



## DT1.2: Final training concept specification

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<b>DELIVERABLE NO</b>	DT1.2: Final training concept specification
<b>DISSEMINATION LEVEL</b>	<b>PUBLIC</b>
<b>DATE</b>	24. August 2006
<b>WORK PACKAGE NO</b>	WP T1: Training
<b>VERSION NO.</b>	0.5
<b>ELECTRONIC FILE CODE</b>	dt1.2_0.4
<b>CONTRACT NO</b>	507100 PROMISE A Project of the 6th Framework Programme Information Society Technologies (IST)
<b>ABSTRACT</b>	This document contains the PROMISE training concepts. It describes the specifications for the Instructional Design of the training architecture that will distribute the PROMISE concepts throughout the Consortium.

<b>STATUS OF DELIVERABLE</b>		
<b>ACTION</b>	<b>BY</b>	<b>DATE (dd.mm.yyyy)</b>
<b>SUBMITTED</b> (author(s))	Andrea Matta	24.08.2006
<b>VU</b> (WP Leader)	James Brusey	
<b>APPROVED</b> (QIM)	D. Kiritsis	24.08.2006

## Revision History

Date (dd.mm.yyyy)	Version	Author	Comments
17.07.2006	0.1	Andrea Matta, Lutz Rabe, Ahmed Bufardi, Paul Folan, Moseng Bjorn, Kary Framling	First version containing part of DT1.1 and the templates for the Macro-phase design filled by WP T1 partners.
24.07.2006	0.2	Andrea Matta, Andrea Zangiacomi, James Brusey, Ajith Kumar Parlikad, Andreas edler, Altug Metin	All macro analysis completed except for one training course (business whole life cycle).
26.07.2006	0.3	Andrea Matta,	Minor revisions of Sections 1,3,4. All macro analysis completed Homogenization of content in Section 8. Summary of courses, Training Action plan and
27.07.2006	0.31	Andrea Matta, Lu, Zheng, Andrea Zangiacomi	Minor revisions of Section 4. Summary of courses Conclusions added.
31.07.2006	0.4	Andrea Matta	Version submitted to the Quality Manager
24.08.2006	0.5	Ajith Parlikad	Revised version incorporating reviewers' comments

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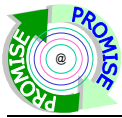
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## Abbreviations

Abbreviations used in this document:

BOL	Beginning Of Life
LMS	Learning Management System
MOL	Middle Of Life
EOL	End Of Life
DSS	Decision Support System
PDKM	Product Data and Knowledge Management
PEID	Product Embedded Information Device

# 1 Introduction

## 1.1 PROMISE Training goal

PROMISE is a very complex project for several reasons. First of all it aims to realize the needed breakthrough in PLM theory and practice by proposing new methodologies, technologies and concepts to improve the competitiveness of European enterprises. As a consequence all the intermediate and final results are not easy to be acquired and applied in practice. Furthermore the number of partners working in the project is high, this means to have the PROMISE knowledge distributed through the PROMISE Consortium and to have different points of views of the same problems, concepts and practices. The fact that the Consortium is highly heterogeneous and people work in different places in Europe do not facilitate the exchanging of the PROMISE knowledge. Mainly for these reasons the work package WPT1 aims at *“facilitating and disseminating key PROMISE outputs, namely research and technology, to other members of the consortium. In addition to providing a ‘hands on’ environment for understanding and demonstrating PROMISE developments and progress, this work will inspire potential developments and uses of PROMISE results, as well as enabling PROMISE tools and methodologies to be transferred to other developers in this area”*.

The PROMISE training model aims at improving the knowledge of PROMISE partners concerning:

- Concepts
- Technologies
- Advanced tools
- Technical problems
- Marketing ideas
- Business cases
- Standards

Notice that training in PROMISE will be delivered internally to the project and not externally. The reason is that internal training is necessary for the success of the project because it helps to disseminate and integrate concepts, methods and tools among the same people that will use them for implementing PROMISE demonstrators in real business scenarios.

Summarizing, WPT1 will design and provide training for:

1. improving knowledge on PROMISE technology and its exploitation
2. supporting the development of demonstrators by delivering the needed technical knowledge on the new technologies developed in the project.

## 1.2 Purpose of this document

This document is the final version of the training specifications on which the training infrastructure will be designed and developed in TT1.2 and TT1.3. This set of specifications will be considered to design, implement and deliver the PROMISE training courses.

In more details, this document describes final specifications about:

- **Why** do we need to train people?
- **Who** will be trained? (That is, who are the users or learners to which the training concepts will be delivered?)

- **What** technologies and business models are we going to teach? (That is, what content will be delivered?)
- **How** do we intend to go about producing and delivering the training materials? (That is, what infrastructure will be used to deliver the training content?)

### 1.3 Related documents

This document aims at deriving the set of specifications needed to properly design the PROMISE training model.

Deliverable DT1.1 is a draft version of this document emitted at month 18. The content of DT1.1 has constituted the base for Sections 3-6 of this deliverable.

This document DT1.2 will constrain the following other documents:

- DT1.3: storyboard of the PROMISE training model. This document will contain the instructional design of training courses and the IT architecture adopted for each course.
- DT1.4: implementation of the PROMISE training model. This document will explain how training courses will be developed with their related material and how they will be delivered.

### 1.4 Structure of the document

This document is structured as follows.

**Section 2** describes the **theoretical approach** adopted in WPT1. This approach will guide all the training activities from the definition of specifications to the delivery of training and its assessment.

**Section 3** describes the **users** of the training activities, i.e. the learners who will improve their knowledge on the PROMISE project and will enhance their capabilities of using PROMISE tools and techniques. PROMISE learners are described by pointing out the characteristics that can affect the instructional design of training courses and their delivery.

**Section 4** reports the main PROMISE **concepts** to deliver in training courses.

**Section 5** defines the main **goals** of PROMISE training.

**Section 6** describes the **resources** (human, hardware and software) potentially usable in training courses.

**Section 7** reports the **list of training courses** to be carried out during the project. These courses have been selected on the basis of the project needs emerged in the applications.

**Section 8** describes, for each training course, the **detailed specifications** for designing, developing and delivering the PROMISE training courses. Specifications regard: learners, goals, concepts and resources.

**Section 9** contains a **summary** of the specifications defined in the previous section.

**Section 10** reports the **Training Action Plan** defined according to the project schedule.

**Section 11** draws the **conclusions** of this document.

The reader of this document must know that:

- The reading of Section 2 is necessary before reading the rest of this document
- A quick view of the list of PROMISE training courses is given in Section 7
- The detailed set of specifications of PROMISE training course is given in Section 8
- A high level analysis of training in PROMISE is provided by Sections 3-6.

## 2 Training model

### 2.1 Model description

In this section the reference instructional design model used to design and develop the training architecture is now presented. This model is taken and adapted from literature (Ranieri 2005), which inspires to the main works on instructional design (Khan 2004).

According to the Ranieri's model, an instructional design project is divided into three phases (see also Figure 1):

1. Macro phase: the phase in which specifications of the instructional project are derived. In this phase it is necessary to analyze the potential learners who will use the training infrastructure, to define their learning necessities and the training goals of the project, to identify the main concepts to deliver and the resources to be used for training. In more detail, specifications are about:
  - Users: specifications about the characteristics of learners who will use the training architecture. These specifications deeply affect the storyboard of the instructional project.
  - Goals: the learning goals on which the instructional design will be based.
  - Concepts: the selection of the research and technology concepts to be delivered to learners.
  - Infrastructure: the resource constraints, both human and technical, limiting the training delivery.
2. Micro phase: the instructional strategy is designed on the basis of the specifications defined in the macro phase. Furthermore specifications on users, goals, contents and infrastructure are further detailed following a spiral approach. The instructional strategy is composed of the following elements:
  - Instructional Model: description of the instructional model to be adopted and implemented by specifying the integration between presence and distance, the learner autonomy, the learning assessment and the training strategies (collaborative learning, self-learning, student centered, teacher centered, group centered, ...).
  - Architecture Design: description of both the training content structure, possibly decomposed in modules and sub-modules, and the IT infrastructure (Learning Management System: technology tools).
  - Delivery mechanisms: description of the tools used to deliver training contents, e.g. syllabus, multimedia, forums, tutoring, etc.



3. Implementation phase: in this phase the instructional strategy design is developed. In particular training material and IT infrastructure will be developed.

This deliverable mainly deals with the first phase. DT1.3 and DT1.4 will deal with the micro and implementation phases, respectively.

### 2.1.1 Macro analysis

The macro analysis consists of defining specifications related to:

- Users
  - Role of users in Promise.
  - Physical distance among learners and teachers
  - Number of potential learners
  - Accessibility of technology to learners
  - Learners' domain of expertise
  - Homogeneity/Heterogeneity of interests among learners
  - Learners' availability to share information and concepts and to collaborate in educational projects.
- Goals
  - Promise project goals
  - Homogeneity/Heterogeneity of interest among learners
  - Availability to sharing and collaborating
- Contents
  - Main Promise concepts.
  - Main Promise components: PDKM, DSS, Middleware, PEID, etc.
  - Promise processes: design for X, adaptive production, predictive maintenance, product decommissioning, etc.
- Infrastructure
  - Human resources available to deliver training contents.
  - Technologies available to deliver training contents.

This set of specifications will help to define the instructional design problem in the micro analysis. This deliverable contains these specifications.

### 2.1.2 Micro analysis

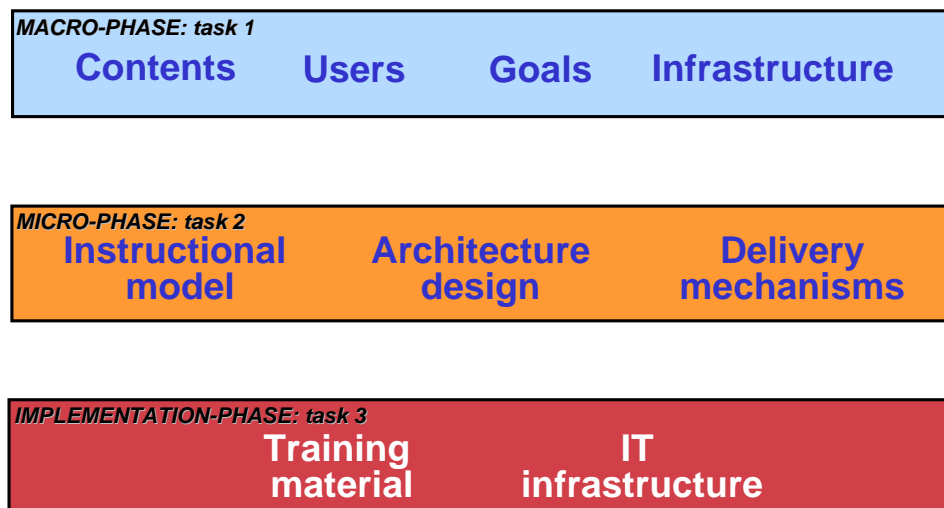
The micro analysis consists of designing the training architecture:

- Instructional Model:
  - Define the integration degree between presence and distance of the training delivery.
  - Define the learner autonomy during his/her learning path.

- Design the assessment method.
- Define the training strategies
- Architecture design
  - Define the IT components needed to deliver training contents (LMS):
  - Define the training contents module by module.
    - Learning objectives >strategies >activities >content >feedback
  - Define the relationships among modules (sequences, flexibilities, requirements, etc.).
  - .
- Delivery mechanisms:
  - IT based
    - To manage the planning (syllabus, agendas, calendar, ...)
    - To publish content (multimedia modules, text modules, video modules, PowerPoint modules, exercises, quiz, test, ...)
    - To communicate (forum, chat, mail, ...)
  - Human based.

Deliverable DT1.3 will contain this storyboard of the training architecture according to the above describes micro analysis.

The output of this design phase will provide all the information for the implementation phase.



**Figure 1. PROMISE Training Model: from the learner analysis to the delivery of contents.**

### 2.1.3 Implementation phase

This phase consists of developing the training architecture:

- IT infrastructure development:
- Training material development
- Set-up training courses.

This phase will be described in the document Deliverable DT1.4.

### 3 PROMISE learners

The goal of the training work package is to ensure that all PROMISE partners are familiar with the progress and activities of their colleagues, as well as being in a position to receive secondary training outside PROMISE activities. Thus, in a first step a learner can be specified in the context of this work package as employee (or owner) of an organisation which is member of the PROMISE consortium or associated with the consortium.

#### 3.1 Physical distance

Members of the promise consortium are European-wide distributed across nine different countries. Joining a consortium meeting requires an average travel effort in time of 5 hours (one way) for a partner to bridge the physical distance of up to 2700 km linear distance. Consequently a notable physical distance should be taken into account not only between the individual learners but also between learners and tutors/trainers. In addition it should be mentioned here that the physical distance includes also a difference in time of up to two hours within the group of the consortium. This time shift is even more considerable for including affiliated partners from other continents such as Australia or Japan.

Previous research has indicated that working in different time zones has a negative influence on trust building and, as a consequence, the ability to exchange knowledge. Apart from that, working across time zones makes scheduling meetings more complicated.

Due to the fact that the special distribution of learners as well as the distance between learners and trainers has a major impact on the development of a training strategy, it is considered as a major issue for the training concept specification.

#### 3.2 Number

The expected number of learners can be estimated on the bases of organizations which are member of the consortium. The PROMISE consortium consists of 22 organizations located in nine European countries as shown in Table 1: Member organizations of the PROMISE consortium.

**Table 1: Member organizations of the PROMISE consortium**

	Participant name	Participant short name	Country
1	SINTEF	SINTEF	N
2	BIBA	BIBA	D
3	BOMBARDIER TRANSPORTATION	BT-LOC	CH
4	CAMBRIDGE UNIVERSITY	CAMBRIDGE	UK
5	CATERPLILLAR	CAT	F
6	CIMRU	CIMRU	IRL
7	COGNIDATA	COGNIDATA	D
8	CR FIAT	CRF	I
9	ENOTRAC	ENOTRAC	CH

	Participant name	Participant short name	Country
10	ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE	EPFL	CH
11	FIDIA	FIDIA	I
12	HELSINKI UNIVERSITY OF TECHNOLOGY	HUT	FIN
13	INDYON	INDYON	D
14	INMEDIASP	INMEDIASP	D
15	INTRACOM	INTRACOM	EL
16	ITIA-CNR	ITIA	I
18	POLITECNICO DI MILANO	POLIMI	I
19	INFINEON	INFINEON	D
20	SAP	SAP	D
21	STOCKWAY	STOCKWAY	F
22	WRAP	WRAP	I

Although the organizational size of the member organizations vary between 10 and 40000, it is expected that at least an average of 5-10 individuals per organization have to be served by each of the different training activities. Thus, the estimated number of learners is about 330 within the consortium. In addition it is estimated that in a wider project context, about 500 learners from affiliated projects or the European commission need to be served, which leads to an estimated overall maximum number of learners of about 830.

### 3.3 Access to technology

The access to technology can be understood in two ways. One is access to technology that can be used as training infrastructure. Basic technology components are computers and devices, software and network access.

The second is access to basic PROMISE technology such as devices (PEID), software (PDKM, DSS, Middleware etc) and demonstration or training components.

The first aspect (access to training infrastructure) can be considered a minor one in the context of this task due to all partners of the PROMISE consortium having integrated standard office applications as well as broadband Internet access and related applications for communication and coordination into their daily work environment. The same is assumed for affiliated organizations, which are also acting in an international work environment.

The second aspect (access to PROMISE technology) deals mainly with the provision of physical training material. Basically all PROMISE components are available without any restrictions for the members of the consortium and there exist at least a possibility of restricted access to these components for the affiliated partners.

A problem that might occur in a distributed learning environment is that access to the physical training / demonstration objects may not exist for all learners. This might include not only the physical transport but also several instances of these objects. It should be noted here that depending on the individual learning strategies the access to physical objects is desirable or required.

Another problem that might occur is that it may be necessary to leave PROMISE components in the care of partners without a mechanism to keep control over them. This might raise issues of intellectual property security in the case of learners from affiliated organization that are intended to only have restricted access rights to the PROMISE results.

### 3.4 Domain expertise

Expected learners are from various domains not only considering their individual functional domain within their organization but also considering the business domain of their organization.

It is expected that the following functional domains from the partner organization have to be considered:

- Management
- Finance / Controlling
- Marketing / Sales
- Information technology
- Production / Manufacturing
- Design / Engineering
- Logistic
- Maintenance

With respect to the application areas represented by the partner of the PROMISE consortium following business domains have to be considered:

- Software
- Hardware
- Construction Equipment (crawler-mounted vehicle)
- Locomotive / Railway
- Automotive
- Recycling
- Metal cutting machine tools
- White goods / Refrigerator
- Telecom equipment

### 3.5 Homogeneity/Heterogeneity of interest among learners

Interest of a learner in training activities is utterly based on his individual motivation which plays a crucial role in the learning process.

**Wikipedia** provides the following information about the role of motivation in the educational context:

*Motivation in education can have several effects on how students learn and their behavior towards subject matter. It can:*

1. *Direct behavior toward particular goals*
2. *Lead to increased effort and energy*
3. *Increase initiation of, and persistence in, activities*

4. *Enhance cognitive processing*
5. *Determine what consequences are reinforcing*
6. *Lead to improved performance.*

*Because students are not always internally motivated, they sometimes need situated motivation, which is found in environmental conditions that the teacher creates.*

*There are two kinds of motivation:*

- ***Intrinsic motivation*** occurs when an individual is internally motivated to do something because it either brings them pleasure, they think it is important, or they feel that what they are learning is morally significant.
- ***Extrinsic motivation*** comes into play when a student is compelled to do something or act a certain way because of factors external to himself (like money or good grades).

Considering the various functional and business domains as well as the general conditions of the individual learners which should be focused by the training concept, it is obvious that not all the learners are fully intrinsically motivated. On the other hand it is hard to estimate the degree of motivation, due to the fact that external factors, such as rewards, incentives or punishment, are controlled by the individual organization that the learner belongs to.

Initially it should be assumed that at least a basic interest in the overall complex of PROMISE themes is existent. Apart from this it there seems to be a wide range of particular interest depending on the functional and the business domain of the learner. For example, learners coming from the marketing department of a white good producer are obviously neither interested in information about technical details of the IT concept nor in information about applying these solutions in the construction equipment domain.

Clustering the different learners with respect to their functional and business domain as well as their position in their organization helps to increase the degree of homogeneity of interests but also increases the effort in producing and delivering the training material.

Depending on the further findings a classification of learners with respect to their interest has to be made into the following categories:

- Business Domain
- Functional Domain
- Organizational Position
  - Manager
  - Team Leader
  - and so forth

### **3.6 Learner availability to sharing and collaborating**

The ability of a learner to share knowledge and to collaborate in the training process is an essential prerequisite for the application of various training methods. These abilities are summarized in the literature as soft skills.

**Wikipedia** provides following information on soft skills

*Soft skills refer to the cluster of personality traits, social graces, facility with language, personal habits, friendliness, and optimism that mark people to varying degrees. Soft skills complement hard skills, which are the technical requirements of a job.*

*Soft skills can also be an important part of the success of an organization. Organizations, particularly those frequently dealing with customers face-to-face, are generally more prosperous if they train their staff to use these skills. For this reason, soft skills are increasingly sought out by employers in addition to standard qualifications.*

*Common Soft Skills include:*

- *Following common Etiquette*
- *Using appropriate body language such as friendly gestures, head nods, facial expressions, body posture and good eye contact*
- *Using appropriate tone of voice and language*
- *Relating to individuals in common conversation, regardless of interests or background*
- *Making others feel comfortable in situations outside their normal sphere of action*
- *Clear and often persuasive manners of speech*

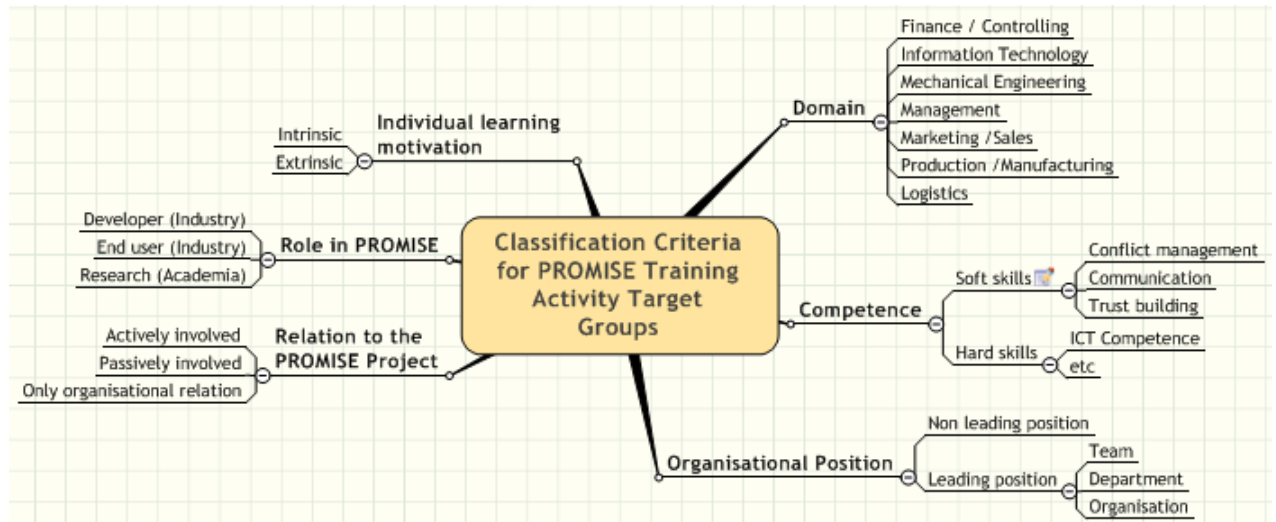
The existence of a certain degree of soft skills, in particular with respect to the ability to communicate and cooperate, have to be considered as essential prerequisite for the transfer of knowledge in the training process. Efficient knowledge sharing requires a collaborative effort, which is not only depending on the recipient's absorptive capacity but also on the ability of the source to communicate its knowledge in a way the receiver can understand. If sharing process happens through information and communication technologies (ICT), the participating individuals additionally need to own a certain degree of ICT skills.

The overall ability of learners to share and collaborate can be considered in the context of the PROMISE project consortium as at least average due to the fact that working in an international research project requires a minimum of both soft and hard skill as described above. Nevertheless, training concepts should not rely entirely on these prerequisites due to the fact that learners from affiliated projects or organizations also need to be addressed by the training activities.

### **3.7 Categories of Learners**

Based on the previous subsections, this section describes the relevant categories of learners to be focused on for the further development of the PROMISE training strategy specification.

Categorization criteria for the members (employees, owners etc) of these organizations are various. A reasonable approach to structure relevant categorization criteria is given in the Figure below and structured as follows.



**Figure 2: Classification Criteria for Training Activity Target Groups**

#### Grouping criteria: the role in PROMISE

- Developer (Industry): the learner belongs to an organization which plays in PROMISE the role of technology developer.
- End user (Industry): the learner belongs to an organization which plays in PROMISE the role of end user or demonstrator owner depending on the application scenario.
- Researcher (Academia): the learner belongs to an organization which plays in PROMISE the role of researcher.

#### Grouping criteria: domain

- Business domain experts: the learner has his main competence on business.
- Functional domain experts: the learner has his main competence on a certain function of the organization he belongs to.

#### Grouping criteria: relation to the PROMISE project

- Actively involved learner: the learner is directly involved in PROMISE research activities.
- Passively involved learner: the learner is directly involved in PROMISE research activities.
- Only organizational relation learner: the learner is not involved in PROMISE research activities even if his organization is a PROMISE partner.

#### Grouping criteria: Competence

- Low skills: low competences in a particular domain.
- High skills: high competences in a particular domain.

#### Grouping criteria: Technical domain

- Mechanical engineering
- Information technologies



- Management
- Finance/controlling
- Production/manufacturing
- Logistics

#### Grouping criteria: Position

- Leading: the learner is in charge of a leading position in his organization.
- Not leading: the learner does not cover a leading position in his organization.

This classification derives from document DT1.1.

## **4 PROMISE training concepts**

In this section the main training concepts, which could be customized for each user group, are introduced. As regards training concepts, we deal with PROMISE technological viewpoint and business viewpoint.

### **4.1 Promise components**

This part provides the PROMISE concepts with PROMISE technologies aspects. It is divided into three parts: component level, sub system level, and system level:

- Component level:
  - *PEID*
  - *Middleware*
  - *PDKM*
  - *DSS*
- Sub system level:
  - *Data acquisition: PEID + Middleware*
  - *Data manipulation: PDKM + DSS + Data transformation*
  - *Etc.*
- System level:
  - *PROMISE PLM system*

### **4.2 Promise processes in the added value chain**

This part provides the PROMISE concept with business aspects. It is divided into three parts:

- For each business issue
- For each lifecycle phase
  - *BOL*
    - *Design for X*
    - *Adaptive production system*
  - *MOL*
    - *Predictive maintenance*

- Maintenance/service optimization
- EOL
  - EOL Product recovery optimization
  - Tracking and tracing EOL product
- For whole product lifecycle

For each Promise process, the training concepts from a technical point of view are.

- Introduction to the significance of the PROMISE solution to the business process
  - Description of the solution
  - Why this solution is important? I.e. what is the added value of the solution?
- Guidance for an efficient application of the solution to the process
  - What are the main issues to know in order to apply efficiently the solution to the process?
- Impact on current practices
  - What processes, activities etc. (of the company o partners) are affected by the adoption of the solution?
- Implementation
  - How to implement the solution?

From a business viewpoint, the training contents are similar to those proposed for PROMISE components.

## 5 Goal analysis for PROMISE training

This paragraph provides a first draft description of the instructional objectives of the training architecture for each learner category. For simplicity of exposition, the training objectives are reported in Table 2.

**Table 2: Training objectives.**

GROUPING CRITERIA	GROUP	GOAL
Role in PROMISE	Developer (Industry)	<p>To deliver the basics of the PROMISE IT architecture and its application to real business cases. To give suggestions as how to built-up technologies that are applied to real business cases.</p> <p>Developers will have some ideas or would like to develop knowledge on how to exploit PROMISE technologies.</p>
	End user (Industry)	<p>To deliver an understanding about the main functionalities provided by the PROMISE IT architecture to be used in the product life cycle processes.</p> <p>End users will know about how emerging technologies and product lifecycle operation problems are combined for maximizing profits of industries</p>

GROUPING CRITERIA	GROUP	GOAL
	Researcher (Academia)	To deliver an understanding of the main technical features and constraints from both end users and developers.
<b>Business/functional</b>	Business domain experts	To deliver an understanding of the potential business impact of the PROMISE results.  Experts will have some inspirations on how to apply PROMISE concepts and technologies to their business domains.
	Functional domain experts	To deliver an understanding of the potential technical impact of the PROMISE results.  Experts will have some information or knowledge related to their functional domains.
<b>Relation to the PROMISE project</b>	Actively involved learner	To deliver a detailed knowledge of the PROMISE architecture and components.  Learners will have some opportunities to summarize PROMISE concept, technologies, case studies, and receive feedbacks from the learners.
	Passively involved learner	To deliver rules and methods on how to interact with (or use) the PROMISE architecture and components.  Learners will have some opportunities to acquire PROMISE concept, technologies, case studies in detail.
	Only organizational relation learner	To deliver an understanding of the overall PROMISE concept, its application and possible impact.
<b>Competence</b>	Soft skills	To deliver basic understanding of main technical content.
	Hard skills	To deliver sound technical contents.
<b>Technical domain</b>	Mechanical engineering	To deliver a detailed understanding of one of the PROMISE components/processes.
	Information technologies	To deliver a detailed understanding of one of the PROMISE components/processes.
	Management	To deliver a detailed understanding of one of the PROMISE components/processes.
	Finance/controlling	To deliver a detailed understanding of one of the PROMISE components/processes.
	Production/manufacturing	To deliver a detailed understanding of one of the PROMISE components/processes.
	Logistics	To deliver a detailed understanding of one of the PROMISE components/processes.
<b>Position</b>	Leading	Give some opportunities to summarize PROMISE concepts, technologies, case studies, and receive feedbacks from the learners.
	Not leading	Give some opportunities to learn PROMISE concepts, technologies, and case studies in detail.

## 6 Infrastructure analysis for PROMISE training

In this paragraph we describe the technological and human resources that are available, or which will be available in the future, to deliver the training concepts.

### 6.1.1 Technological resources

The technological resources available to deliver training contents will be standard as in normal e-distance educational courses:

- Learning software platform (to be selected among the commercial ones)
- Web site
- Physical demonstrators (optional)
- Process simulators (optional)
- Component simulators (optional)

### 6.1.2 Human resources

The people potentially usable to develop and deliver the training concepts are experts of specific contents of courses.

## 7 PROMISE training courses

This Section contains the list of training courses to be delivered to PROMISE participants and the defined calendar of courses.

1. Technical course on PROMISE technologies at system level: this course provides the high level technical knowledge of the main technologies the PROMISE project develops.

**Course code: TC1**

2. Technical course on PROMISE DSS technology: this course provides knowledge of the DSS sub-component developed in PROMISE.

**Course code: TC2**

3. Technical course on PROMISE PDKM technology: this course provides a detailed knowledge of the PDKM component developed in PROMISE.

**Course code: TC3**

4. Technical course on PROMISE PEID technology: this course provides a detailed knowledge of the PEID component developed in PROMISE.

**Course code: TC4**

5. Technical course on PROMISE Middleware technology: this course provides a detailed knowledge of the Middleware component developed in PROMISE.

**Course code: TC5**

6. Business course on the main PROMISE concepts, technologies and benefits overall the whole life cycle: this course provides a business view of the PROMISE benefits.

**Course code: BC1**

7. Business course on the main PROMISE concepts, technologies and benefits in the BOL cycle phase: this course provides a business view of the benefits deriving from the application of PROMISE technologies in the BOL phase.

**Course code: BC2**

8. Business course on the main PROMISE concepts, technologies and benefits in the MOL cycle phase: this course provides a business view of the benefits deriving from the application of PROMISE technologies in the MOL phase.

**Course code: BC3**

9. Business course on the main PROMISE concepts, technologies and benefits in the EOL cycle phase: this course provides a business view of the benefits deriving from the application of PROMISE technologies in the EOL phase.

**Course code: BC4**

This list of training courses has been defined taking into account:

- learner categories
- training concepts
- training objectives
- schedule of the PROMISE project
- specific needs deriving from research and demonstration activities.

The sub-system level described in 4.1 has not been considered in the definition of courses. Course devoted to sub-systems are not basic, rather they can be considered advanced courses, and it seems that they are not fundamental for the success of the project.

## **8 Specifications for the instruction design of PROMISE training courses**

### **8.1 Commonalities**

This Section contains the detailed macro analysis carried out for deriving specifications for the instructional design of all the PROMISE courses presented in Section 7.

For all courses detailed in the remainder of this section:

- the learner's domain expertise is not reported because already described in Section 3.4
- all learners have full possibility to access to internet, networks, PROMISE website and PROMISE IT platform
- the IT platform potentially exploitable consists in:
  - web site
  - file repository
  - multimedia
  - forum
  - chat
  - self-evaluation
  - ...
- the needed human roles are:
  - instructional designer

- teacher
- content developer
- ...

## 8.2 Technical course on PROMISE technologies at system level

### 8.2.1 Learner analysis

The main objective of this course is to give an overall presentation of the PROMISE Technology (system architecture, SW and HW modules, Interfaces, Standards etc.). This course will give an overview which is a necessary background to understand the basic technology, potential and use of PROMISE.

Three main groups of learners will be targeted by the PROMISE Technology course:

1. Technical people who are involved in the development and use of PROMISE technology.
2. End users who are interested in an overall presentation of the technology. The reason might be to evaluate potential in new or improved industrial applications.
3. Researches Institutes and academia who want to learn about the PROMISE technology in general for use in education or implementation of results in other projects and business activities.

#### 8.2.1.1 Number

The number of learners is estimated for the different groups as reported below:

Group 1 *Technical people* - 25 (people with technical background from all PROMISE partners)

Group 2 *End users* – 10 (PROMISE end users with other background than technological)

Group 3 *Researchers* - 10 (researchers from institutes and academia not participating directly in the PROMISE project).

The course will be unique for all the groups.

#### 8.2.1.2 Homogeneity /heterogeneity of interest among learners

Even if the background of learners in the different groups is different, the groups are assumed to be homogeneous in the sense that their background and knowledge is sufficient to understand the content of the course.

The course will be given on an overall level without need for any specific knowledge of the detailed specifications and solutions of all PROMISE components. Specific courses for the different PROMISE components (DSS, PEID, PDKM and Middleware) will describe the components in detail.

#### 8.2.1.3 Learner availability to sharing and collaborating

In the first group there will be high potential of sharing knowledge and establishing collaboration among learners because their main goals in PROMISE are to develop and use the PROMISE Technology. For instance, collaborations can derive by trying to understand the benefits from PROMISE technologies.

The second and third group of learners will have good opportunities to share experiences, future possibilities (technical and business challenges) and initialize possible cooperation in future developments.

### 8.2.2 Goal analysis

The main goal of this course is to improve the learner’s technical knowledge on PROMISE technology. In more detail, the course’s objectives are to deliver knowledge about

- the overall PROMISE system architecture
- the PROMISE components (SW, HW etc)
- the Infrastructure created by PROMISE
- how to interface with PROMISE
- how to build applications.

In addition, especially important for Group 2 (end users), is the following goal:

- describe and demonstrate the potential for using PROMISE technology and components in new ways and in other types of applications.

These objectives are described in Table 3 according to Bloom’s taxonomy.

**Table 3. Technical course on PROMISE technologies at system level: goals.**

Goal	Type	Bloom (1956)
How does the PROMISE architecture look like	to know	<b>Comprehension:</b> to understand the basics about the system architecture
what components can be found in PROMISE	to know	<b>Comprehension:</b> to understand the involved participants in PROMISE and their tasks
what infrastructure can be created with PROMISE	to know	<b>Comprehension:</b> to know how the components and tasks can be distributed in an application
how existing pieces (hardware, software) can be integrated into PROMISE	to know how to do	<b>Application:</b> to implement appropriate interfaces in existing systems
how to implement a PROMISE application	to know how to do	<b>Application:</b> to identify, create and/or use PROMISE compliant components to implement an application

### 8.2.3 Learning concepts

The main learning/training concepts of this course are as follows:

- PROMISE system architecture and infrastructure

- Knowledge and data management
- PROMISE components (PEID, PDKM, middleware, DSS etc): overview and short description
- System layers and interfaces
- Standards
- Building of applications (including potential for applications outside PROMISE partners domains)

### **8.2.3.1 Degree of formalization**

The concepts are common for all learners (user groups). However, for members of Group 2 it should be focused extra on possibilities of using PROMISE technology in new ways and in other types of applications seen from the technical viewpoint.

### **8.2.3.2 Stability**

The concepts are dynamic since the subjects considered in *PROMISE Technology* training are evolving throughout the whole period of the PROMISE project. Consequently, the training concepts should be regularly updated depending on the new needs and developments of the technology. However the overall system architecture and interfaces should be rather stable, while the components will be more dynamic.

### **8.2.3.3 Interactivity**

The concepts require classic text information. No multimedia and real time interactivity is envisaged.

## **8.2.4 Infrastructure analysis**

Both technological and human resources required to deliver the training concepts are available in the project.

### **8.2.4.1 Technological resources**

In addition to the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1), it could be necessary to use special demo labs with facilities for physical demonstrations of PROMISE applications. However this should be possible only at the last phase of the PROMISE project.

### **8.2.4.2 Human resources**

Technology providers and Research Institutes will provide the human resources for training.



## 8.3 Technical course on PROMISE DSS

### 8.3.1 Learner analysis

Two main groups of learners will be targeted by DSS training:

- Group 1: programmers from the research institutes who are involved in the development phase of the DSS modules for BOL, MOL and EOL phases;
- Group 2: technical staff from the PROMISE demonstrator owners who will be involved in the testing phase of the DSS modules for BOL, MOL and EOL phases.

According to the classification of user groups provided in DT1.1 and using the criterion “Role in PROMISE”, the first group corresponds to the group “Research” and the second group corresponds to the group “End user”.

According to the classification criterion “Relation to PROMISE”, the two groups correspond to the group “Actively involved”.

According to the classification of user groups provided in DT1.1 and using the criterion “Domain”, the first group corresponds to the group “Functional” and the second group corresponds to the group “End user”.

#### 8.3.1.1 Number

For the first Group, 5 to 10 participants are foreseen as can be deduced from the current communications between Cognidata and the involved research institutes.

For the second Group 10 to 20 participants are foreseen. This estimation is based on the fact that there are currently 10 application scenarios and for each application scenario there are 1 to 2 people involved.

Courses will be separate and different for the two groups.

#### 8.3.1.2 Access to technology

In addition to what has been stated in Section 8.1, there is the need for learners to access particular technologies. For the access to PROMISE technology, it is worth noticing that the training focuses on PROMISE DSS. However, since DSS is related to other PROMISE components such as PDKM and middleware, they may be considered but in less detail.

Learners of the first Group will use during the course the software architecture to be used for the DSS development.

Learners of the second Group need to access the DSS component.

#### 8.3.1.3 Domain expertise

The domain of expertise of the first Group of learners is conducting research with sufficient skills in programming. A prerequisite for these learners, in order to follow profitably the training course, is that they have to be able to program **Java beans** in the **J2EE architecture**.

Another prerequisite is to have enough knowledge about the decision strategy to be programmed since the programming needs will depend on the decision strategy under consideration.

The domain of expertise of the second Group of learners is technical/functional and can be design, mechanical engineering, production, maintenance, etc. depending on the company to which the learner belongs and the application which his company considers in PROMISE.

#### **8.3.1.4 Homogeneity /heterogeneity of interest among learners**

The groups of users to which learning will be provided are assumed to be homogeneous in the sense that they are willing to participate in the training activities and are able to understand what they will be trained for.

#### **8.3.1.5 Learner availability to sharing and collaborating**

As regards the first Group, we expect high availability of sharing and collaborating of learners because one of their main goals in PROMISE is to develop the software code for the various DSS modules. This activity of code development may require facing several problems that are common to all learners: integration with the DSS architecture, debugging, testing and user interfaces. Therefore collaborating and sharing problems and solutions encountered during their technical activities could increase their efficiency. For this main reason it can be assumed full availability to sharing and collaborating among the learners of the first group during the DSS training course.

As regards the second Group, the learners will test the DSS in PROMISE for different problems in different sectors and it is quite sure they find no interest at all in sharing and collaborating with respect to the actual implementation. For instance, it is low probable end-users focusing on a particular topic such as Design for X in the train sector are willing to share the corresponding DSS with other end users focusing on maintenance in the white sector. However, since the methodological aspects are similar, there exist an opportunity for sharing and collaborating.

Therefore it is highly recommend considering this issue during the design of the instructional strategy of this course for the second Group of learners.

### **8.3.2 Goal analysis**

For the first Group, the main objectives are to learn:

- How the current PROMISE DSS prototype is programmed;
- What tools are used to its development; and
- How the algorithms have to be programmed in the future in order to simplify and ease the integration work.

For the second Group, the main objectives are:

- To emphasize the importance of using the PROMISE DSS to deal with their domain-related tasks and decisions i.e. to explain in details how the DSS can improve the current way in which the tasks are dealt with and decisions made (benefits of introducing DSS in their work);
- How to use the DSS;
- What are the algorithms behind the DSS? The trainees should learn how to: (i) enter and manipulate data, (ii) interpret the results and (iii) implement the results;

- How to improve the decisions and solve the problems using the DSS. This objective goes beyond the understanding of how to use the specific DSS and concerns: (i) the identification of relevant data to use for improving the decisions, (ii) the selection of appropriate parameters and methods, and (iii) the exploitation of the obtained results.

The above described goals are synthesized in the Table 4 according to Bloom’s taxonomy.

**Table 4. Technical course on PROMISE DSS technology: goals.**

Learner	Goal	Type	Bloom (1956)
First group	How to Implement the DSS prototype	To know how to do	<b>Application:</b> to apply guidelines and rules learned in the course for the development of the DSS prototype
	Which tools to use for the DSS development	To know	<b>Comprehension:</b> to know which tools to use for software coding, debugging, testing, etc.
	How to implement the final DSS	To know how to do	<b>Application:</b> to apply guidelines and rules learnt in the course for the development of the final version of the DSS
Second group	Technical benefits of DSS	to know	<b>Comprehension:</b> to know the technical impact of the DSS on their companies
	How to use DSS	To know	<b>Comprehension:</b> to know the DSS functionalities, the input requested and the output provided
	Which logic is behind the DSS	To know how to do	<b>Application:</b> to apply guidelines, techniques and rules learned in the course for customizing the algorithms and manipulating data and results
	How to improve decisions	To know how to be	<b>Analysis:</b> to break down aggregate results, to compare data, to contrast factors, to relate phenomena, to select criteria, to separate causes, etc. <b>Synthesis:</b> to put parts together to form a whole view of the decision problem, to summarize <b>Evaluation:</b> to make judgments about the value of alternative decisions.

### 8.3.3 Learning concepts

For the first Group, the main training concepts are:

- Description of the way the current DSS prototype is programmed.
- Tools to use for further programming

- Guidelines for programming

For the second Group, the main training concepts are:

- Description of DSS modules:
  - BOL module;
  - MOL module;
  - EOL module.
- DSS strategies
  - Design for X knowledge generation from product field data;
  - Adaptive production;
  - Predictive maintenance;
  - Maintenance/service optimization;
  - EOL Product recovery optimization;
  - Tracking and tracing EOL product.
- Development of new strategies.

#### **8.3.3.1 Degree of formalization**

The concepts are context specific and should be adapted to the domain of expertise of the different groups identified for benefiting from DSS training. Some training groups may require the consideration of process/component simulation and some not. So, it is important to consider the training concepts from different perspectives in order to take into account the specific needs of the different groups involved in the training.

#### **8.3.3.2 Stability**

The concepts are dynamic since the subjects considered in DSS training are evolving throughout the whole period of the PROMISE project. Consequently, the training concepts should be regularly updated depending on the new DSS needs and developments. The first training sessions will be dedicated to the testing and evaluation of the already developed DSS prototypes in order to provide the necessary feedback for their extension and refinement.

The issues related to DSS requirements in the PROMISE application scenarios and the overall architecture of DSS are static, and issues related to the different decision strategies and the individual modules in the DSS are dynamic since they are evolving according to the developments to be made throughout the PROMISE project and also on the results of testing and evaluation of intermediate prototypes.

### **8.3.3.3 Interactivity**

The concepts require both classic text information and interactivity. Indeed, the “hands on demonstrations” require interactivity between learners and the DSS tools. Multimedia such as the videos made by Cognidata could be used as auxiliary material for “self training” e.g. for those who can not attend the training sessions.

### **8.3.4 Infrastructure analysis**

It is assumed that both technological and human resources required to deliver the training concepts are available.

#### **8.3.4.1 Technological resources**

In addition to the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1), the DSS prototype must be available.

#### **8.3.4.2 Human resources**

Cognidata and research institutes such as EPFL, POLIMI, BIBA and NUI will provide the human resources for training.

## **8.4 Technical course on PROMISE PDKM**

### **8.4.1 Learner analysis**

One main group of learners will be targeted by PDKM training:

1. Technical staff from the PROMISE demonstrator owners who will be involved in the testing phase.

According to the classification of user groups provided in DT1.1 and using the criterion “Role in PROMISE”, the learners correspond to the group “End user”<sup>1</sup>.

According to the classification criterion “Relation to PROMISE”, the group corresponds to the group “Actively involved”.

Finally, according to the classification of user groups provided in DT1.1 and using the criterion “Domain”, the learners correspond to the group “Functional/technical”.

#### **8.4.1.1 Number**

One or two people for each application could deal with PDKM, use its functionalities and could need a minimal level of training on it. Therefore an estimate of the total number of learners is from 10 to 20 people.

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<sup>1</sup> Demonstrator owner may be more appropriate depending on the particular application scenario.

#### **8.4.1.2 Access to technology**

In addition to what stated in Section 8.1 there is the need for learners to access to particular technologies.

Since this training course focuses on PROMISE PDKM, it might be necessary for learners to access to this technology. In this case InMediasP will provide the necessary instructions for that.

#### **8.4.1.3 Domain expertise**

The domain of expertise of learners is technical/functional and can be product design, mechanical engineering, production, maintenance, etc. depending on the company to which the learner belongs and the application which his company considers in PROMISE.

It also can be assumed that

- all learners knows the application scenario processes
- most of learners have already used another PDKM
- most of learners do not have hard skills on Information Technology

#### **8.4.1.4 Homogeneity /heterogeneity of interest among learners**

The users to which training will be provided are assumed to be homogeneous in the sense that they are willing to participate in the training activities and are able to understand what they will be trained for.

Some heterogeneity may result depending on the specific partners participating to the course due to their different expertise.

#### **8.4.1.5 Learner availability to sharing and collaborating**

No particular tendency to sharing and collaborating is expected.

### **8.4.2 Goal analysis**

The main learner's objectives are to learn:

- what is a PROMISE PDKM
- what users can do and not with PROMISE PDKM
- pre-requisites for the PROMISE PDKM
- how to use the PROMISE PDKM, in terms of:
  - Data population
  - Data query
  - Data access
  - Data analysis
  - Data storage
  - Data validation

- Decision making
- how to modify the PROMISE PDKM
- how to solve technical problems related to the PROMISE PDKM

The above described learners' goals are synthesized in Table 5 according to Bloom's taxonomy.

**Table 5. Technical course on PROMISE PDKM technology: goals.**

Goal	Type	Bloom (1956)
what is a PDKM	to know	<b>Comprehension:</b> <ul style="list-style-type: none"> <li>● to know the basic roles of the PDKM</li> <li>● to know PDKM's interactions with the rest of the PROMISE systems</li> </ul>
what users can do and not with PDKM	to know	<b>Comprehension:</b> to know the functionalities provided by the PDKM
pre-requisites for the PDKM		<b>Comprehension:</b> to know which are the organizational conditions for using PDKM
how to use the PDKM	to know how to do	<b>Application:</b> to apply procedures for using the PDKM
how to modify the PDKM	to know how to do	<b>Application:</b> to start the proper procedure to change the current configuration of the PDKM that, for some reasons encountered in the testing phase, is not more satisfactory
How to solve technical problems related to the PDKM	to know how to do	<b>Application:</b> to start the proper procedure to solve technical problems

### 8.4.3 Learning concepts

For the PDKM training, the main concepts are listed below. Each section of the training concept will consist of a theoretical part (explanation and demonstration by the teacher) and an applied part (interactive handling of the system and exercises).

- Introduction into the concepts of PDKM
  - Product lifecycle management basics
  - Why PDKM? – added value through PDKM
- Introduction into the PDKM user interface
  - Logging-in, personal settings, getting help
  - Handling and navigation

- Understanding PDKM objects
  - Materials
  - Equipments
  - Incidents
  - Field data
  - Documents
  - *(more to come)*
- BOL functions
  - Searching for products
  - Displaying product details
  - Displaying related documents
  - Showing incidents
  - Showing reliability data
  - Configuration evaluation
  - *(more to come)*
- MOL functions
  - Searching for serialized products
  - Displaying details for serialized products
  - Displaying related documents
  - Residual lifetime
  - Product statistics
  - *(more to come)*
- EOL functions
  - *(under development)*
- PDKM backend functions
  - *(under development)*
- General functions
  - Personal messages
  - *(more to come)*

#### **8.4.3.1 Degree of formalization**

The training concepts defined in previous section are not context-specific, although the conventional courses can include process-specific content and thereby are dedicated to particular application scenarios.



### **8.4.3.2 Stability**

All training concepts defined in previous section are static in terms of applicability throughout the entire PROMISE project. This means that all additional PDKM functions and supported processes can be covered by the defined concepts. However, the training concepts have to be assessed regularly in order to ensure that they still meet the predefined goals.

### **8.4.3.3 Interactivity**

The concepts require both classic text information and interactivity. The conventional trainings require interactivity between learners and teacher and of course the PDKM tool. The awareness sessions only require the interactivity between learners and the teacher.

## **8.4.4 Infrastructure analysis**

It is assumed that both technological and human resources that are required to deliver the training concepts are available.

### **8.4.4.1 Technological resources**

This course need of only the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1).

### **8.4.4.2 Human resources**

The human resources will be provided mainly by InMediasP and Polimi.

## **8.5 Technical course on PROMISE Middleware**

### **8.5.1 Learner analysis**

We can classify the learners targeted by Middleware training broadly into one group:

- Technical staff from the PROMISE end users, or application owners, and technology providers who will be responsible for applying the PEID concept to suit their application

According to the classification of used groups illustrated in DT1.1, and the criterion “Role in PROMISE”, the group corresponds to the “End User” and “Technology providers” groups.

#### **8.5.1.1 Number**

With 22 PROMISE partners, it can be expected that one person per organization will have a need for a technical course on middleware. In reality, there will probably be more than one learner for some end-user partners, few learners from some developer and academic partners. Therefore a total of 30 learners could be a realistic estimate.

#### **8.5.1.2 Access to technology**

It is assumed that all PROMISE partners have access to necessary information technology facilities, i.e. computers and network connectivity, mainly Internet (see also Section 8.1).

Access to PROMISE middleware technology is provided at least by HUT's DIALOG middleware platform (<http://dialog.hut.fi>), which is distributed using an open-source policy. However, the open-source policy has not yet been applied to PROMISE-specific parts (i.e. functionality developed in PROMISE project). Such PROMISE-specific parts are available to partners of the PROMISE consortium but if they need to be used by learners external to PROMISE, then an explicit decision might be needed to decide on the level of access. All other software needed for installing and running the DIALOG middleware (Tomcat Servlet container, database drivers etc.) are freely available.

Parts of the training environment will probably be possible to use directly with a web browser, without any software installation required. That environment should provide a sufficient level of demonstration to gain a basic understanding of both middleware in general and PROMISE middleware in particular.

What comes to other implementations of PROMISE middleware, notably those of SAP and Stockway, the availability for training purposes remains to be defined.

Firewalls are also an important issue to take into account for the understanding of middleware functionality and limitations. At least for the moment, HUT can provide a server where middleware components can be installed and where the firewall can be configured for the purposes of PROMISE. However, due to increasingly strict security policies, this might change in the future.

#### **8.5.1.3 Domain expertise**

It is expected that the following main functional domains from the partner organization have to be considered:

- Information technology
- Logistics

With respect to the application areas represented by the partner of the PROMISE consortium, at least the following business domains have to be considered:

- Software, i.e. for companies selling middleware or other software, including end-user companies that may want to embed middleware software components/functionality into the equipment.

#### **8.5.1.4 Homogeneity /heterogeneity of interest among learners**

The main target group amongst the PROMISE partners is the end-user partners (industry), but developer and research partners may also be included. Due to the broad scope of end-users and other partners, it seems probable that learners will be rather heterogeneous what comes to goals, previous knowledge etc.

The learners will most probably be actively involved functional domain experts rather than business domain experts. Due to the technical nature of the course, a high level of "hard skills" would be an advantage, even though "soft skills" are of course also useful.

The main technical domains considered are information engineering, logistics and production/manufacturing to some extent. Learners may be both in a leading and non-leading position, but learners in some kind of leading position may have better possibilities to apply the course contents into practical operations.

The motivation of the learners will probably be mainly intrinsic. The high-level potential effects for the learners are:

- **Direct behavior toward particular goals:** particular goals are at least to be able to put PROMISE middleware technology into use.
- **Lead to increased effort and energy:** better understanding of PROMISE technologies should increase the motivation to put efforts into PROMISE.
- **Increase initiation of, and persistence in, activities:** better understanding of technology can also lead to more own business-related ideas.
- **Enhance cognitive processing:** related to previous points.
- **Lead to improved performance:** yes, as explained for previous points.

### 8.5.1.5 Learner availability to sharing and collaborating

The great physical distance between different learners is an obvious handicap for any learning activity. Fortunately, this is partially compensated by the technical nature of the course subject and the possibility to use Internet for demonstration purposes.

### 8.5.2 Goal analysis

The goal of this course is to provide a general understanding of middleware technology in general and of PROMISE middleware in particular. It is also important to allow learners to understand how to implement PROMISE middleware in real end-user scenarios. The goals of the course are further structured according to Bloom's classification in Table 6.

**Table 6. Technical course on PROMISE Middleware technology: goals.**

Goal	Type	Bloom (1956)
Gain general understanding about middleware	To know	<b>Analysis:</b> understands when, where and how to use middleware
Understanding of PROMISE architecture, middleware interfaces	To know	<b>Comprehension:</b> can relate PROMISE architecture and middleware interfaces to own application area.
How to install and set up PROMISE middleware	To know how to do	<b>Application:</b> being able to explain to staff in own company the requirements and benefits of PROMISE middleware.

### 8.5.3 Learning concepts

The main learning concepts are the following:

1. Middleware
  - Definition of middleware
  - Typical use of middleware
  - Middleware protocols
2. PROMISE middleware
  - Middleware interfaces in the PROMISE architecture
  - Choice of middleware protocols
3. Installation, setup
  - Different implementations of PROMISE middleware
  - Firewall configuration
  - Installation using HUT's DIALOG implementation

- Setup using HUT's DIALOG implementation.

### **8.5.3.1 Degree of formalization**

Due to their technical nature, the learning concepts are easy to formalize. A major challenge is that it may be difficult to direct the material to different audiences (end-user vs. developers). End-users should probably be main target audience so this means taking into account specific perspectives of end-user domains.

### **8.5.3.2 Stability**

Middleware is rather static as a concept, so the first row of Table 6 can be considered stable. However, the PROMISE middleware is dynamic, moving from basic interfaces in the beginning of the project towards application-specific implementations at the end of the PROMISE project. The second row of Table 6 is becoming stable, while the third row is still quite implementation-dependent and dynamic.

### **8.5.3.3 Interactivity**

Interactivity is essential in this course, e.g. using on-line demonstrations and performing own installations and tests are important part of the course.

## **8.5.4 Infrastructure analysis**

### **8.5.4.1 Technological resources**

This course needs, in addition to the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1), of the Middleware technology.

### **8.5.4.2 Human resources**

HUT will mainly assume the roles of Director, Research and Design Coordinator, Interface Designer and Programmer. HUT will also be the main Content Matter Expert on middleware in general and PROMISE middleware and the DIALOG implementation of it in particular. Contributions by SAP and Stockway may be needed at least for their implementation-specific course contents. At least Indyon, InmediasP, Cambridge and BIBA could also be potential contributors of contents and expertise.

## **8.6 Technical course on PROMISE PEID**

### **8.6.1 Learner analysis**

We can classify the learners targeted by PEID training broadly into two groups:

- Group 1: technical staff from the PROMISE application owners who will be responsible for applying the PEID concept to suit their application
- Group 2: programmers and researchers from the research institutes and universities.

According to the classification of used groups illustrated in DT1.1, and the criterion “Role in PROMISE”, the first corresponds to the “End User” group, and the second corresponds to the “Research” group.

According to the criterion “relation to PROMISE”, the two groups correspond to the “actively involved” group.

According to the criterion “Domain” the first group corresponds to the “End User” group, and the second corresponds to the “Functional” group.

#### **8.6.1.1 Number**

From the first group, around 15 participants are expected. This is calculated on the basis of 2-3 participants each from the 7 application partners.

From the second group, around 10 participants are expected on the basis of 1-2 each from the 6 research institutes.

The course will be unique for all the groups.

#### **8.6.1.2 Access to technology**

In addition to what stated in Section 8.1, there is the need for learners to access to PEID technologies. The access to RF equipment is limited. RFID technology is however commercially available and could be used off the shelf. However, access to Sindrion prototypes and the test setup is currently constrained since the PEID reference system is still in development. However, Sindrion prototype hardware (which will serve as the hardware for the PEID reference implementation) will be commercially available as development kits during next year, and the corresponding firmware and software extensions will be made available to the PROMISE project partners by Infineon.

#### **8.6.1.3 Domain expertise**

The domain expertise of the learners would be in Information Technology, and Mechanical and Production Engineering. Further, knowledge about application of RF technologies is a prerequisite. In addition, for learners responsible for programming of Sindrion tags (in both groups), knowledge of Java programming would be a pre-requisite.

#### **8.6.1.4 Homogeneity /heterogeneity of interest among learners**

The learners are homogenous with respect to the general technical background and hence, their interests. However, they would be heterogeneous when it comes to the understanding of particular technologies, e.g. RFID or Sindrion.

#### **8.6.1.5 Learner availability to sharing and collaborating**

There are very good opportunities for sharing and collaboration because the types of problems addressed across the application scenarios are similar.

### 8.6.2 Goal analysis

The main objectives for this course are to learn:

1. The effects of metallic and liquid environment on the performance of RFID and active tag systems.
2. How to use RFID and active tag systems in particular application environments
3. How to integrate the different PEIDs with existing hardware.
4. How to integrate PEIDs with software, in particular, the use of the Core PAC interface.
5. How to program Sindrion tags.
6. How to integrate different types of sensors and the data produced with RFID.

The above objectives are synthesized according to Bloom's classification in Table 7 below.

**Table 7. Technical course on PROMISE PEID technology: goals**

Learner	Goal	Type	Bloom (1956)
Second group	RF Physics	To know	<b>Comprehension:</b> To understand the effects of metallic and liquid environment on the performance of RFID
First group	How to use RFID in particular application environments	To know how to do	<b>Application:</b> To apply Promise PEID to suit the particular environments and conditions posed by various applications.
First groups	Hardware integration	To know how to do	<b>Application:</b> To be able to integrate PEIDs to existing hardware, e.g. ECU of the vehicle.
First groups	Software integration	To know how to do	<b>Application:</b> To be able to develop and integrate software that can communicate with the PEIDs.
Both groups	Programming of Sindrion tags	To know how to do	<b>Application:</b> To be able to use Sindrion technology in particular applications.
Both groups	Sensor integration	To know how to do	<b>Application:</b> To be able to integrate the data coming from the different PEIDs to be integrated and translated to meaningful "information".

### 8.6.3 Learning concepts

The main training concepts of this course are:

1. Principles of RFID tags and active tags (anti-collision protocols backscatter, etc.).

2. Standards.
3. Effect of metallic and liquid environments on the performance of RF tags
4. Understand the Sindrion concept.
5. Understand the concepts of sensor integration (hardware as well software).

#### **8.6.3.1 Degree of formalization**

We do not expect to formalize the issues around RF. However, the programming aspects of Sindrion can be formalized. The concepts are not context specific, and they do not require different perspectives.

#### **8.6.3.2 Stability**

The concepts are evolving during the project evolution, and hence are dynamic in nature. Specifically, the choice of RF tags is under process due to market immaturity as well as technical issues related to tagging in specific environments. Moreover, the Sindrion tags are currently under development and testing, which makes the training issues related to that fairly dynamic.

#### **8.6.3.3 Interactivity**

We expect some hands-on aspects in training. In particular, the use of RF readers and tags would have to be interactive.

### **8.6.4 Infrastructure analysis**

It is assumed that both technological and human resources required to deliver the training are available.

#### **8.6.4.1 Technological resources**

This course needs, in addition to the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1), of the following components:

1. A demo PEID system to provide hands-on training.
2. Sindrion prototypes to be developed by Infineon.

#### **8.6.4.2 Human resources**

Research institutes such as Cambridge University and BIBA, and system developers and integrators such as Infineon and Stockway will provide the human resources for training.

## **8.7 Business course on the main PROMISE concepts, technologies and benefits overall the whole life cycle**

### **8.7.1 Learner analysis**

Based on the classification of groups of learners provided in DT1.1 and using the criterion “Role in PROMISE”, the typical users interested in the “business” whole lifecycle course are individuals from across the spectrum of the product lifecycle (BOL, MOL and EOL) and their respective companies (end-users) that are involved in PROMISE. Additionally there may be individuals, especially researchers, who are interested in the concept of the whole lifecycle as it consists of the three lifecycle phases. Considering the classification criterion “Organizational position”, the learners concerned with this course are those with leading positions in their respective companies and academics. Learners can come potentially from all industrial domains, especially IT, Logistics, Finance / Controlling, Mechanical Engineering, Management, Marketing & Sales, Production / Manufacturing, Design / Engineering, etc.; plus Research.

#### **8.7.1.1 Number**

We suggest that the participants, and hence the numbers involved, are active or passive. Since the whole lifecycle course is very general, it interests all the participants more or less to some extent. Those that are actively interested included Research institutions and Universities: SINTEF, BIBA, Cambridge, CIMRU, EPFL, HUT, Polimi; and some end-users (technological) SAP, Stockway, Infineon, Cognidata. The rest, being application owners, we suggest are passively interested in the whole lifecycle course, but more interested in individual lifecycle phases; these include: BT-LOC, CAT, CRF, ENOTRAC, FIDIA, Indyon, Inmediasp, Intracom, ITIA, MTS, and WRAP. If we assume a participation of 2 learners from each active participant and 1 learner from passive participants, the total number of learners estimated for this course is approx. 33.

#### **8.7.1.2 Access to technology**

Learners have access to the basic technology requirements as described in Section 8.1.

#### **8.7.1.3 Homogeneity /heterogeneity of interest among learners**

For the most part, extrinsic motivation is what drives this business course. Users face a dynamic business world where new ideas, such as PROMISE, must be considered and embraced despite the individual feelings of the users involved. This provides the impetus to learn about the whole lifecycle and how PROMISE technologies may impact upon it. Learners who embraced the business courses of BOL, MOL and EOL may be expected to show extrinsic motivation to continue their studies outside of the individual phase into other areas facilitated by whole lifecycle course.

#### **8.7.1.4 Learner availability to sharing and collaborating**

The overall ability of learners to share and collaborate should be considered in the context of the PROMISE project consortium as at least average due to the fact that working in an international research project requires a minimum of both soft and hard skill as described above. Nevertheless, training concepts should not rely entirely on these prerequisites due to the fact that learners from affiliated projects or organizations also need to be addressed by the training activities. For the whole lifecycle business course, we foresee the use of simple delivery mechanisms without



significant resources employed in face-to-face communications. Hence soft skills are not such an issue here.

### 8.7.2 Goal analysis

The general goals for business courses in the whole lifecycle in PROMISE are to teach the economic aspects of PROMISE whole lifecycle solutions and results, i.e. to focus on business benefits and costs of them (both the fixed and potential).

For the exploitation of PROMISE whole lifecycle solutions and results, we can foresee the following business benefits:

The benefit of viewing the whole product lifecycle, as opposed to just focusing on one individual phase (such as BOL, or MOL, or EOL) enables us to:

- Streamline our information flow system to other partners in the value chain;
- Achieve greater awareness of the material requirements of our customers; improved material flow throughout the product lifecycle;
- Being able to understand the holistic lifecycle view enables us to move beyond the BOL, or MOL, or EOL phase, to an appreciation of other *value chain* issues;
- Enabled to exploit business opportunities that we can only learn about from the whole lifecycle view;
- Greater trust generated between partners in separate BOL, MOL and EOL phases; greater understanding of the needs and wants of other partners;
- Whole lifecycle view enables greater *value chain* optimization of systems and processes;
- PROMISE can improve the operational efficiency of the participants in the *value chain* through the use of PROMISE technologies in BOL, MOL and EOL;
- Benefit derived from captive market; i.e. the fact that PROMISE becomes a *de facto* standard in the value chain, thus participants find it difficult (too expensive) to switch.
- Higher integration and, consequently more business from understanding PROMISE and its use of the whole lifecycle view to drive the product lifecycle across BOL, MOL and EOL.
- Lower information transmission costs;
- Increased Return on Investment (ROI) by improving the existing process management investments and technologies;
- Increased responsiveness and decision support owing to whole lifecycle view to issues of future impact (prevention is better cure).

For the exploitation of PROMISE whole lifecycle solutions and results, we can foresee the following business costs:

- Cost of appropriating the correct data at the operative product lifecycle phase;
- Potential information-overload from whole lifecycle view, inhibiting expensive information systems operation;
- The cost of getting value chain participants involved with PROMISE; the time taken to persuade, reward, endorse others to set-up up PROMISE technologies;
- Cost of training across the value chain on PROMISE technologies;
- Cost of PROMISE implementation across the value chain;
- Cost of human resources across the value chain required to operate PROMISE;
- Potential cost of switching to other technologies (Lock-in risk)
- Cost of transmitting value chain information in PROMISE.

The above describes the learner's goals, which are synthesized in Table 8 according to Bloom's classification.

**Table 8. Business course on PROMISE whole life cycle: goals**

Type of goals	Goals	Type	Bloom (1956)
Business benefits	Streamline our information flow system to other partners in the value chain	To know	<b>Knowledge:</b> Describe the improved information flow throughout the product lifecycle in the global environment
	Achieve greater awareness of the material requirements of our customers; improved material flow throughout the product lifecycle	To know	<b>Knowledge:</b> Describe the improved material flow throughout the product lifecycle in the global environment
	Being able to understand the holistic lifecycle view enables us to move beyond the BOL, or MOL, or EOL phase, to an appreciation of other <i>value chain</i> issues	To know	<b>Comprehension:</b> Comprehend the holistic lifecycle view beyond the BOL, MOL, and EOL
	Enabled to exploit business opportunities that we can only learn about from the whole lifecycle view	To know	<b>Knowledge:</b> Explain the business opportunities generated throughout the product lifecycle in the global environment
	Greater trust generated between partners in separate BOL, MOL and EOL phases; greater understanding of the needs and wants of other partners	To know	<b>Comprehension:</b> Comprehend the greater trust between the partners in the whole lifecycle of products
	Whole lifecycle view enables greater <i>value chain</i> optimization of systems and processes	To know	<b>Knowledge:</b> Recognize the optimization of the systems and processes in the value chain from the whole lifecycle view
	PROMISE can improve the operational efficiency of the participants in the <i>value chain</i> through the use of PROMISE technologies in BOL, MOL and EOL	To know	<b>Knowledge:</b> Describe the improved operational efficiency in the value chain
	Benefit derived from captive market; i.e. the fact that PROMISE becomes a <i>de facto</i> standard in the value chain, thus participants find it difficult (too expensive) to switch	To know	<b>Knowledge:</b> To identify the business benefits in the global market
	Higher integration and, consequently more business from understanding PROMISE and its use of the whole lifecycle view to drive the product lifecycle across BOL, MOL and EOL	To know	<b>Comprehension/Knowledge:</b> Comprehend Explain the business opportunity resulted in understanding PROMISE and its use of the whole lifecycle view
	Lower information transmission costs	To know	<b>Comprehension:</b> Compare the difference between the transmission costs
Increased Return on Investment (ROI) by improving the existing process management investments and technologies	To know	<b>Comprehension:</b> Comprehend the increased ROL in the value chain	

Type of goals	Goals	Type	Bloom (1956)
	Increased responsiveness and decision support owing to whole lifecycle view to issues of future impact (prevention is better cure)	To know	<b>Comprehension:</b> Comprehend the Business effects on the company
<b>Business Costs</b>	Cost of appropriating the correct data at the operative product lifecycle phase	To know how to do	<b>Application:</b> Compute the cost of using correct field data during the whole lifecycle
	Potential information-overload from whole lifecycle view, inhibiting expensive information systems operation	To know how to do	<b>Application:</b> Estimate the cost of processing of the overload information from the view of the whole lifecycle.
	The cost of getting value chain participants involved with PROMISE; the time taken to persuade, reward, endorse others to set-up up PROMISE technologies	To know how to do	<b>Application:</b> Evaluate the cost of getting PROMISE partners involved
	Cost of training across the value chain on PROMISE technologies	To know how to do	<b>Application:</b> Estimate the training cost
	Cost of PROMISE implementation across the value chain	To know how to do	<b>Application:</b> Estimate the cost of implementing PROMISE technologies
	Cost of human resources across the value chain required to operate PROMISE	To know how to do	<b>Application:</b> Calculate the human cost involved in the daily running and maintenance
	Potential cost of switching to other technologies (Lock-in risk)	To know how to do	<b>Application:</b> Estimate the potential cost of switching technologies.
	Cost of transmitting value chain information in PROMISE	To know how to do	<b>Application:</b> Estimate the cost of transmitting information.

### 8.7.3 Learning concepts

In the whole lifecycle business course for PROMISE technologies, the main learning concepts—from the perspective of benefits—may be concluded into 34 categories:

(1) Affected global environment;

- Dynamic competitive environment;
- Pockets of National/Regional optimization?
- More sophisticated end-user as they become familiar with PROMISE products
- Ethical considerations—will PROMISE PLM data be shared outside of value chain??

(2) Affected value chain;

- Customers / operators;
- Suppliers;
- Departments within the company;
- Actors;
- Processes;
- Etc.

(3) Business effects on the company;

- Benefits of adopting PROMISE whole lifecycle solutions—greater external collaboration;
- Costs of adopting PROMISE whole lifecycle solutions.

In the whole lifecycle business course for PROMISE technologies, the learning concepts –from the perspective of business costs– may be:

- Cost models.
- Detailed description of the elements having an impact on the business aspects of the company and value chain.

### **8.7.3.1 Degree of formalization**

Training for business is difficult to formalize in comparison to technical training concepts, as the PROMISE consortium is used to working with technical aspects.

The learning concepts are context specific and should be adapted to different value chain domains. Depending on the industry sector, type of goods produced, information flows maintained etc. the whole lifecycle view of business for PROMISE will have to be customized. Thus it is important to consider the training concepts from different perspectives in order to take into account the specific needs of the different learners involved in the training.

### **8.7.3.2 Stability**

Most of the concepts are dynamic because the subjects considered in the whole lifecycle business course are evolving throughout the whole period of the PROMISE project. We are constantly seeing the development of new opportunities, and exploitation possibilities that can change the whole lifecycle viewpoint in new directions. Consequently, the training concepts should be regularly updated depending on the new business needs and demonstrators' developments. Some basic definitions in learning concepts are static, such as BOL business, value chain, ROI etc.

### **8.7.3.3 Interactivity**

The concepts require only classic text information because there are no special tools needed for training. Consequently, no multimedia and real-time interactivity is envisaged. The requirements of learners can be sent to the training committees by e-mail, and can be replied as soon as possible.

## **8.7.4 Infrastructure analysis**

There are no special needs to deliver the training concepts for the whole lifecycle business course. Consequently, we assume that both technological and human resources required to deliver the training concepts are available.

### **8.7.4.1 Technological resources**

The standard technologies potentially adoptable in all training courses (see Section 8.1) are available.

### **8.7.4.2 Human resources**

Business consultant and research institutes such as EPFL, POLIMI, BIBA and NUI, CIMRU will provide the required human resources for BOL business training.

## **8.8 Business course on the main PROMISE concepts, technologies and benefits in the BOL cycle phase**

### **8.8.1 Learner analysis**

Based on the classification of groups of learners provided in DT1.1 and using the criterion “Role in PROMISE”, the typical users interested in “business” BOL (where BOL involves Design improvement / DfX and adaptive production) course are individuals from companies (end-users) that are involved in PROMISE. Considering the classification criterion “Organizational position”, the learners concerned with this course are those with leading positions in their respective companies. Learners can come from a variety of domains, but especially IT, Logistics, Finance / Controlling, Design / Engineering, etc.

#### **8.8.1.1 Number**

We estimate that there are 6 end-users involved in PROMISE that have some interest in extending PROMISE BOL results beyond the project in its research aspect to business ends as expressed in the description of their applications. These end users are: BIBA/INDYON (A3), CAT (A5), FIDIA (A6), INTRACOM (A9) in addition to BT-LOC (A10) which has BOL / DfX as the main focus of its application and POLIMI (A11) which has BOL / adaptive production as the main focus of its application. If we assume a participation of 1 to 2 learners from each end-user; so the total number of learners estimated for this course is 6-12.

#### **8.8.1.2 Access to technology**

For the access technology related to the training infrastructure, the basic technology requirements for this course are computers and devices, software and network access—these are taken as standard and are assumed to be available for the learners (see also Section 8.1).

Regarding the access to PROMISE technology, technical components such as PEID, Middleware etc. are not necessary for the business course to take place.

#### **8.8.1.3 Homogeneity /heterogeneity of interest among learners**

For the most part, extrinsic motivation is what drives this business course. Users face a dynamic business world where new ideas, such as PROMISE, must be considered and embraced despite the individual feelings of the users involved.

Most of the companies involved in PROMISE produce products with intensive usage phase which require frequent service and maintenance. The induced costs are significant. The extent to which these costs can be reduced through the adoption of PROMISE BOL concepts is a determinant factor for the decision of the company about whether or not to implement PROMISE BOL concepts. Consequently, learning about the business aspects of PROMISE BOL concepts is crucial.

#### **8.8.1.4 Learner availability to sharing and collaborating**

The overall ability of learners to share and collaborate should be considered in the context of the PROMISE project consortium as at least average due to the fact that working in an international research project requires a minimum of both soft and hard skill as described above. Nevertheless, training concepts should not rely entirely on these prerequisites due to the fact that learners from affiliated projects or organizations also need to be addressed by the training activities. For BOL business courses, we foresee the use of simple delivery mechanisms without significant resources employed in face-to-face communications. Hence soft skills are not such an issue here.

### 8.8.2 Goal analysis

The general goals for business courses on BOL in PROMISE are to teach the economic aspects of PROMISE BOL solutions and results, i.e. to focus on business benefits and costs of them (both the fixed and potential).

For the exploitation of PROMISE BOL solutions and results, we can foresee the following business benefits:

- Business benefits of improved and more competitive product designs, mainly by adequate re-use of proven designs and enhancement of weak designs;
- Business benefits of improved production processes and systems, mainly by adequate use of related field data;
- Business benefits of increased customer satisfaction due to improved fulfillment of customer requirements which favors long-term trust among business partners;
- Business benefits of reduced design effort by allowing engineers to have direct access to discrete and meaningful DfX product data in every design phase;
- Business benefits during product service life (respectively warranty period) due to improved component selection during initial design and adaptable production systems;
- Suppliers benefit from improved field information respectively knowledge regarding their scope of supply;
- Partners companies / consortiums could benefit from improved field information respectively knowledge regarding their scope of supply.

For the business cost of the exploitation of PROMISE BOL solutions and results, we can foresee the following ones:

- Cost for getting appropriate field data from operator and / or additional effort for customer to provide field data;
- Training cost of implementing PROMISE BOL technologies for involved persons due to usage of new processes and tools;
- Cost for implementing activities for involved persons because of changes in current processes and tools;
- Inspiring of inadequate (customer) expectations / requirements;
- Cost of integration within the company and between the company and its partners (suppliers, customers, etc.).

### 8.8.3 Learning concepts

In the BOL business course for PROMISE technologies, the main learning concepts—from different perspective—are concluded into 4 categories:

- Affected value chains;
  - Customers / operators;
  - Suppliers;
  - Departments within the company;
  - Actors;

- Processes;
- Etc.
- Business effects on the company;
- Benefits of adopting PROMISE BOL solutions;
- Costs of adopting PROMISE BOL solutions.
- Business effects on partners;
- Benefits for partners affected by the adoption by the company of PROMISE BOL solutions;
- Costs for partners affected by the adoption by the company of PROMISE BOL solutions;
- Cost models.
- Detailed description of the elements having an impact on the business aspects of the company.

### **8.8.3.1 Degree of formalization**

Training for business is difficult to formalize in comparison to technical training concepts, as the PROMISE consortium is used to working with technical aspects.

The learning concepts are context specific and should be adapted to different BOL/DfX domains. The DfX processes are quite different from company to company and the perspectives for dismantlers, recycling companies, remanufacturing companies, exchanges are not the same. The business benefits and costs are then focused on different aspects. Thus it is important to consider the training concepts from different perspectives in order to take into account the specific needs of the different learners involved in the training.

### **8.8.3.2 Stability**

Most of the concepts are dynamic because the subjects considered in BOL business courses are evolving throughout the whole period of the PROMISE project. Consequently, the training concepts should be regularly updated depending on the new business needs and demonstrators' developments. Some basic definitions in learning concepts are static, such as BOL business, value chain, ROI etc.

### **8.8.3.3 Interactivity**

The concepts require only classic text information because there are no special tools needed for training. Consequently, no multimedia and real-time interactivity is envisaged. The requirements of learners can be sent to the training committees by e-mail, and can be replied as soon as possible.

## **8.8.4 Infrastructure analysis**

There are no special needs to deliver the training concepts for the BOL business course. Consequently, we assume that both technological and human resources required to deliver the training concepts are available.

### **8.8.4.1 Technological resources**

This course needs only the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1).

#### **8.8.4.2 Human resources**

Business consultant and research institutes such as EPFL, POLIMI, BIBA and NUI, CIMRU will provide the required human resources for BOL business training.

### **8.9 Business course on the main PROMISE concepts, technologies and benefits in the MOL cycle phase**

#### **8.9.1 Learner analysis**

Typical users interested in “business” MOL course are End Users, with leading positions in their respective companies. Learners can come from a variety of domains, but especially after sale/service, finance / controlling.

##### **8.9.1.1 Number**

We estimate that there are roughly 6 end-users involved with PROMISE that have some interest in extending PROMISE EOL results beyond the project in its research aspect to business ends. These numbers refer to end users already involved in MOL scenarios and could in addition include end users for others scenarios interested in improving competencies in MOL processes. We can estimate approximately 2-4 from each end-user; so the number of learners estimated for this course is 12-24.

##### **8.9.1.2 Access to technology**

Basic technology components are computers and devices, software and network access—these are taken as standard. Technical components such as PEID, Middleware etc. are not necessary for the business course to take place.

##### **8.9.1.3 Homogeneity /heterogeneity of interest among learners**

For the most part, extrinsic motivation is what drives this business course. Users face a dynamic business world where new ideas, such as PROMISE, must be considered and embraced despite the individual feelings of the users involved. In this context it is crucial to widen the range of solutions offered to customers including valued added products and post sales services as the ones proposed in the MOL business solutions..

##### **8.9.1.4 Learner availability to sharing and collaborating**

The overall ability of learners to share and collaborate can be considered in the context of the PROMISE project consortium as at least average due to the fact that working in an international research project requires a minimum of both soft and hard skill as described above. Nevertheless, training concepts should not rely entirely on these prerequisites due to the fact that learners from affiliated projects or organizations also need to be addressed by the training activities. For MOL business courses, we foresee the use of simple delivery mechanisms without significant resources employed in face-to-face communications. Hence soft skills are not such an issue here.



### 8.9.2 Goal analysis

The general goals for business courses on MOL in PROMISE are to teach the economic aspects of PROMISE MOL solutions and results, i.e. to focus on business benefits and costs of them (both the fixed and potential).

For the exploitation of PROMISE MOL solutions, we can foresee the following business benefits:

- Business benefits of production processes integration and optimization by introducing PROMISE technologies also in maintenance and service management
- Business benefits of improved operational efficiency of MOL
- Business benefits of enlarge market share in the after-sales services to improve the customer fidelity
- Improved relationship with customers through the offer of a value added extended product
- Real benefits that accrue to the business from the introduction of PROMISE technologies also in the MOL
- Develops long-term trust among business MOL partners
- Lower information transmission costs from PROMISE MOL users
- Increased Return on Investment (ROI) by improving the existing maintenance management investments and technologies
- Increased responsiveness, by providing valid process information and decision support

For the business cost of the exploitation of PROMISE MOL solutions, we can foresee the following ones:

- Cost of implementing PROMISE technologies among MOL partners, e.g. the cost of PEIDs, Readers, DSS, PDKM and the integration cost among them
- Training cost of implementing PROMISE technologies
- Cost of human resources involved in the daily running and maintenance of PROMISE MOL solutions
- Cost of variability amongst the technical components and standards
- Potential cost of switching to other technologies (Lock-in risk)

The above describes the learners' goals, which are synthesized in the Table according to Bloom's classification.

**Table 9. Business course on PROMISE MOL: goals**

Type of goals	Goals	Type	Bloom (1956)
Business benefits	Business benefits of production processes integration and optimization by introducing PROMISE technologies	To know	<b>Knowledge</b> Describes the business benefits in the global market
	Business benefits of improved operational efficiency of MOL	To know	<b>Knowledge</b> Recognizes the increasing competitive ability and real-time management in MOL

Type of goals	Goals	Type	Bloom (1956)
	Business benefits of enlarge market share in the after-sales services to improve the customer fidelity	To know	<b>Knowledge</b> Describes the business benefits in the after sales market
	Improved relationship with customers through the offer of a value added extended product	To know	<b>Comprehension</b> To identify the business benefits in the value chain
	The business benefits that accrue from being in the network of MOL PROMISE partners as opposed to being outside the PROMISE MOL network. Higher integration and more business.	To know how to be	<b>Analysis</b> Compare the differences between being inside and outside of the PROMISE MOL network
	Lower information transmission costs from PROMISE MOL users.	To know how to be	<b>Analysis</b> Compare the difference between the transmission cost
	Increased Return on Investment (ROI) by improving the existing maintenance management investments and technologies	To know	<b>Comprehension</b> Comprehends the increasing ROI in maintenance management
	Increased responsiveness, by providing valid process information and decision support	To know	<b>Comprehension</b> Comprehends increasing competitive ability and real-time management
Business Cost	Cost of implementing PROMISE technologies among EOL partners, e.g. the cost of PEIDs, Readers, DSS, PDKM and the integration cost among them	To know how to do	<b>Application</b> Computes the cost of implementing PROMISE technologies
	Training cost of implementing PROMISE technologies	To know how to do	<b>Application</b> Estimates the training cost of implementing PROMISE technologies
	Cost of human resources involved in the daily running and maintenance of PROMISE MOL solutions	To know how to do	<b>Application</b> Calculates the human cost involved in the daily running and maintenance
	Cost of variability amongst the technical components and standards	To know how to do	<b>Application</b> Evaluates the cost of variability amongst the technical components and standards
	Potential cost of switching to other technologies (Lock-in risk)	To know how to do	<b>Application</b> Estimates the potential cost of switching to other technologies

### 8.9.3 Learning concepts

In the MOL business course for PROMISE technologies, the main learning concepts—from the perspective of benefits—are concluded into 4 categories:

- PROMISE MOL technology's business benefits in global market
  - production processes integration and optimization by introducing PROMISE technologies
  - increasing competitive ability and real-time management
  - gaining captive market, especially in the after sale area and improving market share
    - PROMISE MOL technology's business benefits in the value chain
  - long-term trust among business MOL partners who use PROMISE solution
  - network of MOL PROMISE partners collaborating across MOL Product lifecycle
  - business benefits in legislative compliance
    - PROMISE MOL technology's business benefits in maintenance management
  - improved operational efficiency
  - increasing Return on Investment (ROI)
  - improving relationship with customers who purchase a value added service
- In the MOL business course for PROMISE technologies, the main learning concepts—from the perspective of costs—are concluded into 2 categories:
  - Description and estimation of fixed costs
  - Cost of implementing PROMISE technologies among MOL partners, e.g. the cost of PEIDs, Readers, DSS, PDKM and the integration cost among them
  - Training cost of implementing PROMISE technologies
  - Cost of human resources involved in the daily running and maintenance of PROMISE MOL solutions
  - Description, analysis and estimation of potential costs
  - Cost of variability amongst the technical components and standards
  - Potential cost of switching to other technologies

#### 8.9.3.1 Degree of formalization

Training for business is difficult to formalize in comparison to technical training concepts, as the PROMISE consortium is used to working with technical aspects.

The learning concepts are context specific and should be adapted to different MOL domains. The MOL processes are quite different from company to company and the perspectives for different users are not the same. The business benefits and costs are then focused on different aspects. Thus it is important to consider the training concepts from different perspectives in order to take into account the specific needs of the different learners involved in the training.

### **8.9.3.2 Stability**

Most of the concepts are dynamic because the subjects considered in MOL business courses are evolving throughout the whole period of the PROMISE project. Consequently, the training concepts should be regularly updated depending on the new business needs and demonstrators' developments. Anyway some basic definitions in learning concepts are static, such as MOL business, value chain, ROI etc.

### **8.9.3.3 Interactivity**

The concepts require classic text information. No multimedia and real-time interactivity is envisaged. The requirements of learners can be sent to the training committees by e-mail, and can be replied as soon as possible.

## **8.9.4 Infrastructure analysis**

It is assumed that both technological and human resources required to deliver the training concepts are available.

### **8.9.4.1 Technological resources**

This course needs only the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1).

### **8.9.4.2 Human resources**

Business consultant and research institutes such as EPFL, POLIMI, BIBA and NUI, CIMRU will provide the required human resources for BOL business training.

## **8.10 Business course on the main PROMISE concepts, technologies and benefits in the EOL cycle phase**

### **8.10.1 Learner analysis**

Typical users interested in "business" EOL course are End Users, with leading positions in their respective companies. Learners can come from a variety of domains, but especially IT, logistics, finance / controlling.

#### **8.10.1.1 Number**

We estimate that there are roughly 6 end-users involved with PROMISE that have some interest in extending PROMISE EOL results beyond the project in its research aspect to business ends. We can estimate approximately 2-4 from each end-user; so the number of learners estimated for this course is 12-24.

### **8.10.1.2 Access to technology**

Basic technology components are computers and devices, software and network access—these are taken as standard (see also Section 8.1). Technical components such as PEID, Middleware etc. are not necessary for the business course to take place.

### **8.10.1.3 Domain expertise**

[see also deliverable DT1.1 for explanation of this item]

The specific domains of interest here (from PROMISE) are:

- Construction Equipment (crawler-mounted vehicle)
- Automotive
- Recycling

Learners are expected to come from the following domains:

- Information technology
- Marketing / Sales
- Production & Manufacturing
- Logistics

### **8.10.1.4 Homogeneity /heterogeneity of interest among learners**

For the most part, extrinsic motivation is what drives this business course. Users face a dynamic business world where new ideas, such as PROMISE, must be considered and embraced despite the individual feelings of the users involved. On another level, senior managers who have an opportunity to position their companies in the EOL space may decide to invest in PROMISE because they are interested in it from an intrinsic motivational viewpoint. These are, however, the minority of learners.

### **8.10.1.5 Learner availability to sharing and collaborating**

The overall ability of learners to share and collaborate can be considered in the context of the PROMISE project consortium as at least average due to the fact that working in an international research project requires a minimum of both soft and hard skill as described above. Nevertheless, training concepts should not rely entirely on these prerequisites due to the fact that learners from affiliated projects or organizations also need to be addressed by the training activities. For EOL business courses, we foresee the use of simple delivery mechanisms without significant resources employed in face-to-face communications. Hence soft skills are not such an issue here.

## **8.10.2 Goal analysis**

The general goals for business courses on EOL in PROMISE are to teach the economic aspects of PROMISE EOL solutions and results, i.e. to focus on business benefits and costs of them (both the fixed and potential).

For the exploitation of PROMISE EOL solutions, we can foresee the following business benefits:

- Business benefits of production processes integration and optimization by introducing PROMISE technologies
- Business benefits of improved operational efficiency
- Business benefits of captive market, and enlarge market share
- Improved relationship with customers who purchase second-hand products/materials
- Develops long-term trust among business EOL partners
- The business benefits that accrue from being in the network of EOL PROMISE partners as opposed to being outside the PROMISE EOL network. Higher integration and more business
- Lower information transmission costs from PROMISE EOL users
- Benefits of warehouse storage management by using PROMISE PEIDs
- The use of PROMISE to enable us to comply with environmental legislation more closely in terms of recycling etc.
- Increased Return on Investment (ROI) by improving the existing process management investments and technologies
- Increased responsiveness, by providing valid process information and decision support

For the business cost of the exploitation of PROMISE EOL solutions, we can foresee the following ones:

- Cost of implementing PROMISE technologies among EOL partners, e.g. the cost of PEIDs, Readers, DSS, PDKM and the integration cost among them
- Training cost of implementing PROMISE technologies
- Cost of human resources involved in the daily running and maintenance of PROMISE EOL solutions
- Cost of variability amongst the technical components and standards
- Potential cost of switching to other technologies (Lock-in risk)
- Potential cost of PROMISE which removes potential customers because we maybe unable to operate outside of PROMISE
- Potential costs of transmitting information to BOL or MOL (Should EOL partners be compensated for this?)

The above describes the learners' goals, which are synthesized in Table 10 according to Bloom's classification.

**Table 10. Business course on PROMISE EOL: goals**

Type of goals	Goals	Type	Bloom (1956)
Business benefits	Business benefits of production processes integration and optimization by introducing PROMISE technologies	To know	<b>Knowledge</b> Describes the business benefits in the global market

Type of goals	Goals	Type	Bloom (1956)
	Business benefits of improved operational efficiency	To know	<b>Knowledge</b> Recognizes the increasing competitive ability and real-time management
	Business benefits of captive market and enlarge market share	To know	<b>Knowledge</b> Describes the business benefits in the global market
	Improved relationship with customers who purchase second-hand products/materials	To know	<b>Comprehension</b> To identify the business benefits in the value chain
	Develops long-term trust among business EOL partners	To know	<b>Comprehension</b> To identify the business benefits in the value chain
	The business benefits that accrue from being in the network of EOL PROMISE partners as opposed to being outside the PROMISE EOL network. Higher integration and more business.	To know how to be	<b>Analysis</b> Compare the differences between being inside and outside of the PROMISE EOL network
	Lower information transmission costs from PROMISE EOL users.	To know how to be	<b>Analysis</b> Compare the difference between the transmission cost
	Benefits of warehouse storage management by using PROMISE PEIDs.	To know	<b>Comprehension</b> Explain the benefits of warehouse storage management
	The use of PROMISE to enable us to comply with environmental legislation more closely in terms of recycling etc.	To know	<b>Knowledge</b> To know business benefits in legislative compliance
	Increased Return on Investment (ROL) by improving the existing process management investments and technologies	To know	<b>Comprehension</b> Comprehends the increasing ROL in recovery production management
	Increased responsiveness, by providing valid process information and decision support	To know	<b>Comprehension</b> Comprehends increasing competitive ability and real-time management
Business Cost	Cost of implementing PROMISE technologies among EOL partners, e.g. the cost of PEIDs, Readers, DSS, PDKM and the integration cost among them	To know how to do	<b>Application</b> Computes the cost of implementing PROMISE technologies

Type of goals	Goals	Type	Bloom (1956)
	Training cost of implementing PROMISE technologies	To know how to do	<b>Application</b> Estimates the training cost of implementing PROMISE technologies
	Cost of human resources involved in the daily running and maintenance of PROMISE EOL solutions	To know how to do	<b>Application</b> Calculates the human cost involved in the daily running and maintenance
	Cost of variability amongst the technical components and standards	To know how to do	<b>Application</b> Evaluates the cost of variability amongst the technical components and standards
	Potential cost of switching to other technologies (Lock-in risk)	To know how to do	<b>Application</b> Estimates the potential cost of switching to other technologies
	Potential cost of PROMISE which removes potential customers because we may be unable to operate outside of PROMISE	To know how to do	<b>Application</b> Estimates the potential cost of PROMISE which removes potential customers
	Potential costs of transmitting information to BOL or MOL (Should EOL partners be compensated for this?)	To know how to do	<b>Application</b> Estimates the potential cost of PROMISE EOL compensation.

### 8.10.3 Learning concepts

In the EOL business course for PROMISE technologies, the main learning concepts—from the perspective of benefits—are concluded into 4 categories:

- PROMISE EOL technology’s business benefits in global market
  - production processes integration and optimization by introducing PROMISE technologies
  - increasing competitive ability and real-time management
  - gaining captive market and improving market share
- PROMISE EOL technology’s business benefits in the value chain
  - long-term trust among business EOL partners who use PROMISE
  - network of EOL PROMISE partners collaborating across EOL Product lifecycle
  - business benefits in legislative compliance
- PROMISE EOL technology’s business benefits in recovery production management
  - improved operational efficiency
  - increasing Return on Investment (ROI)
  - improving relationship with customers who purchasing second-hand goods or recycled materials



In the EOL business course for PROMISE technologies, the main learning concepts—from the perspective of costs—are concluded into 2 categories:

- Description and estimation of fixed costs
  - Cost of implementing PROMISE technologies among EOL partners, e.g. the cost of PEIDs, Readers, DSS, PDKM and the integration cost among them
  - Training cost of implementing PROMISE technologies
  - Cost of human resources involved in the daily running and maintenance of PROMISE EOL solutions
- Description, analysis and estimation of potential costs
  - Cost of variability amongst the technical components and standards
  - Potential cost of switching to other technologies
  - Potential loss of revenue because PROMISE removes potential customers
  - Potential cost of transmitting information to BOL or MOL (EOL partners are supposed to be compensated for this)

#### **8.10.3.1 Degree of formalization**

Training for business is difficult to formalize in comparison to technical training concepts, as the PROMISE consortium is used to working with technical aspects.

The learning concepts are context specific and should be adapted to different EOL domains. The EOL processes are quite different from company to company and the perspectives for dismantlers, recycling companies, remanufacturing companies, exchanges are not the same. The business benefits and costs are then focused on different aspects. Thus it is important to consider the training concepts from different perspectives in order to take into account the specific needs of the different learners involved in the training.

#### **8.10.3.2 Stability**

Most of the concepts are dynamic because the subjects considered in EOL business courses are evolving throughout the whole period of the PROMISE project. Consequently, the training concepts should be regularly updated depending on the new business needs and demonstrators' developments. Some basic definitions in learning concepts are static, such as EOL business, value chain, ROI etc.

#### **8.10.3.3 Interactivity**

The concepts require classic text information. No multimedia and real-time interactivity is envisaged. The requirements of learners can be sent to the training committees by e-mail, and can be replied as soon as possible.

#### **8.10.4 Infrastructure analysis**

It is assumed that both technological and human resources required to deliver the training concepts are available.

#### **8.10.4.1 Technological resources**

This course needs only the already mentioned standard technologies potentially adoptable in all training courses (see Section 8.1).

#### **8.10.4.2 Human resources**

Business consultant and research institutes such as EPFL, POLIMI, BIBA and NUI, CIMRU will provide the human resources for training.

### **9 Summary of specifications for the instructional design of PROMISE training courses**

This section contains table summarizing Section 8.

**Table 11. Summary of training specifications.**

Course code	Course description	Learners groups	Max number of learners	Learning concepts	Formalization	Stability	Interactivity	Additional resources	Partners involved	
TC1	Technical, System level	Technical, End users, Research	45	1) Overall PROMISE system architecture	no difficulty	static	none	none	All technology providers and research institutions	
				2) PROMISE components (sw, hw)	no difficulty	dynamic		physical demonstrators		
				3) How to interface with PROMISE	no difficulty	static		none		
				4) How to build applications	no difficulty	dynamic		none		
				5) PROMISE technologies potentialities	it may require different perspectives	dynamic		physical demonstrators		
TC2	Technical, DSS	1) Research	10	1) Description of the way the current DSS prototype is programmed	no difficulty	static	none	none	Cognidata	
				2) Tools to use for further programming	no difficulty	static				none
				3) Guidelines for programming	no difficulty	static				yes
		2) Technical, End users	20	1) Description of DSS modules	it may require different perspectives	static	none	DSS prototypes	Research institutions, Cognidata	

Course code	Course description	Learners groups	Max number of learners	Learning concepts	Formalization	Stability	Interactivity	Additional resources	Partners involved	
				2) DSS strategies	it may require different perspectives	dynamic	yes			
				3) Development of new strategies	it may require different perspectives	dynamic	Yes			
TC3	Technical, PDKM	Technical, End users	20	1) PROMISE PDKM concepts	no difficulty	static	yes	On-line meeting tool	InMediasP, POLIMI	
				2) PDKM user interface		static				
				3) PDKM objects		static				
				4) PDKM functions		static				
TC4	Technical, PEID	Technical, End users	65	1) Principles of RFID tags and active tags	no difficulty	dynamic	none	none	Cambridge, BIBA, Infineon and Stockway	
				2) Standards			none			
				3) Effect of environment on RF tags' performance			none			
				4) Sindrion concept			yes			PEID, Sindrion prototypes
				5) Sensor integration			yes			PEID, Sindrion prototypes
TC5	Technical, Middleware	Technical, End users	20	1) Middleware	it may require different perspectives	static	none	none	HUT, SAP, Stockway	
				2) PROMISE Middleware	it may require different perspectives	dynamic	yes	Middleware platform		

Course code	Course description	Learners groups	Max number of learners	Learning concepts	Formalization	Stability	Interactivity	Additional resources	Partners involved
				3) Installation and set-up	it may require different perspectives	dynamic	yes	Middleware platform	
BC1	Business, whole life cycle	Business, End users	33	1) Affected global environment	no difficulty	static	none	none	BIBA, CIMRU, EPFL, SINTEF, POLIMI
				2) Affected value chain	it may require different perspectives	static	none		
				3) Business effects on the company	it may require different perspectives	static	none		
BC2	Business, BOL	Business, End users	12	1) Affected value chains	no difficulty	static	none	none	BIBA, CIMRU, EPFL, SINTEF, POLIMI
				2) Business effects on the company	Difficult. It may require different perspectives	dynamic			
				3) Business effects on the partner	Difficult. It may require different perspectives	dynamic			
				4) Cost models	Difficult. It may require different perspectives	static			
BC3	Business, MOL	Business, End users	24	1) Business benefits in the global market	no difficulty	static	none	none	BIBA, CIMRU, EPFL, ITIA, SINTEF, POLIMI
				2) Business benefits in the value chain	Difficult. It may require different perspectives	dynamic			

Course code	Course description	Learners groups	Max number of learners	Learning concepts	Formalization	Stability	Interactivity	Additional resources	Partners involved
				3) Business benefits on maintenance management	Difficult. It may require different perspectives	dynamic			
				4) Cost models	Difficult. It may require different perspectives	static			
BC4	Business, EOL	Business, End users	24	1) Business benefits in the global market	no difficulty	static	none	none	BIBA, CIMRU, EPFL, SINTEF, POLIMI
				2) Business benefits in the value chain	Difficult. It may require different perspectives	dynamic			
				3) Business benefits in recovery production management	Difficult. It may require different perspectives	dynamic			
				4) Cost models	Difficult. It may require different perspectives	static			

## 10 Training action plan

According to the PROMISE Roadmap shown in Figure 3, the training course should be activated from project month 36 to project month 42. However, there are some specific needs that could force changes for some specific courses. Indeed, the technical courses which support the development of demonstrators in the applications should be activated starting from project month 27 (start date of “Implementation of demonstrators” in the Roadmap) in order to be effective for the PROMISE implementation activities to be carried out in the applications.

The training courses conceived to improve the knowledge on PROMISE technologies and methods can be activated after the implementation activities in the applications have been completed and the testing phase is started (project month 36, see the Roadmap diagram).

**Figure 3. PROMISE Roadmap to results (from PROMISE DoW).**

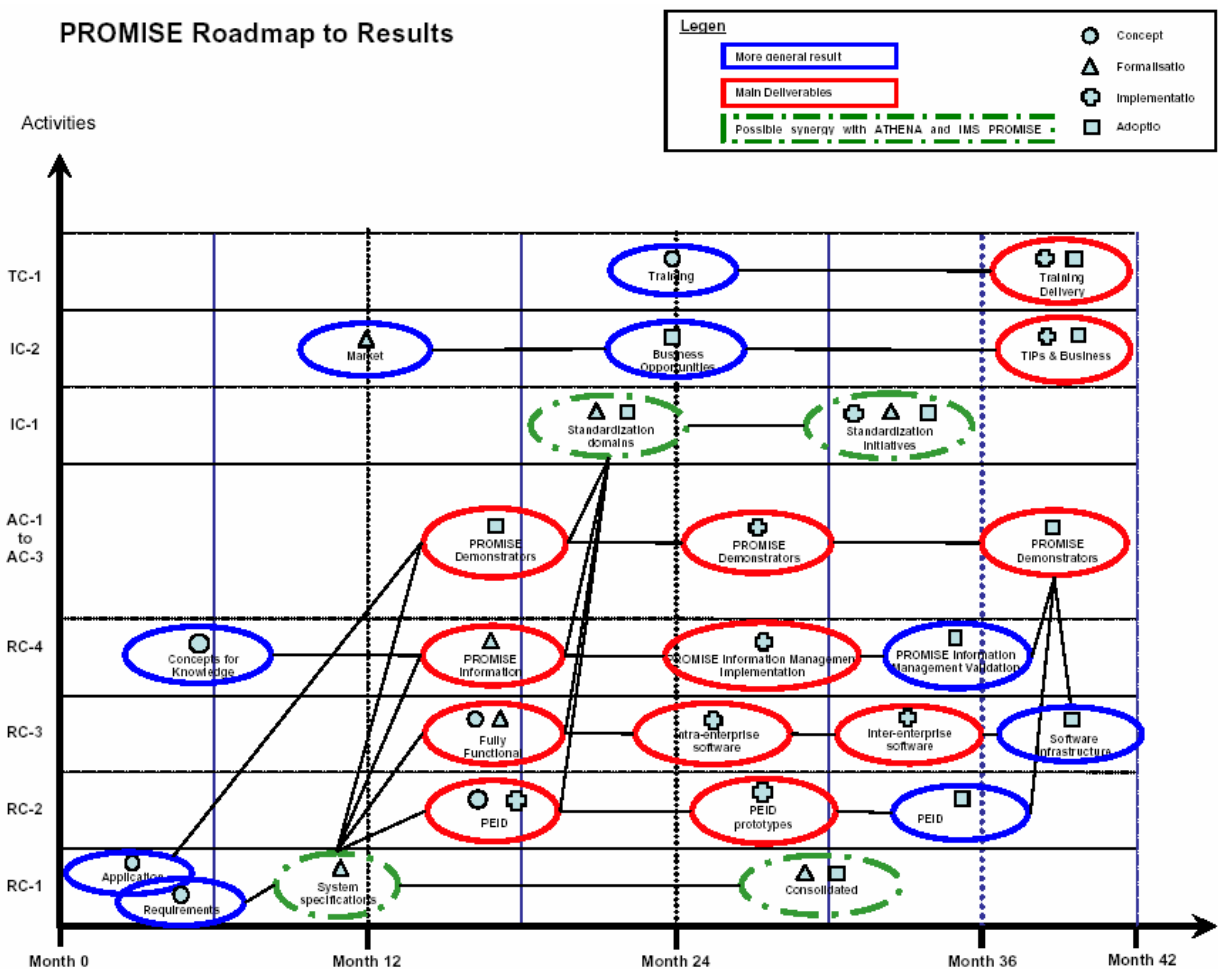


Table 12 reports the list of training courses, the priority expressing the project needs of activating a specific course and finally the planned activation period. It can be noticed from this table that the training course code TC2 for programmers of research institutions has the highest priority learner due to the need of DSS prototype implementation. The general technical and business courses have a medium priority; the rest of courses will be activated in the last period from project month 36 to 42.

**Table 12. Activation plan of training courses.**

Code	Name	Learner priority	Activation period (project month)
TC1	Technical course on PROMISE technologies at system level	Medium	27 - 42
TC2	Technical course on PROMISE DSS technology		
	Group 1	High	21 - 35
	Group 2	Medium	30 - 42
TC3	Technical course on PROMISE PDKM technology	Medium	30 - 42
TC4	Technical course on PROMISE PEID technology	Medium	30 - 42
TC5	Technical course on PROMISE Middleware technology	Medium	30 - 42
BC1	Business course on the main PROMISE concepts, technologies and benefits overall the whole life cycle	Medium	24 - 42
BC2	Business course on the main PROMISE concepts, technologies and benefits in the BOL cycle phase	Low	36 - 42
BC3	Business course on the main PROMISE concepts, technologies and benefits in the MOL cycle phase	Low	36 - 42
BC4	Business course on the main PROMISE concepts, technologies and benefits in the EOL cycle phase	Low	36 - 42

## 11 Conclusions

The main objectives of the task 1 of WPT1 have been reached:

1. to set up a Training Action Plan by defining the list of training courses and a related calendar
2. to derive the needs and the main constraints for the Instruction Design Phase.

The complete set of specification has been defined in this document. This set of specifications constitutes the main reference to the design phase of the PROMISE training model, which is being developed in task T1.3.

The developed specifications mainly regard:

- Learners with their characteristics and goals
- PROMISE contents to delivery to learners
- Course availability during the project activities
- Availability of human resources
- Availability of IT resources.

## 12 References

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### 13 Contact Persons

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