed content of the module,
- Duration,
- Learning mode,
- Learning support,
- Knowledge evaluation mode,
- Pedagogical method,
- Bibliography,…

Using the template of the pedagogical form proposed with the presentation of e-LITE Method in the MSEE deliverable D72.1, we built a first version of the pedagogical form of the e-Learning module.

Then, we sent this first version of the pedagogical form to MSEE WP72 partners for comments and validation. The partners have given us some comments about the proposed pedagogical form. The two main comments of partners were:
- The content of the training module was too ambitious relative to its duration,
- There was a lack of content concerning business model and marketing aspects.

After taking into account these comments, the pedagogical form associated to the e-Learning module was adopted. This pedagogical form is presented in the annex 1 of this deliverable.

3.2 Step "Collection of pedagogical resources or elements from partners"

After the definition of the pedagogical form of the e-Learning module, we have sent the pedagogical form to all partners of MSEE WP72, asking them if they owned some pedagogical resources (courses, presentations, documents,…) in relation with one of the topics of the content of the module.

Three MSEE WP72 partners sent PowerPoint presentations and documents associated to items of content of the e-Learning module. Most of these documents were MSEE deliverables and references to MSEE deliverables documents. These documents have been helpful to identify, for each topic presented in the e-Learning module, elements of text, figures and references constituting the content of the module.

3.3 Step "Design of the architecture and pedagogical scenario of the training module"

In the development phase of the e-Learning system, at the step "Design of the architecture and pedagogical scenario of the training module", after the definition of the pedagogical form of the training module and the collection of pedagogical materials from the MSEE WP72 partners, it was necessary to define the architecture the MSEE VTS and the pedagogical scenario of its first e-Learning module.

Concerning the architecture of the e-Learning system, because it was decided at the design phase of the MSEE project that the MSEE Vocational Training System would be constituted by only two training modules, we defined the architecture of the MSEE VTS presented in the figure 3:
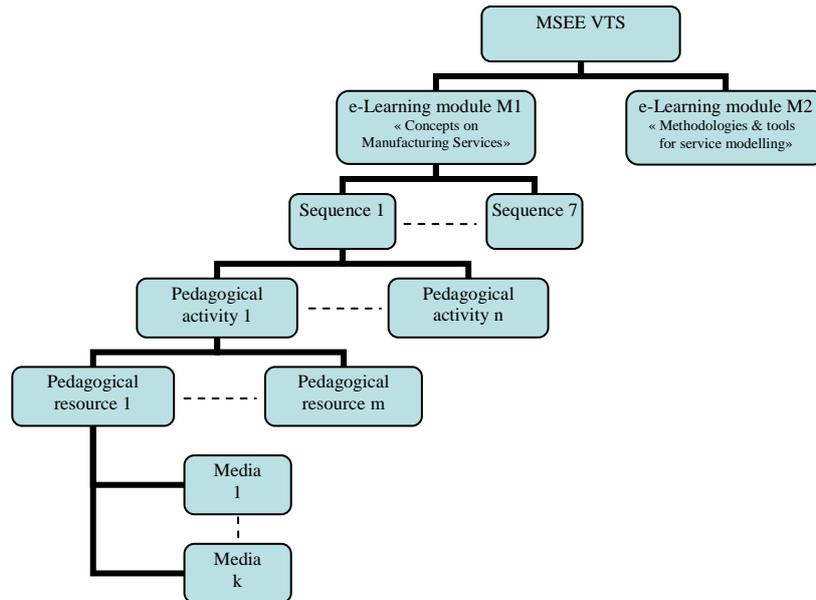

Figure 1: Architecture of the MSEE VTS

The MSEE VTS is composed of two training modules: The e-Learning module M1 described in this deliverable and the e-Learning module M2 "Methodologies and tools for service modelling" which will be developed at M30.

The e-Learning module M1 "Concepts on Manufacturing Services and Servitization" is made up of seven sequences. Each sequence is constituted of pedagogical activities. For each pedagogical activity, it is necessary to develop pedagogical resources using different media such as images, texts, sons, etc.

Once the architecture of the MSEE VTS defined, it was possible to define the pedagogical scenario of the e-Learning module. This work consists in the division of the training module in sequences of activities then in activities. This needs a pedagogical thinking at the base of the pedagogical scenario design. The pedagogical scenario of the e-Learning module M1 is constituted by seven sequences. Each sequence is related to one of the seven topics covered by the training module. The seven covered topics are:
- Development context of the training module,
- Concepts/Definitions on servitization,
- Marketing and organizational aspects of the servitization,
- Life cycle management,
- Service system modelling,
- Performance evaluation of the service system,
- Illustration of the concepts by MSEE test cases.

For the first versions of the e-Learning module M1, just one activity "knowledge acquisition" related to a PowerPoint presentation is associated to each sequence but, in the future versions of the module, knowledge evaluation activity and others pedagogical activities will be developed.

3.4 Step "Production and test of the pedagogical resources of the module"

Once the pedagogical scenario defined, we began the production of the pedagogical resources of Module 1. Production of the pedagogical resources is a technico-pedagogical and operational activity. For the first versions of the e-Learning module, we used PowerPoint software to create the presentation of each of the seven sequences of the module.

After definition of guidelines (structure and duration of sequences, graphical standard,…) to develop with consistency the different sequences, we produced, sequence by sequence, the pedagogical resources corresponding to each sequence.

Once all the sequences have been produced, we have installed the sequences on the I-VLab collaborative platform in order that all WP72 partners could evaluate the first version of the e-Learning module "Concepts on Manufacturing Services and Servitization" and give feedback and comments on the use of the e-Learning module. The main comments of the W72 partners were about:
- The targeted learners of the training module,
- The needs of additional examples about the sequence on Service System modelling,
- Proposition of use of the pedagogical resources of this module.

A new version (Version 2) integrating these comments was produced and installed on the I-VLab platform and then, on the MSEE web site.

4. Development of the different training sequences of the module

As presented in section 3 of this deliverable, for the main topics of the e-learning module defined in the pedagogical form, we have developed the seven sequences.

To produce a sequence, we have collected all information, documents, figures,… necessary to build and design the PowerPoint presentation of the sequence and its different slides. The activity of design of training sequences represent an important work because it needs to read and integrate a lot of information in various documents (DoW, many deliverables and external documents) in order to give a realistic point of view of the works done, concepts used and results produced in MSEE Project. Then, for each slide of each sequence, we have written in comment page, a detailed description of the content of the slide.

After the production of each sequence, we have made the narration of each presentation. This narration has been realized by exploiting detailed comments developed in each slide. For that, we added sound to each slide of the presentation and check the pedagogical coherence of the presentation associated to the sequence.

Now, we are going to present the seven sequences developed in the frame of this deliverable. For that, for each sequence, we shall describe successively, the title of the sequence, its content, the main documents or information sources used, comments and difficulties encountered during the development of the sequence.

4.1 Sequence 1: "Development context of the training module"

This sequence constitutes an introduction to the training module. The content of this sequence presents MSEE Project, its key figures, objectives, main challenges and its partnership. Then, MSEE VTS (objectives and architecture) is described. The end of the sequence 1 speaks about the content, pedagogical objectives of the training module M1 "Concepts on Manufacturing Services and Servitization", first of the two training modules of the MSEE VTS.

Number of Slides: 11   Duration of the sequence: 12 minutes

Comments and/or difficulties encountered: The main difficulties relative to the sequence 1 was to give to the learners a global view about the MSEE Project, the MSEE VTS and its first training module in twelve minutes.

4.2 Sequence 2: "Concepts/Definitions on servitization"

The second sequence gives some concepts and definitions related to servitization. First, it presents the general definition of a service. Then, it explains the concepts of Product Service and Product Service System. This sequence ends with the description of the servitization process with its different levels of servitization and their impacts on the competitive position of an enterprise.

Number of Slides: 16   Duration of the sequence: 14 minutes

Comments and/or difficulties encountered: A lot of documents was related to this sequence and the concepts on servitization and were used to build this sequence. The main difficulties relative to the sequence 2 was to select, among all documents and definitions, the best and the most pedagogical one.

4.3 Sequence 3: "Marketing and organizational aspects of the servitization"

The third sequence begins to describe the marketing aspects related to the rise of customer needs for services. Then, this sequence speaks about possible evolutions of the organizations to meet these customer needs: Classical Manufacturing Enterprise, Virtual Manufacturing Enterprise and Manufacturing Service Ecosystem.

Number of Slides: 15   Duration of the sequence: 12 minutes

Comments and/or difficulties encountered**:** We had some difficulties to build the first part of this sequence due to a lack of available information and documents in MSEE Project on marketing aspects of the servitization.

4.4 Sequence 4: "Life cycle Management"

The fourth sequence begins to review Product Life cycle Management (PLM). Then, after a description of the different phases of service engineering, it speaks about Service Life cycle Management (SLM) and the underlying difference between PLM and SLM. To finish, the sequence 4 describes the Life cycle Management and the evolution of a Service System during the Service Life cycle.

Number of Slides: 12   Duration of the sequence: 11 minutes

Comments and/or difficulties encountered: We have identified some differences between MSEE partners about the definitions of the phases of service engineering which created for us some difficulties to build this sequence with coherence.

4.5 Sequence 5: "Service System modelling"

The fifth sequence is dedicated to Service System Modelling. It begins with a short presentation of the application of System Theory to the Service System. Then it presents the GRAI Approach and its application to Service System modelling. Thirdly, the sequence 5 describes the Model Driven Service Engineering Architecture, an extension of the MDA (Model Driven Architecture) approach adapted to Service System engineering. To finish, this sequence evokes the general architecture of the Engineering Tool SLMToolBox designed in the MSEE Project to support Service Engineering.

Number of Slides: 25   Duration of the sequence: 31 minutes

Comments and/or difficulties encountered: This sequence is the biggest sequence of the e-learning module. It presents a lot of abstract concepts necessary for service modelling and it has been difficult for us to explain in thirty minutes, all these concepts to industrial people. In the second version of the e-learning module we have added some slides to the sequence 5 in order to give modelling examples and facilitate a good understanding of the GRAI model by industrial learners.

4.6 Sequence 6: "Performance evaluation of the Service System"

The sixth sequence speaks about performance evaluation. First, an introduction to the notion of performance and motivations for performance evaluation is made. Then, it defines the KPI, categories of KPI, objectives and difficulties of implementing a KPI system. To finish, the sequence 6 describes the ECOGRAI Method, an original approach to designing and implementing a KPI system.

Number of Slides: 16   Duration of the sequence: 12 minutes

Comments and/or difficulties encountered: The main difficulty to build this sequence was linked to the lack of simple example, available in the MSEE Project Environment, illustrating in concise way the application of ECOGRAI Method in Industry.

4.7 Sequence 7: "Illustration of the concepts by MSEE test cases"

The seventh sequence is a synthetic presentation of the four MSEE test cases of the MSEE Project (BIVOLINO, IBARMIA, INDESIT, TP VISION). These test cases correspond to servitization projects in organizations at different levels of servitization. This sequence illustrates that the concepts related to Manufacturing Services presented in this training module are applicable in different industrial contexts.

Number of Slides: 7   Duration of the sequence: 10 minutes

Comments and/or difficulties encountered: A difficulty for the building this sequence was that the MSEE test cases are today in progress. It would be better for us, in order to have more updated and detailed information about these cases, be partner of the WP6.

The seven sequence described below constitute the first e-Learning module of the MSEE VTS. The duration of the seven sequences is around 2 hours in continuous training session. The following table gives an overview on the different sequences of the Module M1:

Sequence Number	Title of the sequence	Duration
1	Development context of the training module	12 '
2	Concepts/Definitions on servitization	14 '
3	Marketing and organizational aspects of the servitization	12 '
4	Life cycle management	11 '
5	Service system modelling	31 '
6	Performance evaluation of the service system	12 '
7	Illustration of the concepts by MSEE test cases	10 '

5. Conclusion

In the frame of the WP72 and the deliverable D72.2, we have developed a first version of the e-Learning module "Concepts on Manufacturing Services and Servitization". This first version is a set of seven training sequences supported by pedagogical resources developed with PowerPoint. These pedagogical resources are sounded. This first version of the e-learning module has been installed on the I-VLab collaborative for a first evaluation by the MSEE WP72 partners.

After, the first feedback of partners about the first version of the Training module, we consider that the pedagogical resources developed in the frame of the D72.2 may be considered as useful in two ways:
- As a training module ready to be used,
- As a kernel of pedagogical resources on the main topics about Manufacturing services.

In the first case, the training module is targeted toward people involved in a servitization project in industrial, IT or consulting companies.

In the second case, MSEE Partners will have to adapt these pedagogical resources to build customized training modules dedicated to specific learner's audience characterized by different criteria (level of education, industrial experience, size, activity sector and maturity of company,…).

This first version could evolve in different ways: First, by adding, for each sequence, auto-evaluation of the learner's knowledge acquisition then by improvement of the pedagogical scenario and learner's interface of the module. A new version will be produce in two months.

6. References

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7. Annexe

MSEE pedagogical form of the training module

"Concepts on Manufacturing Services and Servitization"

	Module: Concepts on Manufacturing Services and Servitization
MSEE Vocational Training System	**Targeted Learners :** People involved in servitization project working in : • Industrial companies, • IT companies, • Consulting companies,…
Year : 2013	
Author(s) : J-Ch. AKIF	**Objectives of the module in terms of skills to acquire:** *(at the end of the module, learners are able to…)* At the end of this Module, the learners will be able to understand the main concepts related to manufacturing services and servitization. They will be able to identify the various phases of the important steps of the Service system Lifecycle Management (SLM) in order to apply these in their enterprises.
Nb hours of theoretical courses: 2-3 h (with exercises and Knowledge evaluation)	
Updating date: 21/03/2013 **Page** 1 / 1	**Prerequisites:** For the learners of this module, it is mandatory to know manufacturing concepts.

CONTENT OF THE MODULE:

1) Context of the training module

2) Concepts/Definitions on servitization

3) Marketing and organizational aspects of the servitization

4) Life cycle management

5) Service system modelling

6) Performance evaluation of the service system

7) Illustration of the concepts by MSEE test cases

Pedagogical methods and resources:
• e-learning course divided in short sequences (between 15 and 30 minutes),
• The access to the e-learning for the MSEE VTS will be supported by Internet on a PC with a broadband connection.

Knowledge evaluation mode:
• Auto-evaluation with the help of on-line QCM and exercises.

Bibliography :
• Main related MSEE deliverables: D11.1-4, D12.3-4, D13.1-2, D14.1-2, D15.1-3, D24.1.
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