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A CHANGING PEDAGOGY IN LEARNING AT ASML

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Preface and acknowledgements

After my study at the PTH in Eindhoven I thought that I had finished my long path of learning. (LTS, MTS, PTH). But in the year of the millennium I got the change to start with this study at the University of Twente “Toegepaste Onderwijskunde” supported by the company I work for ASML. Now seven school years and many kilometres of driving later I am writing my final thesis. The people who know me will understand the choice I made for the chosen ADDIE design model!

Every year I had my moments of thoughts but due to the major support at home and some special moments in June 2002 and October 2003 I continued with pleasure. The study took a little bit longer then planned but was definitely worth it. Within the training department we talk about learning every day and this study helped me to think about it more. I hope that I can contribute to the “Changing pedagogy in learning within the training department”.

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1 Introduction and research questions

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn”. Alvin Toffler

The title of this thesis “A changing pedagogy in learning” is related to the change which is ongoing at the training department of ASML. There are no two days the same and we learn different things every day so it should be with education. Training should adapt the changes in education to the time we live in. The training department of ASML is planning to implement a Course Management System (CMS). In the timeframe of this thesis it is not yet decided which CMS will be chosen. Due to the fact that Moodle, an open source learning environment is already in use by the training department of ASML for a project of assessment, this CMS is used as an example in this thesis. Section 1.1 explains in general the reason for this project; Section 1.2 describes the overall problem description and other related questions. The goals and objectives are discussed in Section 1.3. The product (the outcome) is explained in Section 1.4. How to get to this product, which methods to be used are discussed in Section 1.5, and Section 1.6 gives an overview of the chapters of this thesis.

1.1 Reasons for this project

A training department has two main functions: the first main function is to spread knowledge about the product the company is making to internal and external customers. ASML is making a machine used for the semiconductor industry. The knowledge about the machines, how they work and how to maintain them, needs to be trained to the engineers who directly work with the machine. These engineers are called trainees; see Section 1.3 for more details about the trainees.

The second main function is to create course materials that will be used during the training of the trainees. These course materials can be a combination of various materials, such as electronic (e-learning) files and of paper binders. The training department is one of the first direct contacts with the customer and is therefore a sort of business card for ASML to the customers. The training department should be a knowledge database for the company. The training department can be divided into two teams, one team to deliver the knowledge, the training delivery team, and a team which develops the course materials, the course development team. When the course developers have created new or updated course materials then the trainers have to learn these materials to be able to train the trainees this new information.

When you have a product which are changing very quickly or when new machines are developed rapidly then the transition phase is more difficult to control. Basically, the rapid transitions and related phasing is the problem within the training department of ASML. The semiconductor industry is changing very rapidly therefore new machines need to be created to react on these changes in the market. Next to this the course development team is also busy with implementing E-learning, or at least trying out forms of E-learning, such that the training department is in an in-between phase using blended learning (a combination of different educational teaching methods together), for example using a CMS (Moodle) for doing assessments, using classroom training, remote training with net meeting and using CBT computer based training for a introduction course. To be able to better support the customers the trainers need to be updated with these latest and greatest materials.

1.2 Problem statement and research questions

Given the reason for a project described in Section 1.1 the overall research question is:

“How can a training delivery team be involved from the start in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process? How can the latest information related to new or upgraded course materials be incorporated in new and existing products? How can trainers be utilized to better support the trainees (customers)? “

The problem was brought to attention during a department meeting. After that department meeting a meeting was held with the training manager for Europe to discuss the problems which were brought up during the meeting.

After discussions with the coach (University of Twente) and the training manager Europe of ASML the following design task was agreed. The project will focus on an overview of educational scenarios which will support development of course material. Templates will be designed which can be used in a course management system according to a learning scenario. Furthermore there will be a plan made on how to implement these renewed scenarios within the training department.

The preliminary investigation focuses on the context of the problem and what the internal and external needs for the training department are.

In order to help the course development team templates, will be designed to help them to structure the way of creating course materials. Within this structure, the involvement of the training delivery team should be taken into account. These templates should be designed according to a pedagogic approach. Therefore investigations need to take place about the different pedagogic approaches and strategies in relation with a CMS and blended learning. To be able to design these templates and implementation of the new way of working some answers need to be given to the following questions:

1. *What is Blended Learning?*
2. *What are design paradigms in a corporate context?*
3. *What different pedagogical models and instructional approaches are used in relation to a CMS?*
4. *Which learning scenarios are used within a corporate training department such as ASML?*

Implementing this new way of working within the training department will also be a change of learning within the department. Therefore, there is a need to investigate which of the four scenarios for educational delivery (Collis and Moonen, 2001, p. 199) will be applicable for the training department; back to the Basics, the Global Campus, Stretching the Mold, or the New Economy?

In principle every learning organisation is able to be divided into one of the four scenarios from (Collis and Moonen, 2001), looking at the organization at the moment and how they would like to be in the future. A learning organization needs to be busy with modernization to motivate the learners and to prepare them for their daily work.

Therefore, in every organisation there will be a movement taking place in the way of learning. To be able to find out which scenario will be suitable for the training department after implementation of the templates the following questions also need to be discussed and answered.

5. *What are task based learning templates?*
6. *Which templates can be used for an LCMS to support a certain scenario?*
7. *What will be the role of the trainer with the new learning scenario supported by use of templates?*
8. *What will be the role of the course developer with the new learning scenario supported by use of templates?*

And last but not least it is very important that the learning scenario and the templates, which will be used to support the course developers and trainers, will be implemented according to a plan.

9. *How can the learning scenario be implemented within the training department?*

1.3 Goals and objectives of the project

Out of the overall research question from Section 1.2 there are some questions derived. These questions will be discussed in this Section. Each question will be explained and what is meant by the question. First a general more in detailed explanation of ASML and the training department will be given.

1.3.1 *The company ASML*

ASML is a world leader in the manufacture of advanced technology systems for the semiconductor industry. The organization offers an integrated portfolio for manufacturing complex integrated circuits (also called ICs or chips). ASML designs, develops, integrates, markets and services advanced systems used by customers – the major global semiconductor manufacturers – to create chips that power a wide array of electronic, communications and information technology products.

With every generation of new Personal Computers, the complexity of producing integrated circuits with more functionality increases. Semiconductor manufacturers need partners that provide technology and complete process solutions. ASML is committed to provide customers with leading edge technology that is production-ready at the earliest possible date. ASML technology is supported by process solutions, enabling customers to gain and sustain a competitive edge in the marketplace.

ASML's corporate headquarter is in Veldhoven, the Netherlands. Manufacturing sites and research and development facilities are located in Connecticut, California and the Netherlands. Technology development centers and training facilities are located in Japan, Korea, the Netherlands, Taiwan and the United States. Additionally, ASML provides optimal service to its customers via over 50 sales and service organizations in 16 countries. Founded in the Netherlands in 1984, the company is publicly traded on Euro Next Amsterdam and NASDAQ under the symbol ASML.

The vision of the Worldwide Training organization is to be the number 1 provider of learning solutions in the semi-conductor industry, in support of the ASML mission and Customer Support strategic intent. The IC industry requires increasingly sophisticated technology and an infrastructure required to support this technology. To support advancing technology, ASML offers a variety of training courses either on-site or delivered in state-of-the-art facilities. Training programs focus on providing customers with the knowledge and skills required to optimize ASML system performance and utilization.

The training programs provide a clear route to increased productivity. Organized courses focus primarily on hands-on experience. Students gain the skills and knowledge needed to operate and maintain ASML systems. Class sizes are limited to ensure that students receive significant amounts of equipment exposure. ASML has made a significant investment in new training facilities worldwide. ASML has some of its newest production systems currently dedicated for training.

New courses are developed and given in main headquarters Europe. A major drive within the company is to improve the knowledge in the field, to cut costs and to improve customer satisfaction. Training is the major way to improve the knowledge in the field. This is focused two-ways. One focus is on first line Field Service and the other focus is on 2nd line Competence Development. The 1st line Field Service Engineer requires extensive travel to local training centers. This is specifically the case for new-hires. The 2nd line engineers need to travel to Main headquarters Europe for Competence Development.

1.3.2 *The Training Department of ASML*

ASML has a customer support organization including a training department. The headquarters of the training department are in Veldhoven with training centers in Tempe USA and Seoul Korea. Training

Introduction

courses are delivered onsite (at customer sites) but most of them are delivered at the training centers in Veldhoven and in Tempe. To be able to support the training organization better in the future a CMS will be implemented.

The training department of ASML is divided into two teams, a course development team and a training delivery team. The course development team is responsible for creating the materials which will be used by the delivery team to deliver the training to internal and external trainees (customers). The new courses are developed in Main headquarters Europe by the course development team. The courses are 80% focused on practice based on performing of procedures on the training machines.

The trainings are divided into four levels. Level 1 (Introduction), Level2 (periodic maintenance), Level 3 (maintenance and adjustment) and Level 4 (diagnostics). The main part of all theory lessons will still be delivered according to the original all-classroom schedule (Figure 1). More and more, the training department will move to the Final architecture schedule.

In the all-classroom model a trainer is delivering training in front of a group of trainees in a classroom or at the machine. The basic principle is that knowledge will be delivered by a trainer in front of a group of trainees. The final architecture is a combination of different transfers of knowledge (Figure 1). Firstly there will always be a knowledge transfer by a trainer in front of a class. Then there are different options, such as more classroom training, on the job learning or a mentoring program. The main difference between the all classroom schedule and the final architecture is the possible contribution of the trainee, because the trainee can choose the way of learning which suits him/her best.



Figure 1. From all-classroom to a learning architecture (Rosenberg, 2001).

Due to the fact that the development of new machines is going so quickly it is very difficult for the course development team to keep track of all the updates for all courses. If new updates are implemented in existing courses or in new courses then these updates need to be cross trained to the delivery teams (Korea, Tempe, Veldhoven) who are responsible to update the field with all the new information. The delivery teams get customers from all over the world. These customers' trainees have all kinds of machines, often these trainees ask questions related to new machine types which can not be answered by the trainers because they don't have the related knowledge yet. This problem is growing and needs some attention.

At the moment the training department is missing a pedagogy strategy in learning or a learning path for training updates. There is limited time for the development team to cross train the delivery team and the delivery team needs to be up to date at all times about all new subjects or upcoming new updates to the course materials. A clear process is missing how to maintain and update all course materials including cross training the delivery team.

1.3.3 Way of working at the Training Department

A training department should be working according to a curriculum. In this curriculum there should be time planned to update trainers with all the new information that is developed or about the upcoming new materials. So a training department needs a process to modernize and develop new course materials and update the trainers during the whole process of development. To be able to set up such a curriculum it's important to know what the way of working of the training department currently. Habermas (1984) distinguishes three ways of working. Instrumental, when they are directed at efficient interventions in a state of affairs in the world (e.g. through labor),

Strategic, when they guide attempts to successfully influence the decisions of other actors (e.g. in relations of domination).

Communicative rationality underlies action that is aimed at mutual understanding, conceived as a process of reaching agreement between speaking subjects to harmonize their interpretations of the world. There is some distinction between the way of working that is oriented on success and a way of working that is focused on getting consistent. Instrumental and strategic are both directed to success. A communicative way of working focuses on consistency?

Within ASML an Instrumental approach of working is used within the training department.

1.3.4 The Research questions discussed

In Section 1.2 the research questions are mentioned, in this Section the research questions will be explained more in detail and it will be explained how the questions will be investigated and where these answers from the investigation will be given in this thesis.

1. *What is Blended Learning?*
2. *What are design paradigms in a corporate context?*
3. *What different pedagogical models and instructional approach are available in relation to a CMS?*
4. *Which learning scenarios are used within a Training Department such as ASML?*
5. *What are task based learning templates?*
6. *Which templates can be used for a CMS to support a certain scenario?*
7. *What will be the role of the trainer with the new learning scenario supported by use of templates?*
8. *What will be the role of the course developer with the new learning scenario supported by use of templates?*
9. *How can the learning scenario be implemented within the training department?*

1. *What is Blended Learning?*

Blended learning is originally used to describe combinations of online and face-to-face learning; this is now used much more broadly to refer to blends of technology, blends of teaching techniques, blends of resources, etc. (Collis and Moonen, 2001). The course materials used (resources) are created according to a specific design model. Design used as rational problem solving process is very popular in the domain of instruction see the large amount of models that are been developed the last 50 years. One of the

models that is used most is (ID) (Smith and Ragan, 1999) “Instructional Design is the systematic process of translating general principles of learning and instruction into plans for instructional materials and learning”. (p. 2)

Many definitions exist for instructional design - all of them are an expression of underlying philosophies and view points of what is involved in the learning process. Distinguishing the underlying philosophy of learning (in terms of: How does learning occur? What factors influence learning? What is the role of memory? How does transfer occur? What types of learning are best explained by the theory? Can help trainers and course developers select the design model most congruent with their education philosophies. Different ID models are: Addie, OKT, Dick and Carey model, Robert Gagne’s ID model, Minimalism, Rapid Prototyping. But what is blended learning? Blended learning is a combination of different educational methods, which will support and stimulate a learning process. Combinations of different educational methods are combinations of remote training, classroom training and or E-learning. A different way of saying is that blended learning this is combining the advantages of distance learning with classroom and E-learning.

2. *What are design paradigms in a corporate context?*

This question will be answered during the literature investigation in Chapter 2. We will investigate which of the four design paradigms (Visscher-Voerman, 1999) the course developers within the training department use.

- Instrumental paradigm: planning-by-objectives.
- Communicative paradigm: communication to reach consensus.
- Pragmatic paradigm: interactive and repeated tryout and revision.
- Artistic paradigm: creation of products based on connoisseurship

What will be the difference in use in combination with a CMS? Different Educational approaches will be investigated and compared such as: Problem based Learning, project based learning, task oriented learning, experimental based learning, collaborative based learning and skills based learning. Which approach is used by the training department and is this approach useful in combination with a CMS? The support for the trainers and course developers with using a CMS and new educational approaches related to more flexibility in education with use of different learning methods. To underline this 4-E model of Collis and Moonen (2001) will be used.

3. *What different pedagogical models and instructional approach are there in relation with a CMS?*

4. *Which learning scenarios are used within a Training Department such as ASML?*

The goal of scenario analyses is “to assist thinking about the future, so as to inform decision-making in the present” (Miles, 2000). Within Table 1 the four Change scenarios in higher education (Collis & Gommer, 2000) are shown. In principle every learning organization can be divided into one of the four scenarios? Looking at the present and thinking about the future how the organization will look like. A learning organization will continuously be busy with modernization to keep the learner motivated to support them better and to prepare them for the future. That’s why in every learning organization there will be a displacement of the way education is offered.

Table 1. Four scenario's for flexible learning (Collis & Gommer, 2000)

	Local and face to face transactions are highly valued	Where global and network-mediated transactions are the norm
In which the institution offers a program and ensures its quality	<i>A Back to the basics</i>	<i>B The global Campus</i>
In which the learner chooses what he wants and thus takes more responsibility for quality assurance	<i>C Stretching the mold</i>	<i>D The new economy</i>

For a corporate learning organization these scenarios differ (Figure 2).

In the corporate learning setting, different dimensions have emerged to represent change tendencies. One dimension still relates to local versus distance, but in a different way than universities. Local is seen as leaving the workplace and coming to a classroom course in a corporate learning center for some number of days. Global is replaced by "workplace": staying on the job while learning. The second dimension relates to the mode of learning in terms of individual versus group or community. Individual learning is often associated with the "any time, any where" slogan while a group or community orientation is less about speed of learning than it is about learning with and from others. These two dimensions were seen in an analysis of courses offered by the Shell EP Learning Centre in The Netherlands (Hendriks, 2003). Figure 2 shows these four scenarios.

Choices and combinations...



Figure 2. Scenarios in corporate learning (Collis, 2003)

During the preliminary investigation we will discuss which scenario is valid at this moment at the training department of ASML and which scenario will possibly be used in the future. The different possibilities need to be examined for the four scenarios and which scenario will be most suitable for the training department, taking into account the implementation of templates within a LMS (Learning Management System) and the pedagogic approach. To be able to answer this question a literature study will be held.

5. What are task-based learning templates?

To support the course developers and the trainers, templates will be designed. But what are these templates and how can they support the course developers and the trainers? Due to the fact that ASML is working a lot with work instructions / procedures does it make sense to investigate during the

literature investigation into task oriented templates according to the minimalism approach (Carroll ,1998)? During this literature investigation no other actors are involved such that the question to which this should be asked is not imported.

6. *Which templates can be used for a CMS to support a certain scenario?*

To be able to answer this question the results of questions 3 & 4 have to be taken into account. Further we need to investigate which template is the most suitable within the chosen scenario of the training department. Possible options for the chosen template will be investigated and discussed with all the people concerned. Points of issues will be the result, which will be taken into account with the design model which will be used, for example, ADDIE model (Rosset, 1987; Wedman & Tessmer, 1993). The introduction of the templates will give a new way of working within the training department.

7. *What will be the role of the trainer with the new learning scenario supported by use of templates?*

8. *What will be the role of the course developer with the new learning scenario supported by use of templates?*

Within every change the emphasis on actors will be different (Table 2. Variables, actors and assumptions give a good overview of these changes, the changes per actor and which assumptions are playing an important role. The table is a junction of actors from Fisser (2001) and the changes from Boonstra (DU project team 2007) and the assumptions for managers defined by (Caluwe & Vermaak, 2002). These categories of actors are important for the success of the changes. Every way of changes has its own important key figures. If all actors are included in a positive way in the process the chance of success will be bigger.

Table 2. Variables, actors and assumptions.

		<i>Things / people will change if</i>
Blue change	<ul style="list-style-type: none"> - Board - Students - Middle management 	<ul style="list-style-type: none"> - In advanced a clear result / goal is formulated - A good plan is created to get from A to B - Monitors the taken steps and monitor these, and if needed correct these on time. - everything is stabilized and kept under control - Kept simple.
Green change	<ul style="list-style-type: none"> - Board - Middle management - Higher management - Faculty - Students - Support - external 	<ul style="list-style-type: none"> - point out the short comes and make them aware of these, - Be able to motivate them to show new things - To be able to create a collective learning situation
White change	<ul style="list-style-type: none"> - Board - Middle management - Higher management - Faculty - Students - Support - external 	<ul style="list-style-type: none"> - Take care of the will and wish of the natural way of the human self, add meaning to it - The energy will come from the people them self - Dynamic / complexity will see, - To remove blockades, - Use symbols and rituals.

9. *How can the learning scenario be implemented within the Training Department?*

The implementation of the change is to see in the white change Table 2 it's a fundamental change through the whole organization which ask a lot of the people involved and the end destination is not clear. The people have to invest in how it should be and what need to be reached. Blockades need to be removed and the use of symbols and rituals will be playing an important role. There will be a new way of looking and new competencies need to be learned. This will be investigated in detail through the whole process of preliminary investigation, design, implementation and evaluation according through Plomp, Feteris, Pieters and Tomic (1992).

1.4 Product

The project will focus on an inventory of learning scenarios that can support blended learning, templates that can be used in the course management system that support a certain learning scenario, and an implementation plan how the new learning scenario can be implemented.

1.5 Methods

The goal of this thesis is to emphasise the change in education for the training department and design templates to support the training department and the new learning scenario. Additional we will check how these templates can be implemented into the way of working of the course development team and training delivery team.

A changing pedagogy in learning at ASML will mean that the training department also has to change to a different scenario. This change from scenario is theoretically very easy but in practice there are many aspects involved. The different learning scenarios need to be identified and there needs to be an investigation which scenario is most applicable for the training department. Interviews and or questionnaires will be done with, the trainers, developers, training delivery and course delivery team managers and the world wide training manager. Next to these learning scenarios need to be identified with different pedagogical approaches in relation to a CMS. A pedagogical model relates to the abstract concepts about the learning- and teaching process that underlie an instructional approach. Sfard (1998) identifies two basic types of pedagogical models, the Acquisition Model and the Participation Model.

The general purposes of this research is to identify types of flexibility involving Web-supported learning in higher education and how Web-based course management systems can support course developer and trainer choices with respect to flexibility. It is important to support the need that trainers have for the use of course management systems and new pedagogies that relate to more-flexible learning and teaching models. The 4-E model from Collis and Moonen (2001) will be used to express this integration.

To support the course developers and the trainer's, templates will be created. A template is: a document or file having a preset format, used as a starting point for a particular application so that the format does not have to be recreated each time it is used. How these templates will be designed and which conceptual model will be used will be investigated during the literature study of this thesis. The templates will be designed at the start with use of the general model Plomp et al. (1992). Further the minimalism Carroll (1998) approach will be used because the templates will be used as a sort of procedure. To bring the course developers and the trainers closer to work with each other the Participatory design (Slocum, 2003) will be used.

This is the mean principle of Participatory design method. "Participatory Design (PD) is an approach to the assessment, design, and development of technological and organizational systems that places a premium on the active involvement of workplace practitioners (usually potential or current users of the system) in design and decision-making processes" (Nikolova-Houston, 2005). The overall design method will be the "reflective –in-action" approach (Schön, 1983).

Out of the interviews, issues will come up which will then be implemented. After the templates are implemented an evaluation needs to take place according to Plomp et al. (1992) about the use of the templates.

1.6 Structure of the thesis

Chapter one will describe the reason of this project and describe the problem and related questions to the problem. To be able to give answers to these defined questions a preliminary / literature investigation needs to be done about the different pedagogical models that will be described in Chapter 2. More in depth additionally information about the change of scenario which will be applicable for ASML for the future will be described. In Chapter 3 the context of the course design process at ASML will be reviewed and more will be explained about templates in combination with the CMS and web based applications in general. Chapter 4 will go deeper into details about the concept of the templates which will be designed and the considerations and design descriptions which need to be taken into account. Each Chapter will end with some conclusions. In Chapter 5 the templates will be evaluated and in Chapter 6 all the conclusions from the previous Chapters next to a personal reflection of this assignment will be given. After the chapters a summary in English and a summary in Dutch are given about this assignment and thesis.

2 Blended Learning

Blended learning is a combination of different educational methods, which will support and stimulate a learning process. Combinations of different educational methods are combinations of remote training, classroom training and or E-learning. In other words, blended learning is combining the advantages of distance learning with classroom and E-learning. According to e-learning consultant Brandon Hall, “The online experience provides tools that add value to all the traditional modes, from classroom experiences to learning from books. It’s about combining media and technologies for maximum impact.”(<http://www.brandon-hall.com/>) Blending, such as the mix of face-to-face and online learning have become particularly prominent (Delahoussaye & Zemke, 2001). Through these combinations blended learning has all the ingredients for the knowledge routes in 2006 like individual learning plans and social contacts with the help of the digital learning environment. Before explaining what blended learning is, we should know the relationship between educations, instruction, teaching and training. This will be discussed in Section 2.1. In Section 2.2 gives an explanation of different instructional design methods and how these “classic” methods fit into a new way of learning “E-learning”. The four design paradigms on how the educational design and development processes might be conducted are discussed in Section 2.3 from which the choice for the discussed instructional design methods is made. Section 2.4 explains design models for educational media, Section 2.5 two pedagogical models the Acquisition and the Participation models are discussed.

The training department wants to focus more and more on E-learning. This means a move of scenario which will be discussed in Section 2.6.

Blended learning’s claims to sustained behavioral change rest solidly on an instructional design model that acknowledges the learning stages, provides appropriate instructional strategies for those stages, and reinforces skills development through practice, feedback, and testing.

Blended learning represents an effective and proven learning model. It capitalizes on the strengths and benefits of technology-based training as well as classic self-study, classroom, and on-the-job instruction in a “mix & match” format that is tailored to the specific training needs of each organization.

2.1 Relation training within education

According to Rosenberg (2001) training is the “default” approach to facilitate and improve performance and instruction is the specific process that makes training work.

According to Smith and Ragan (1999), education is a broad concept that describes all experiences in which people learn. Many of these experiences are unplanned, incidental, and informal...in other words, unintentional, which is what distinguishes education from instruction. Instruction is a part of education because all instruction consists of experiences leading to learning (Figure 3). By contrast, not all education is instruction since many experiences that lead to learning are not specifically developed and implemented to ensure attainment of particular learning goals.

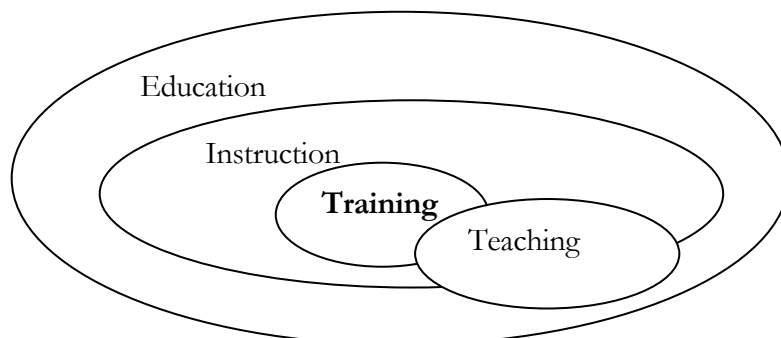


Figure 3. Relationships among terms associated with instruction.

In Figure 3 the concepts can be described as following:

Education: All experiences in which people learn (Smith & Ragan, 1999).

Instruction is the intentional facilitation of learning toward identified learning goals” Smith and Ragan (1999) states instruction is the deliberate arrangement of learning conditions to promote the attainment of some intended goal (learning outcome). Instruction can be used distinctly from related terms such as education, training, and teaching. Instruction includes all learning experiences in which the instructional support is carried out by teaching or other forms of mediation.

Training is the term to refer to those instructional experiences that are focused on individuals acquiring very specific knowledge, skills, or abilities that they will normally apply almost immediately. The immediacy of application is what distinguishes training. Training often refers to the learning experiences directed toward preparing learners with specific on-the-job skills, most commonly in settings such as business, military, and government. Not all instruction can be considered training (Smith & Ragan, 1999).

Teaching and instruction are the most interchangeable terms. Smith and Ragan (1999) define teaching to refer to those learning experiences that are facilitated by a human being (not video, TV, textbook, or computer based program), a real live teacher. Instruction however, includes all learning experiences in which the instructional support is carried out by teaching or other forms of mediation. In some cases, teaching is considered instruction, and in others it will be more like a general education experience, but without the focus that typifies instruction.

Approximately 90 % of the regular training within ASML is still delivered as classroom training. Computer based training (CBT) was introduced a few years ago for the introduction course. Then remote training was introduced to deliver small portions of theory lessons. At the moment classroom training is given with some support of simulation programs during the training. Blended learning is what is going on at this moment.

2.2 Traditional design models

The most widely used design model / methodology for developing new training programs is called Instructional Systems Design (ISD) or just Instructional Design (ID). This model provides a step-by-step system for the evaluation of trainee’s needs, the design and development of training materials, and the evaluation of the effectiveness of the training intervention. Smith & Ragan (1999) “Instructional Design is the systematic process of translating general principles of learning and instruction into plans for instructional materials and learning”.

ISD evolved from post-World War II research in the United States military to find a more effective and manageable way to create training programs. These efforts led to early ISD models that were developed and taught in the late 1960's at Florida State University. Today, Walter Dick and Lou Carey are widely viewed as the torchbearers of the methodology, the Dick and Carey model (1985). This model was meant to introduce the concepts and applications to the systematic design of instruction, using a system approach to trainees new to the field. This model “reflects the fundamental instructional design process used in many business, industry, government, and military training settings, and also reflects the influence of performance technology and the application of computers to instruction” (Dick & Carey, 1985) (Figure 4).

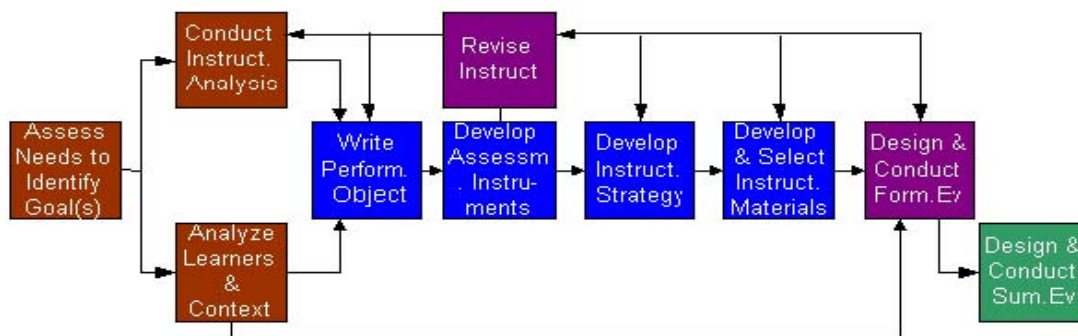


Figure 4. The Dick and Carey Model (1985)

Several authors have reviewed a number of instructional design models in order to increase understanding of design activities. The review provided by Andrews and Goodson (1980) clearly shows that instructional design models focus upon technical-professional activities. They reviewed 40 instructional design models, and found that these models share a core of 14 design activities, which are summarized in Table 3.

Table 3. Core design activities in instructional design models (Andrews & Goodson, 1980)

1	Formulating of broad goals and detailed sub goals stated in observable terms
2	Development of pre-test and post-test matching goals and sub goals
3	Analysis of goals and sub goals for types of skills / learning required
4	Sequencing of goals and sub goals to facilitate learning
5	Characterization of learner population
6	Formulation of instructional strategy to match subject matter and learner requirements
7	Selection of media to implement strategies
8	Development of courseware based on strategies
9	Empirical try-out of courseware with learner population, diagnosis of learning and courseware failures, and revision of courseware based on diagnosis
10	Development of materials and procedures for installing, maintaining, periodically repairing the instructional program
11	Assessment of need, problem identification, occupational analysis, competence, or training
12	Consideration of alternative solutions to instruction
13	Formulation of system and environment descriptions and identification of constraints
14	Costing instructional programs

Another possible explanation is that the trainer's approach to developing learning tasks or study units may not even be considered as an (instructional) design-approach. According to Visscher-Voerman (1999), an instructional design is expected to incorporate the typical phasing of the so-called ADDIE model (Rosset, 1987; Wedman & Tessmer, 1993). ADDIE stands for: Analysis, Design, Development, Implementation, and Evaluation. From the perspective of the ADDIE model, it can be argued that the trainers/developers do not follow a complete design cycle in their design approach, because they pay little attention to the phases of Analysis and Evaluation. Although Klauer (1997) and Moallem (1998) have speculated about possible causes, it remains unclear why trainers do not frequently use an ISD approach for preparing their study units. The five phases of the ADDIE model are ongoing activities that continue throughout the life of a training program. After building a training program, the other

phases do not end once the training program is implemented. The five phases work like a loop. They are continually repeated on a regular basis to see if further improvements can be made (Figure 5).

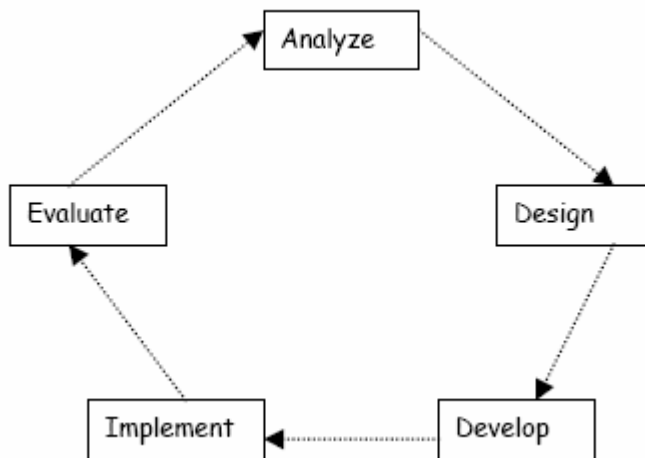


Figure 5. The Addie model

During analysis, the designer develops a clear understanding of the "gaps" between the desired outcomes or behaviours, and the audience's existing knowledge and skills. The design phase documents specific learning objectives, assessment instruments, exercises, and content. The actual creation of learning materials is completed in the development phase. During implementation, these materials are delivered or distributed to the student group. After delivery, the effectiveness of the training materials is evaluated.

Most of the instructional design models start from the assumption that instruction or training will be the appropriate solution to the problem. The OKT-model (Plomp, 1982) has not been designed specifically for the field of instructional design but it is also a model with ADDIE phases. The difference with the instructional ADDIE-models is that the OKT-model shows the evaluation phase before the implementation phase, and that the implementation phase starts at the analysis phase, which implies that designers should think about and anticipate the implementation from the beginning and during the whole process (Figure 6). Plomps OKT model (1982) shows an emphasis on implementation activities, the designers need to start thinking about the implementation conditions at the beginning of the design process.

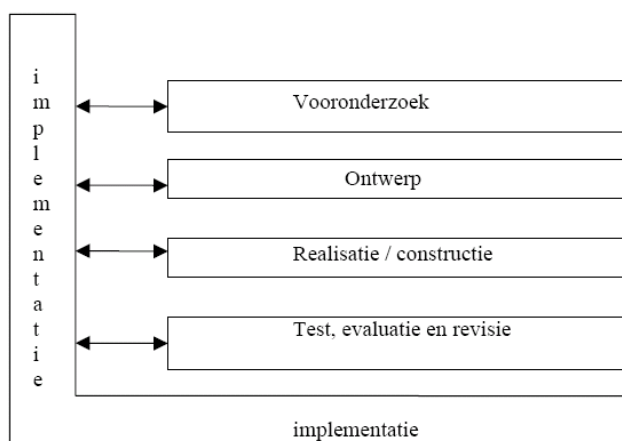


Figure 6. the OKT-model (Plomp, 1982)

As an alternative to the systematic approach, there are a variety of systematic design models that emphasize a more holistic, iterative approach to the development of training. Rather than developing the instruction in phases, the entire development team works together from the start to rapidly build

modules, which can be tested with the student audience, and then revised based on their feedback. The systematic approach to development has many advantages when it comes to the creation of technology-based training. To create engaging metaphors or themes, subject matter experts and course developers work together in a process that validates the creative approach with trainees early in the development cycle. Despite these advantages, there are practical challenges with a purely systematic design approach in the management of resources. In most cases, training programs must be developed under a fixed and often limited budget and schedule.

When closely examined, good ISD is more engineering than art. Its important benefits come from well documented procedures, a differentiated staff team development approach, separation of instructional content and strategy, and the continuing evolution of a prescriptive, analytical, research-based model. In order for teams of developers to work efficiently and effectively together, procedures must be well documented at all levels of the ISD process (Figure 7).

One prominent Web source is *Big Dog's ISD Page* (Clark, 1995). Clark's treatment is similar to many other Web sources: he provides a visual model incorporating the ADDIE terms, but refers to it as "the ISD process" Figure 7.

Documented procedures allow for peer review, process control, and the possibility for improving practice over time. Perhaps the greatest strength of the ISD process is the evolutionary nature of the prescriptive, research-based model itself. While the practice of ISD still retains the strengths of the empirical evaluation and revision cycles, to the extent research and experience permit, it is prescriptive. That is, rather than depending extensively on the test-revision cycle to generate effective instruction in an iterative manner, every attempt is made to incorporate research findings and past experience into the detailed procedures and supporting ISD documentation to ensure that the instruction developed comes as close to the mark as possible the first time.

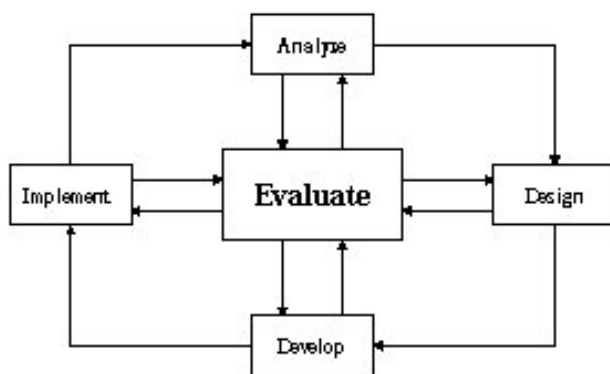


Figure 7. The ISD process (Clark, 1995)

One of the aspects which need to be taken into account is the design model which can be used for the templates which will be designed. The templates will follow a design model. When we look at the traditional design model the ADDIE model fits best within a training department because of the ongoing activities of the five phases which continue throughout the life of a training program. After building a training program, the other phases do not end once the training program is implemented.

2.3 Introduction to Instructional Design regular training

This Section describes the four design paradigms related to the different design models described in Section 2.1. To be able to choose a design model to work with, it is important to know what design model and paradigm they use at the moment.

Four Design paradigms

Visser-Voerman and her colleagues have identified four different perspectives on educational design and development which they have labeled instrumental, communicative, pragmatic and artistic (Visser-Voerman, 1999). In this Section, these four design paradigms are distinguished.

- Instrumental paradigm: planning-by-objectives;
- Communicative paradigm: communication to reach consensus;
- Pragmatic paradigm: interactive and repeated tryout and revision;
- Artistic paradigm: creation of products based on connoisseurship.

2.3.1 The instrumental paradigm

The instrumental model has as its central activity “planning by objectives. This means that in the beginning of the process, (often extensive) time is devoted to exploring and formulating the intended outcomes of the project, resulting in concrete goals and objectives. Thus, problem and needs analysis is done at an early stage of the design process. Next, the means are determined that are necessary to reach these concrete goals and objectives. Because of its focus on ends and means, the rationality underlying this model can be called instrumental. Within ASML most development activities are based on this way of working, first creating an objective then plan the design activities / goals.

Although designers with an instrumental rationality place great emphasis on the analysis of goals and means, the specific activities they employ can differ in scope and time. Depending on the specific project, these activities can vary, for example, from extensive interviews and observations with potential learners and subject matter experts, to a short interview with the trainers. Having specified the goals, designers specify the means that will be used to reach the goals. This design phase results in a blueprint of the product to be made. The objectives that have been formulated at the beginning of the project serve as a reference throughout the entire design process. In the instrumental paradigm, logical reasoning and working systematically (from one phase to another) are considered essential elements to guarantee that the best solution is reached.

The emphasis in this paradigm is on instrumental or technical reasoning, which is proclaimed by both proponents and opponents of planning-by-objectives models. A large number of the design models rely on an instrumental rationality, such as instructional design models for example Dick and Carey (1985), Gagne, Briggs, and Wagner (1992), Gerlach and Ely (1980), Kemp, Morrison, and Ross (1994). The most known model is the one from Dick and Carey (1985) Figure 4. There are a lot of similarities within the different design models but the general structure underlying these models is a generic problem solving approach. Section 2.2 has explained some common instructional design models according to this approach.

2.3.2 The communicative paradigm

Design is a process in which different perception and opinions are being communicated and negotiated until decisions can be made based on consensus. The starting point for the design is not so much an analysis of the existing situation, but the negotiated decisions within the team (course developer, subject matter expert, trainer). The views and perceptions of course designers, trainers, and other stakeholders steer the design process. To sharpen their views of the problem, the solution, or the ways to get there,

designers may analyze existing materials, observe real learning situations, or visualize their ideas into the new materials. Solution alternatives are considered carefully and communicated and articulated between stakeholders. Because of its focus on a shared consensus and on communication as a vehicle to get there, the rationality underlying this paradigm can be called communicative. Course designers should not only strive for internal, but also for external consistency Kessels (1993) argues that in order to reach external consistency, course designers should adopt a relational approach and conduct activities in the domain of interpersonal dynamics of decision-making on educational planning. In the relational approach, course designers should aim at gaining commitment.

The concept of communicative rationality was introduced by Habermas (1984), the most prominent current representative of critical theory. Habermas argues that whereas instrumental rationality might be useful to solve a technical problem, communicative rationality should be used when people are involved. For this communication to be just, everyone concerned should be able to participate in the process, with equal chances and rights. Communication therefore, has a strong legitimizing function, and speaks of 'critical rationality', rather than of 'communicative rationality' to highlight the relation to critical theory involvement, and support for implementation from the beginning of the process. This elaborates the concept of 'implementation starts at the preliminary analysis' (Plomp, 1982). Course designers should obtain the perceptions of all persons involved and integrate them in the product to be made. Frequent communication among team members and other stakeholders is essential to reach consensus as to what the problem is and how it should be solved. A consensus approach is not only seen as a mere strategic 'trick' to increase the chance on a successful implementation but as necessary for reaching intrinsic quality of the product. In the communicative paradigm, considerable attention is being paid to socio-professional activities in the design process. Establishing a shared frame of reference and reaching consensus among all those involved are important elements.

2.3.3 *The pragmatic paradigm*

In the pragmatic paradigm, both the practical environment in which the product will be implemented and its users are central to the design process. This is a typical paradigm for Prototyping approaches. The basic rationale is that validity, and especially practicality and effectiveness (Nieveen, 1997) can best be determined in a practical test with the users. According to these approaches, course designers can only be satisfied with what they make if it works and if it is useful. The multiple views of the users provide the primary judgment for assessing an educational product as valid, and especially practical and effective. Therefore, early in the design process, several prototypes or interim versions of the product are evaluated with users. Thus, designers quickly start to make a preliminary version of the eventual product. This preliminary version -a prototype- is evaluated formatively with the users either by discussing it (usually in the beginning of the project) or by trying it out (often later in the project). During these evaluations, the potential of the product becomes more concrete, helping the course designers to make better decisions about the specifications of the product. Since these highly iterative approaches plead to make a prototype early in the process, some authors refer to these processes as *rapid* prototyping (Rieber, 1994; Tripp & Bichelmeyer, 1990) (Figure 8).

Within this paradigm, the use of concrete prototypes is seen as an essential means for identifying the specifications of the product in interaction with course designer, sub matter expert and end users. Depending on user satisfaction and available time and finances, the process of design, evaluation, and revision is repeated several times.

The pragmatic paradigm recently serves the field of educational software, particularly interface design (Hix & Hartson, 1993) and to a limited extent the fields of electronic learning materials design (Keursten, 1994; Moonen, 1996). Pragmatic processes are not so popularly used in areas where computers and/or multimedia are used.

2.3.4 *Artistic paradigm*

The basic idea underlying the artistic paradigm is that individuals construct their own reality. Course designers could be considered as artists choosing among an almost unlimited variety of ways of representing their view of reality (Marsh & Willis, 1995). Therefore, the rationality underlying this paradigm is called artistic, which has a basis in post-modernism.

Designers with an artistic rationality construct design problems and solutions in their own way. They conceptualize the situation into one they understand from their own professional background. Just like artists, designers make certain moves and immediately judge these moves. According to Schön (1983) course designers evaluate their moves in a threefold way. First, they judge how desirable the consequences of their moves are, based upon categories drawn from normative design domains. Second, they judge the extent to which their current moves conform to earlier moves, or violate the implications set up by earlier moves. Third, they estimate how much they appreciate the new problems or potentials the current move has created. Means and ends are framed interdependently in the problem situation. After a lead-time in which the idea for a product matures, course designers conceptualize this idea into a product. The course designers may test their own ideas by talking about them with others or by showing them and observing their reactions. The norms and values of the course designer play a decisive role in decision making about the product. Artistry is the basis for bringing a design into being.

Looking at the four paradigms we can say that the course developers at ASML are working closest to the instrumental paradigm. Before they start to develop course materials course objectives are created and a planning is made when materials need to be finished. The problem statement stated that the course developers do not or too with involve the trainers during the design of course materials. Therefore, it could be an option that the instrumental and the communicative paradigm together will be a solution to get a better way of working! But when you look at the explanation of the pragmatic way of working then this way of working will suit ASML training department best. Why? Due to the fact that the industry ASML is working in is changing so rapidly it's almost impossible to finalize objectives and plan dead lines for course materials. The pragmatic way of working explained that course materials will be designed in combination with the users (you could say that the trainers are the users during the prototype creation). *rapid* prototyping (Rieber, 1994; Tripp & Bichelmeyer, 1990) (Figure 8) is a design model that fits into this paradigm but to get more structure in the design process in combination with more interaction I would prefer to choose for the ADDIE model in combination with the pragmatic design to be used to design the templates and the new way of working within the department.

2.4 **Design model for educational media**

Course developers are more and more using the Information and Communication Technology (ICT); either as part of the learning process they want to support and the product they design, or as part of the design environment, in the format of performance support systems. ICT as part of the learning process can consist of three forms: ICT as object (learning about the computer), as aspect (learning specific computer tasks or learning from the computer), or as medium (the computer supports the teaching and learning process) (Ministerie van Onderwijs, 1992). ICT cannot only make traditional learning environments more attractive, inviting, and effective, but can also help realize new learning environments that link up with new visions on teaching and learning, such as constructivism (Roblyer, Edwards & Havriluk, 1997), or learner-centered education. ICT as a medium can take different forms, such as networks, interactive multimedia programs, or web-based products, and support different instructional strategies. Because of the relative newness of such types of products, design specifications often cannot be formulated in the beginning of the process, and need to be specified during product design and development. Also, often relatively high costs and risks are connected to the development of these kinds of media. The domain of design of educational media is relatively new. Tripp and

Bichelmeyer (1990) depicted standard instructional design activities in a model for prototyping, visualized in Figure 8 according to them, a prototyping approach starts with a restricted analysis; then a small part of the solution is constructed (design) and tested (research). Test results are analyzed, which generates input for new design activities. This cycle is repeated several times. In such prototyping models, as well, the traditional ADDIE-phases could be recognized. But, the phases are iterative and may overlap highly.

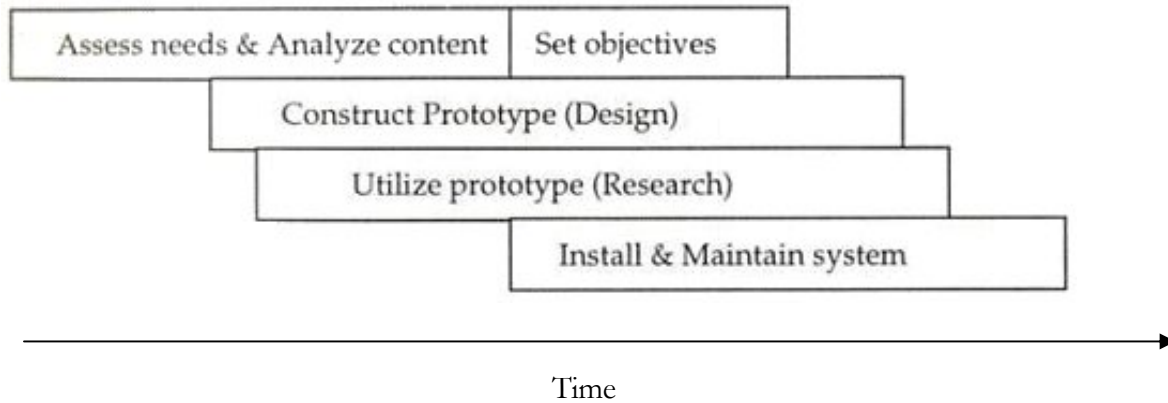


Figure 8. Prototyping model for design (Tripp & Bichelmeyer, 1990, p. 136)

The last decade has also shown an increased use of ICT in performance support systems. Both designers and researchers have focused on how technology could support designer's tasks, for example in the format of on-the-job training, job-aids, or communication and interaction tools. A tool which ASML is going to introduce next to the LCMS is a LMS (Learning Management System) which will be used as a skill tracking database.

Curriculum design

In the previous Sections some traditional and educational design models were discussed but a learning organization should also work according to a specific curriculum. One of the first systematic and rational approaches to curriculum design and development is Tyler's 'planning by objectives approach' (1949). His work is often referred to as the Tyler-rationale, offering a logical ground for curriculum design. The Tyler-rationale addresses four basic questions:

- What educational purposes should the organization seek to attain?
- What educational experiences can be provided that is likely to attain these purposes?
- How can these educational experiences be effectively organized?
- How can we determine whether these purposes are being attained?

Tyler provided structure for a process that was often experienced as difficult and even chaotic. Over years, the Tyler-rationale has been criticized, in particular the supposed linearity and excessive rational character of the process. Tyler's work was elaborated by (Taba, 1962) who developed a procedural model for curriculum design. One apparent aspect in Taba's theory is that she proposes an inductive approach to curriculum design, in which small parts of the curriculum are pilot tested by trainers in the classrooms first, before the final curriculum is to be established. She, thus, advocates a strong influence of trainers in the design process in order to reduce the potential gap between design and implementation. This led us to pedagogical models and approaches.

2.5 Two Pedagogical models: Acquisition and Participation model

A pedagogical model relates to the abstract concepts about the learning- and teaching process that underly an instructional approach. Sfard (1998) identifies two basic types of pedagogical models, the Acquisition Model and the Participation Model. Table 4 summarizes Sfard's interpretation of these two fundamental pedagogical models.

Table 4. Two metaphors for learning (adapted from Sfard, 1998, pp. 6-7)

	Acquisition Model	Participation model
Key definition of learning:	Learning as knowledge acquisition and concept development; having obtained knowledge and made it one's own; individualized	Learning as participation, the process of becoming a member of a community, "the ability to communicate in the language of this community and act according to its norms" (p. 6); "the permanence of having gives way to the constant flux of doing" (p. 6)
Key words:	Knowledge, concept, misconception, meaning, fact, contents; acquisition, construction, internalization, transmission, attainment, accumulation;	Apprenticeship, contextually, cultural embeddedness, discourse, communication, social constructivism, cooperative learning
Stress on	"The individual mind and what goes into it" (p. 6); the "inward movement of knowledge" (p. 6)	"The evolving bonds between the individual and others" (p. 6); "the dialectic nature of the learning interaction: The whole and the parts affect and inform each other" (p. 6)
Ideal	Individualized learning	Mutuality; community building
Role of trainer	Delivering, conveying, facilitating, clarifying	Facilitator, mentor, "Expert participant, preserver of practice/discourse" (p. 7)
Nature of knowing	Having, possessing	Belonging, participating, communicating

With the Acquisition Model, the focus of learning activities is on the acquisition of pre-specified knowledge and the development of pre-determined concepts. In contrast, with the Participation Model, the focus of learning activities is on becoming a member of a community of practice, learning from the community but also contributing to it. With the Acquisition Model, what is to be learned is generally pre-determined. The quality control of the content selection and presentation rests with the trainer. In contrast, with the Participation Model, the interactions to which the trainee contributes may serve to change the knowledge base of the community even as he or she participates in it. Learning is not so much a matter of understanding and applying, but rather degrees of insight, belonging and participating.

Sfard (1998) emphasizes that both models are needed in higher education. The Participation Model needs to make use of the Acquisition Model. Learners cannot communicate in a professional community if they do not share basic vocabulary and concepts; learners cannot participate in an apprenticeship without acquiring many basic skills of the domain in which the apprenticeship occurs. Thus the Participation Model is not enough in itself. But what is powerful about Sfard's analysis is her claim that the Acquisition Model is also not enough in itself. She makes her arguments for these claims in philosophical terms; however support of the need for both Acquisition and Participation Models can be more directly seen in emerging conditions in society.

2.5.1 Participatory Design (PD)

Participatory Design (PD) is an approach to the assessment, design, and development of technological and organizational systems that places a premium on the active involvement of workplace practitioners (usually potential or current users of the system) in design and decision-making processes.

There are a number of positive aspects to PD. Participatory methods are often used in the natural environment of the user (e.g. a workplace) and thus offer high ecological validity and are heavily user centered. Co-designing with real users in realistic situations and environments helps improve the quality of feedback users provide. Frequent iteration between users and designers reduces misconceptions designers make (in part due to insufficient domain experience). Additionally, the social intent of PD to avoid deskilling of workers and create humane products is admirable. PD can help to improve the communication within the course developers and the trainers. Trainers need to be involved from the beginning during the development of new course materials which the communication between the two groups. The design of the templates will build on this PD design method.

However, some other PD research has revealed a number of potential issues in the application of participatory design methods. There are a range of studies and methods which many researchers agree are PD, however, what is or is not PD is still the subject of debate. Consequently, the issues discussed below do not apply to all PD studies and methods, but would certainly apply to some studies which claim to be PD.

Some issues and potential solutions are briefly discussed below. The issues will be discussed related to the problem description.

- Asking trainers to design objects themselves

This is different than trainers providing feedback or proposed variations on existing designs. Trainers are usually not trained designers. Consequently, they can produce bad designs or feel uncomfortable doing unfamiliar designs activities. A potential solution is to provide trainers with simple designs in primitive forms that invite variation and re-appropriation. A related problem is that if users have too much power to control designs, they may advocate poor designs, or designs that avoid automation.

- Expecting domain experts to be technology experts

New technologies can be extremely complex and their advantages and disadvantages often reveal themselves only after long usage in real situations. In most cases trainers won't be able to accurately tell us what technology offerings they want. However, they can show what they need through other methods. It is possible to have people show us their needs through normal activities; and then present them with fictional devices that address those needs. Trainers have to make practical examples of how they want to tell or explain things, best is to invite the course designer to a practical training session.

- Asking trainers to predict theoretical usage

No one can accurately predict their future behavior, particularly in semi conductor industries and environments with unfamiliar technologies. Watching actual use of prototypes during trainings and getting feedback on them provides more realistic input from users.

- Asking trainers to start from scratch

Trainers work better with some scaffolding to direct design ideas. Tangible objects can be interacted with and used as props for discussion. Consequently, it is possible to give people simple prototypes and ask them to discuss their own use of the "future technologies" in an appropriate context. Thus, they can talk around the existing designs instead of intangible possibilities.

- Expecting trainers to want to contribute

Participatory design came from trade union roots where organizations ensured workers understood the impact of technologies and were motivated to help construct new designs. In more contemporary design situations users may not be willing to devote time to help build technologies which other people profit from. A key challenge is determining how to interest or motivate trainers to help build a product they may use in the near future.

- Letting small numbers of users greatly impact design

Representative user feedback is useful, and being aware of non-representative issues affecting design is useful. However, thinking that extreme issues are commonplace when they are not can ruin a design. Using a small sample of trainers runs the risk of one user being an outlier with unrepresentative concerns. These trainers can provide useful challenges to the design, but they should not drive it. PD approaches that repeatedly use the same group of future users stand a greater chance of this occurring. It is possible to take the approach of using different (small) groups of users in an iterative fashion, to sample a more diverse set of opinions about proposed designs and avoid over-emphasizing outliers. This often requires PD methods to adjust to avoid long-term interactions with the same user group.

- Focusing on what trainers design instead of what they need

Potential users can easily draw an interface on a piece of foam or paper – that does not necessarily make it a workable design or help solve their real problems. Trainers can usefully review product ideas if they are presented in realistic situations, and in language the trainers can relate to. They can also use technologies in basic forms, which allow for generation of new design ideas based on observed usage. While user-generated solutions should not be ignored, focusing on work practices and observed problems provide a great deal of participatory design input in the form of high-quality requirements.

- Confusing design education with creating good designs

Iterative processes have a good dialogue between designers and users. This necessarily requires the user to learn a bit about design, and for the designer to learn a bit about the domain being designed for. Sometimes PD attempts to have users do the design work, and design ideas originating from users are presumed to be of high quality – because they originate from users. Some PD projects have even had explicit goals of educating users about design during the design process. While this could be appropriate in some education settings, in many professional software development projects there isn't a goal of training users in neither design, nor money to waste on implementing poor design ideas. Professional designers are hired because they have expertise to create good designs, and with the input of users they can efficiently and accurately do so.

- Attempting to prescribe humane workplaces via designs

Since the beginning of PD, there has been a social goal of creating democratic workplaces where workers are able to design their own future tools and avoid dehumanizing technologies. Modern software development would do well to adopt this awareness of the social impact of the tools they create. However, it should be remembered that the technologies in use are only a small part of the picture of a humane workplace. Any technology can be harnessed into a system designed to subjugate workers. It is the larger system of workplaces policies and law which ultimately decide if workers are respected.

- Judging what is not participatory design

Traditional PD advocates are quick to note that many new participatory methods are not PD. This is usually because the studies don't have political or social intent, or don't engage users in design in an

accepted fashion. Participation will happen in a variety of new ways, and much of it won't fit the idealized conceptualizations of traditional PD. PD needs to embrace adaptation of how it is used if it is to be effective and increase in popularity.

The above Sections have identified potential weaknesses in PD. Many PD methods are already very good, but as they are applied in new environments they will need adaptation. So will the PD method be adapted into the templates in combination with the ADDIE phases?

A participatory approach advocates actively involving 'the trainers' in decision-making processes. In general, the processes can be seen as a three-step cycle of planning, implementation and evaluation, whereby a participatory approach may be used in some or all of these steps (Figure 9).

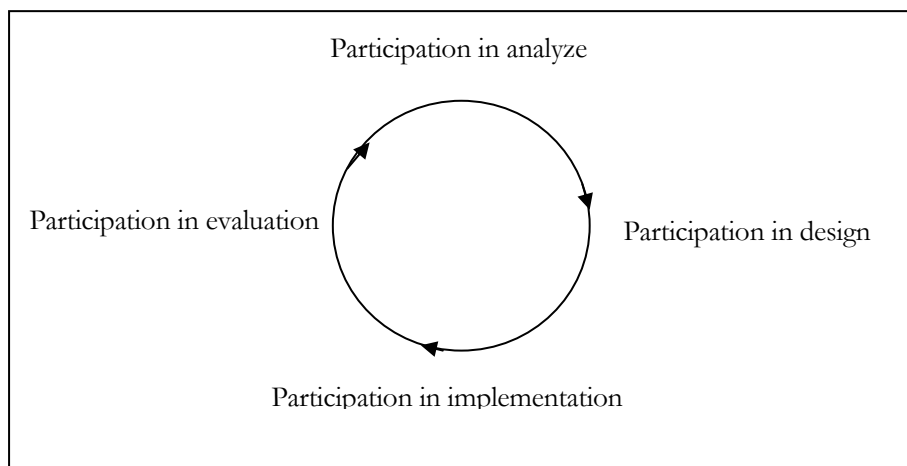


Figure 9. Participation Process (Sfard, 1998).

2.6 Inventory of learning scenarios

Difference between high school and training: With education you spent a day in the seminar or four years in college. Training, on the other hand, is measured by what you can do when you've completed it. Focus will be on your daily job activities. The Scenario's for flexible learning (Collis & Gommer, 2001). The scenarios developed higher educations are visible in Table 5. But what is the definition on higher education? Does training also belong to higher education?

In general higher education is the study beyond the level of secondary education. Higher general education and training generally takes place in a university. Such education is based on theoretical expertise. Higher general education might be contrasted with higher vocational education, which concentrates on both practice and theory. Higher vocational education and training takes place at the non-university tertiary level. Such education combines teaching of both practical skills and theoretical expertise. Training within your company is a study beyond formal education such as secondary education or higher so we could say the training within a company belongs to higher education. What results that that the scenario's for flexible learning are also valid for the training department within ASML.

Table 5. Scenarios for flexible learning (Collis & Gommer, 2001)

	Local and face to face transactions are highly valued	Where global and network-mediated transactions are the norm
In which the institution offers a program and ensures its quality	Scenario A <i>Quality control of a cohesive curriculum, experienced in the local setting (current situation)</i> <i>Back to the basics</i>	Scenario B <i>Quality control of a cohesive local curriculum, available globally:</i> <i>The Global Campus</i>
In which the learner chooses what he wants and thus takes more responsibility for quality assurance	Scenario C <i>Individualization in the local institution:</i> <i>Stretching the mould</i>	Scenario D <i>Individualization and globalization</i> <i>The New Economy</i>

2.6.1 The four scenarios and ASML

A short description of the four scenarios and how they are related to the training department of ASML will be discussed.

Scenario A: Back to basics

Trainees are visiting the training centre. Training will be given in the classical way, this means face to face contact between trainer and trainee and between themselves. The study program is defined by the training department and prepared by the trainer. For the internal customers (ASML employees) the internal network (intranet) is used to support the training. Communication, like invitations etc, will be done with E-mail. So this is an organized educational program with classroom training

Scenario B: The global Campus

Trainees want to follow a structured educational program but want to follow this program from local office. The internet will be used to follow some theoretical programs. In this case, trainees do not have to physically move to a training department. Very important for this way of education is the technical part of the whole setup etc. Trainees have to logon to an environment to get access to the courses, the course materials and to be able to apply for a course and later also to follow the course. Communication will be done through the site and or portal of the training department (LMS).

Scenario C: Stretching the Mold

The trainee does not need to be personally involved with the study program but decides how and where to follow the course. Face to face or remote. The trainee wants to make his/her own study planning with or without consultation of the trainer. The internet will be the most valuable communication resource. The technology is then also very important.

Scenario D: The new economy

The trainee can decide everything for them self. The trainee wants to make all the decisions them self related to the education program they want to follow or attend. The trainee is well informed about the different trainings and which are important to attend for his/here future development.

The trainee has a good communication with the training department or study advisor (boss) to define which trainings need to be attended. Most information about the courses, prerequisites etc will be

Blended Learning provided via the internet. All information related to the courses needs to be available through the internet in a portal or learning environment. The trainee wants to follow only these parts which he or she thinks are important to follow.

According to the above scenarios every organization will start with scenario A, but according to the possibilities and agreements there will be a possible move to scenario D. But this scenario *The New Economy* is the most radical; a systematic example of it does not yet seem to be available in most traditional universities / training centers and yet it is increasingly being seen as the way of the future. Every movement from A to D will be done from A to B to D or from A to C to D (Figure 10).

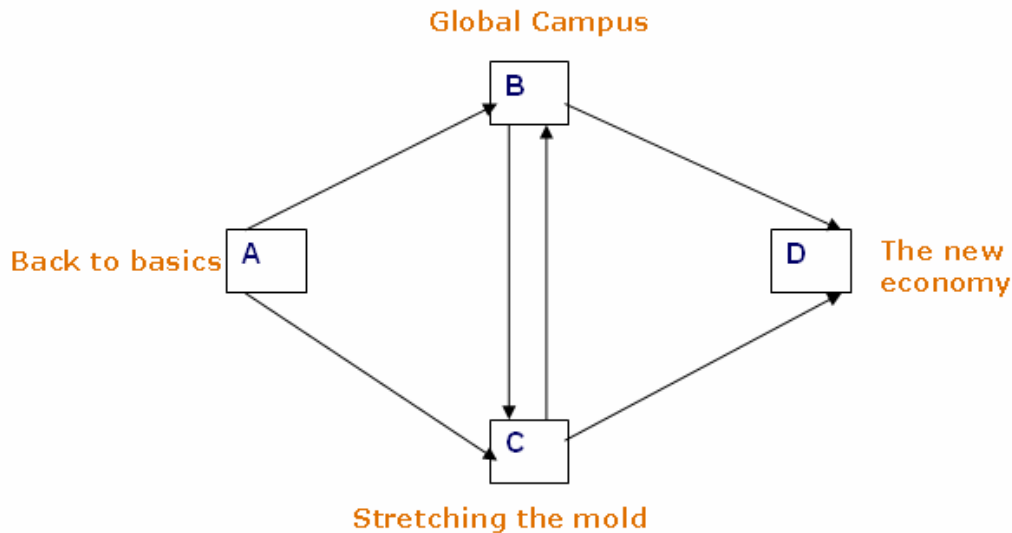


Figure 10. Evolution toward the new economy in higher education (Roosendaal, cited in Collis & Gommer, 2001)

If we look at the above scenarios then we could compare these with the models from Rosenberg (2001), where scenario A Back to basics correspond to the Original All classroom model and scenario C Stretching the mold corresponds to the Final Architecture (Figure 10). Scenario C *Stretching the Mold* relates to increased flexibility with or without changing the underlying pedagogical model within the institution. Many traditional universities are now moving toward some forms of *Stretching the Mold*, by offering more flexibility for participation within their pre-set programs.

2.7 Course Management System within blended learning

In the previous Section 2.6 four scenarios for flexible learning were discussed. Flexible learning expands choice on what, when, where and how people learn. It supports different styles of learning, including e-learning. Flexibility means anticipating, and responding to, the ever-changing needs and expectations. A way to use this flexible learning is to use a tool such as a course management system CMS.

Barron and Rickelman (2001) define a course management system as “a software program that is especially for the delivery and management of a finite amount of Web-based, asynchronous curricula” (Collis and Moonen, 2001, p. 58) also give a definition: “A WWW-based course-management system is a comprehensive software package that supports some or all aspects of course preparation, delivery and interaction and allows these aspects to be accessible via a network.” (p. 78). A more-general definition could be that course-management systems (CMSs) are Web based database-driven systems that enable or support learning. This Section will discuss the CMS in relation to one of the flexible learning scenarios, the stretching the mold scenario and which CMS will be used within the training department.

2.7.1 *The course management system and stretching the mold*

Course management systems are online systems that were originally designed to support classroom learning in academic settings, such as universities, high schools and training departments. CMS provide trainers /developers with the ability to perform the following tasks:

Place course materials online. Most CMS provide pre-programmed buttons for the course syllabus, course schedule, and course materials linked to specific lessons, such as copies of readings and PowerPoint slides from lectures. Track trainees progress through assessment features, which enable trainers to give quizzes and tests online, and an online grade book, where trainers can post trainee grades. Other communications tools, which let trainers send announcements to classes and communicate individually with trainees.

Pedagogies can be enriched or reengineered by appropriate use of technology. When attempting to design courses for the “Stretch the Mold” model it should be noted that the trainer-rooted classroom-orientation model (Gustafson & Branch, 1997, p. 30) is the dominant approach to course design and delivery within higher education. The weaknesses of this classroom orientation can also be its strengths (Collis & Moonen, 2001, p. 42). The trainer as content expert is fully responsible for the course and can mentor, stimulate, scaffold, and personally interact with his or her course developer so that the course is much more than a systemic way to meet pre-defined objectives but also can be a framework for an apprenticeship-type relationship between course developer and trainer. Trainers can also monitor and adapt during the trainings; tasks that are often difficult to accomplish with technology based instruction.

Trainers have to deal with new trainees, new technology, and new pedagogies. All of these are part of a blend, as stretching the mold emerges and makes learning and teaching more flexible and trainee centered. It begins by positioning trainers concerns within the larger context of some general implementation issues relating to CMS use and stretching the mold within the organization. CMSs should be flexible and have a high quality or trainers concerns will increase. Concerns of trainers with regards to their new roles and about time-management issues will be discussed in Section 6.1.2.

Robson (1999) mentions five common sets of functionalities offered by CMSs.: Computer-mediated communication functionalities; navigational tools (organizational structures that tell trainers what to do and where to do it); course-management functionalities (keeping track of course developers and their records); assessment tools (such as via a Web-based quiz that returns immediate predetermined feedback); and authoring tools (which allow trainers to upload and organize material, create discussions, create and edit on-line quizzes, and otherwise control the features offered by the

environment). These results are similar to those coming from the analysis of Collis (1999b) who found five main purposes of using teleware (a broad term for Web-based tools, resources, and systems): publication and dissemination of information; structured communications; collaboration; information and resources handling; and support for course delivery. The overviews of Robson (1999) and Collis (1999b) can be used as resources for a general overview of main elements that can be found in course-management from Stretching the Mold and the trainer. Table 6 shows an overview of what characteristics different researchers have found and relate these to the structure of content, communication, and Organization tools within a CMS.

Table 6. Characteristics of course-management systems. (De Boer, 2002)

	Creation	Content delivery	Communication	Organization
Nachmias & Tuvi (2001)	Manipulation of information & creation of content environment	Instructional delivery	A communication facilitator	
Robson (1999)	Authoring tools, assessment tools,	Navigational tools, assessment tools,	Computer-mediated communication functionalities	
Mioduser & Nachmias (2001)	Resource-creation support	Content delivery, instruction delivery	Communication support	
Collis (1999a,b)	Information and resources handling	Publication and dissemination of information	Structured communications; collaboration	Support for course delivery
Droste (2000)		Subject-matter delivery	Communication support	Organization support
Collis & Moonen (2001)	Information management	Computer-based learning	Communication-system, groupware background	

Creation and delivery: Options or tools in a CMS for content creation can present information in several formats including HTML pages, PDF-format documents, PowerPoint sheets, and Word documents (Robson, 1999). A trainer can use the documents that are made with programs (course developers) he uses already and easily put the documents in the CMS, without having substantial (editing) work. These options save considerable work for trainers, and they can easily provide more course materials for their trainees. Course-management systems enable automatic posting of input data (Robson, 1999). In an automatic entry, course developers and trainers can put data into a form on a Webpage and submit the form. The data will automatically show in an output page, which can be available for trainers and course developers. Additional information can be added to the output page, such as the date and time the author (course developer /trainer) submitted the form.

Communication and organization: Options or tools in a CMS that can be used for communication include e-mail, discussion lists, chat, co-operative workspaces, and Internet conferencing (Looi, 2001). Messages, usually text, can be sent from one person to another via the CMS. E-mail can also be sent automatically to a large number of addresses using a mail list (or mailing list). This is a (usually automated) system that allows people to send e-mail to one address, whereupon their message is copied and sent to all of the other subscribers to the mail list (course developers, trainers, developers,

subject matter experts etc). In this way, people who have many different kinds of email systems receive and respond to the same messages.

The organization within a course can include a calendar tool (Collis & Moonen, 2001; Landon, 2002; Robson, 1999). CMSs support the organization and management of Web-based teaching and learning (Oliver & McLoughlin, 1999). Functions of the particular system in use should be efficient and effective in use. A calendar (such as a daily planner) that can handle entries (including information, start and end times, and links) can be added. The trainer can make entries (for all course participants) to view or entries only visible to a group of persons. Within the course-organization portions of CMS trainers have options to administer and manage learning (Oliver & McLoughlin, 1999). A progress-tracking tool is commonly available. Progress tracking allows the course developer to maintain an overview of trainer's progress in updating or reviewing of the course. An administrative overview can be given for every trainer with scores, attendance data, and results on assignments. Course-management systems allow many possibilities for co-operation, interaction, storage of important data and interactivity, all with the computer through a Web interface (client). The current CMSs contain many different tools. It is interesting to see what actually happens within these CMS course environments and to some extent, how the particular tools are being used.

2.7.2 *The course management system used within ASML training: Moodle*

Course-management systems are becoming commonplace in higher education (De Boer, 2002). Implementation is growing, and many trainers have adopted CMSs. On the other hand, their use is qualitatively limited and the focus seems to be on organization and resource options within the CMS rather than flexibility relating to pedagogy.

The implementation and use of CMSs is high in The Netherlands compared to other countries (Bunjes, Ronde, & Wijngaarden, 2001; De Boer & Boezeroy, 2003). All traditional universities in The Netherlands have implemented a form of CMS, either at an experimental level, as a pilot, or already institution-wide (Bunjes, Ronde, & Wijngaarden, 2001). The most popular systems currently are Blackboard, WebCT, TeleToP, and Moodle. For aspects which can help to choose a CMS see Appendix 1 it shows a table which is made by integrating Education, Ease of use, Techniques & maintenance, Organization and Cost & benefits. From (Veen, 1999), and evaluation topics from (Spearman, 1998) other criteria where looked at were the formal assignments Flexibility and Pedagogical from (Collis, 1999) (Table 7).

Table 7. WWW-based applications: Extending flexibility within pedagogical categories (Collis, 1999)

<i>Pedagogical category</i>	<i>WWW-based applications</i>
1. Course organisation	-A course calendar is available on the course WWW site via which relevant dates and times for different aspects of the course are highlighted. The calendar and updates are always available.
2. Lectures, contact sessions	-Highlights of lectures are captured as digitized video and made available as video on demand via the course WWW environment, synchronized with lecture notes, for students not physically present -Follow-up reflections or questions can be posted and responded to via various WWW-based forms and communication tools in the course WWW site, at a time and location convenient to the student.
3. Self-study, assignments	-Study materials are expanded and updated by using links to additional resources via the WWW; course assignments involve students contributing new resources to the WWW site, along with written comments as to why the resources are appropriate
4. Major assignment	-Tools to support group activities such as a shared workspace are available; Group members can have their own private communication areas within shared workspaces
5. Testing	-Password-protected (practice) test sessions are available, with automatic feedback when appropriate to the test questions
6. Mentoring, communication not specific to #1-5	-Convenient communication through an e-mail centre in the course WWW site can occur, where not only individuals can be messaged but also groups within the course, including trainer groups.

Although course management systems do not necessarily have to be web-based, the advent of the WWW and the immensity of the resources available through it have led to a proliferation of web-based CMSs. A CMS can be user-developed, like the University of Twente's TeleTop™ system (UT TeleTop CMS, 2006); off-the-shelf commercial systems e.g. webCT™ (WebCT CMS, 2006), Blackboard™ (Blackboard CMS, 2006); or open-source CMSs such as Sakai™ (Sakai, 2006) and Moodle™ (Moodle™, 2006). Moodle is already in use at ASML for an assessment project such that it is out of the scope of this thesis to discuss in detail why they choose for Moodle.

Moodle is an open source course management system that enables to create powerful, flexible, and engaging online learning experiences. The phrase "online learning experiences" instead of "online courses" is deliberately used. The phrase "online course" often connotes a sequential series of web pages, some images, maybe a few animations, and a quiz put online. There might be some email or bulletin board communication between the teacher and students. However, online learning can be much more engaging than that. Moodle's name gives insight into its approach to e-learning.

The word Moodle was originally an acronym for *Modular Object-Oriented Dynamic Learning Environment*, which is mostly useful to programmers and education theorists. As such it applies both to the way Moodle was developed, and to the way a trainer or course developer might approach creating or teaching an online course. Anyone who uses Moodle is a *Moodler*. (Rice, 2006)

Appendix 1 helped to define which open source CMS could be of use. The website of Edutools (2006) has a comprehensive listing of features of most CMSs. The features have been summed up as learner tools and support tools.

This Section gave a summary explanation of a CMS. There are many topics which can be of use when creating a course or content. For this project it's not the scope to develop a course but to develop a way of working with a CMS and all necessary features.

2.8 Concluding remarks on the literature review of blended learning

This chapter explained the basic concept of blended learning. Due to the fact that blended learning is going on within the training department of ASML, the Sections build up in such a way to give a short introduction what blended learning is and which design models can be used. We have chosen for a possible logical pedagogical model and learning scenario which can be used during the design of the templates in Chapter 4. These templates will be made and used in a CMS, therefore Section 2.7 discussed the CMS. Which features are needed and will be used will be described in the following chapters. Before we are able to design the templates we need to know how courses / content are been developed at the moment within the training department of ASML which will be described in the next chapter.

3 Context review of course design at ASML training

The previous chapter discussed different design methods and blended learning in general for course development; this chapter will go more in detail about the Way Of Working (wow) of the training department and then specifically the course developers and discuss how they develop materials. Section 3.1 gives an introduction about the course design within the training department.

Before the WOW of the course developers and the trainers can be explained we need to know the responsibilities they both have within the training department; this will be explained in the second Section 3.2. Section 3.3 will explain E-learning within the department, Section 3.4 will go more in detail about the multimedia design process which is important to know for further development of the templates in Chapter 4. Section 3.5 will discuss the way the problem statement came into being, the context analysis where the group interview will be discussed. Section 3.6 gives a conclusion of this chapter and the relation to designing of templates in Chapter 4.

3.1 Introduction to course design within ASML

Effective course design is more than just following a set of rules. It requires a user-centred attitude and design methodology. It also requires early planning of the interface and continued work throughout the development process. (Figure 11) shows the training department in general.

An important consideration in the design of a course is the composition of the team that develops and builds it. It need to be a balance of disciplines and skills, including development, visual design, writing, human factors, and usability assessment. So create a team of individuals who specialize in each area and who can contribute uniquely to the final design. Within ASML, for every subject, this team consists of an equipment engineer (Subject matter expert), the developer and the course developer who gathers all the information and builds it into a training package. The trainer is involved when the first draft versions are created and that is almost at the end of the course development process (Figure 13). The design teams have to effectively work and communicate together. Locating them in close proximity or providing them with a common area to work out design details often fosters better communication and interaction.

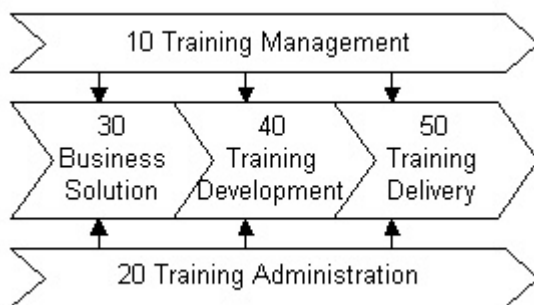


Figure 11. Training department communication

3.2 The training department

The training department hierarchy is given in Figure 12. The delivery team of training is split into three categories, Twinscan, Pas5500 and application. These are the different platforms within the training department at the moment. The focus of this thesis will only be the relation between the course developers and trainers within the Twinscan delivery group.

The functions and responsibilities described in the following Sections are taken from the job descriptions posted on the intranet pages of ASML.

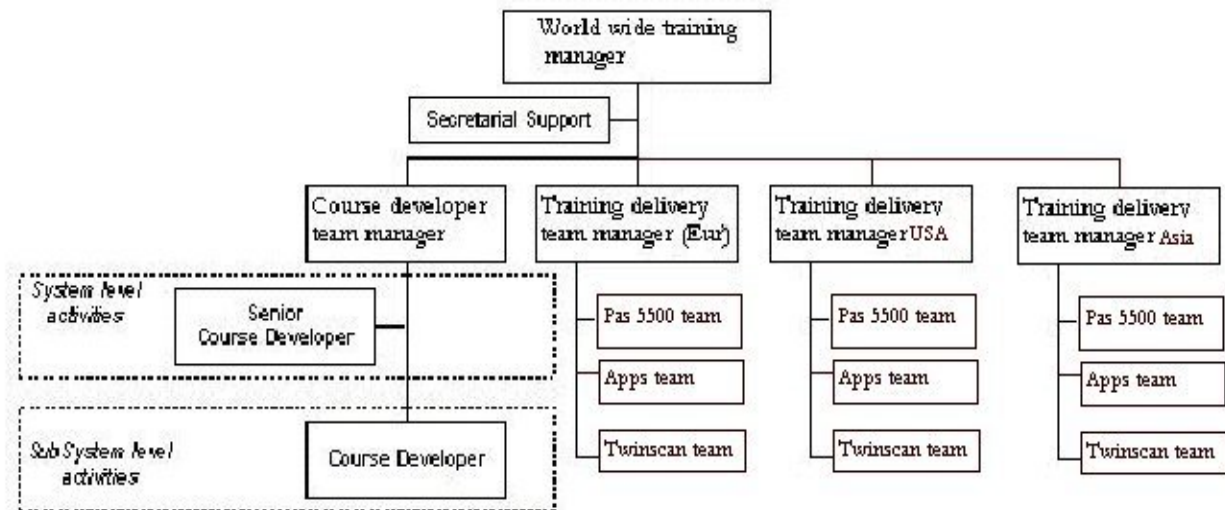


Figure 12. Training department

3.2.1 The function of the course developers

A course developer at ASML is responsible for the development of ASML Technical Training course materials for a variety of service technical employees and external customers. Table 8 gives an overview of the main tasks of a course developer.

Table 8. Essential Functions of the course developer at ASML training:

Analyzing and Deciding	Conduct research, analyze data reports and draw conclusions from written or computer generated materials, create subsequent methodologies to achieve project objectives
Working with People	Establish and maintain positive working relationships with a variety of departments in order to research information for training program development
	Provide on a regular basis, via the Project Leaders, feedback on course development progress to management
	Liaise with a variety of sources to ensure the timely availability of information relating to course development for associated projects
	Provide input to the Project Team on all course development issues, i.e., resources, information, relationships, etc.

3.2.2 *The function of the trainer*

A technical trainer is responsible for delivery of technical training to a variety of service technical employees and external customers, ensuring that they have the required skills and knowledge to optimize the use and performance of ASML products and associated equipments. Table 9 gives an overview of the tasks descriptions of a trainer.

Table 9. Table Essential Functions of the trainer at ASML training

Analyzing and Deciding	Conduct research, analyze data reports and draw conclusions from written or computer generated materials. Create subsequent methodologies to achieve project objectives.
	Execute the delivery of new training modules and materials on a pilot basis. Assess, report recommend and implement improvements for the deliverables.
Working with People	Establish and maintain positive working relationships with a variety of departments in order to research information for training program development and to gain feedback on training delivered.
	Instruct, coach and develop trainees and colleagues on ASML products and associated materials.
	Provide on a regular basis via the Project Leader, feedback on trainee performance and skill level to managers and customers.
	Act as the first point of contact for concerns and issues raised by individual trainees on a daily basis.
	Provide input to the Project Team on all training related issues, ie; resources, facilities, materials, relationships etc.

Trainers and course developers should work closely together. Therefore processes have been made and the following function an overview matrix explains the responsibilities for all persons involved at the training department (Table 10).

Table 10. Functions overview ASML training department

Tasks \ Functions → ↓	Worldwide Training Manager	Regional Training Delivery Manager	Manager Training Development	Team Leader Training Delivery	Course Developer	Senior Technical Trainer	Trainer	Senior Technical Mentor	Technical Mentor	Project Coordinator	Training Coordinator	Facility Co-coordinator
Operational Phase	A											
1. Deliver / Organize Training		A/R		R	C	R	C				R	
2. Student Coaching and Mentoring		A		R		R	R					
3. Trainer Coaching and Mentoring		A		R	C	R	R					
4. Update Training Materials		A	A/R	R	R	C					C	C
5. Certification		A/R		R		R	R					

Legend:**A:** Authority: primary and final responsible**R:** Responsible: execution of activities**C:** Contributing to activities

According to this matrix there is some overlap between the trainer and course developer. They have theoretically exactly the same tasks; in reality the trainer is almost not involved with creating new course materials. Trainers are only involved in the review phase of the course materials creation.

3.2.3 Way of working course developers.

How are the course developers creating the course materials, do they follow a process, how are the products reviewed, how are the products implemented, are the trainers involved in the whole process? Refer to Figure 13 for the short version of the course development process within ASML. Appendix 5 gives a detailed overview of the course development process. The short version of the course development process will be explained:

The course developers are collecting all comments which emerge from class evaluations from all training centers. In addition, the course owner keeps track of technical changes from development and applications. This is a continuous activity. Then they categorize and prioritize the comments, review the analysis outcomes of this course, update them where necessary and ensure agreement with all training centers. If no formal analysis results are available, the analysis is carried out as if it were a new course to be developed. The next step is to inform the project leader about the status of the course and the need for revision in the regular team meeting. The project leader and the course owner select the modifications that need to be carried out, the course developer estimates the required capacity and the project leader makes the needed capacity available.

The course developer modifies the appropriate modules and takes care of consistency of the total course contents. In combination with the relevant subject matter experts from Factory Support, Equipment Support and Development Departments and the other training centers, reviews the course on technical content, consistency and representative ness. The course developer revises the course in accordance with the outcome of the reviews and returns the revised materials to the course owner for sign-off.

The implementation process finalizes the course development process. With inputs from the evaluation process corrections have to be made to the new training materials. Part of the implementation of the course materials is the cross training phase. The cross training is done in 3 steps: The 1st session is done by the course developer were the trainer attends as a trainee, the 2nd session is delivered on a 50-50% base by the course developer & the Trainer, the 3rd session is delivered by the trainer; the course developer sits in as a coach. When the course developer and trainer both agree on the materials and the didactical flow etc then the materials need to be archived with the correct ID- and revision number in ASML internal archiving database.

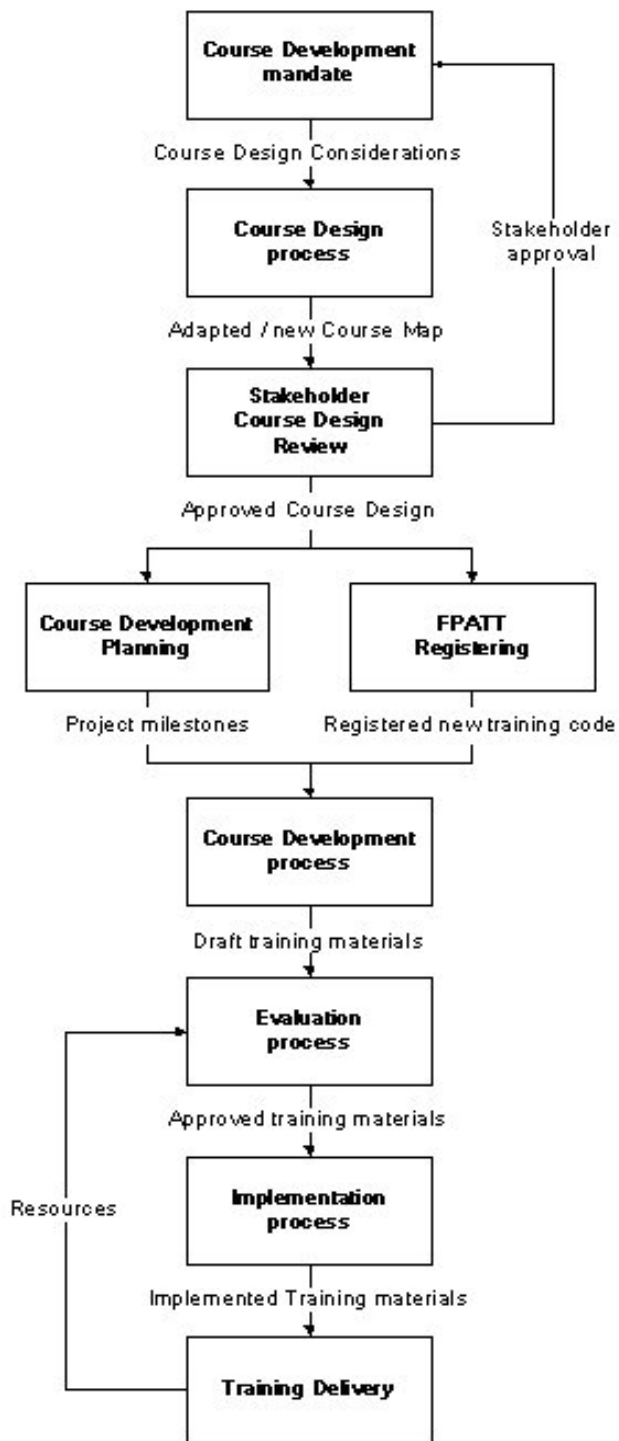


Figure 13. Course development process

The training department has different actors (wherefrom the course developers and trainers only are discussed). Course development is a process built on following a sequence of steps, it looks like a procedure. For every step or tasks there are different actors involved Table 11 gives an overview of the different tasks within the course development process and all the actors involved within the training department. These different actors also have different authorities and responsibilities. The responsibility of the course developers starts from the design phase and are involved and responsible till the materials are finalised and cross trained.

Table 11. Authorities and responsibilities course development

Tasks \ Functions → ↓ Course Development	Supervisor CS Development	Manager CSE WW Training	CS Project Leader (CSPL)	Sr. Course Developer	Course Developer	Technical Trainer	CS Equipment Engineer
Analyse	A						
Prioritise	R						
Assign team members	R						
Design	R						
Design Course map	C		C	R	C		
Define skills list				R	R		A
Define CRI tests				R	R		
Group skills				R	R		
Review course design	C		C	R	C		
Develop							
Plan Course Development project	R						
FPATT registering	C			R	C		
Design Instructional plan	R			C	C		
Select & develop materials and learning activities for trainee & trainer				R	R		
Implementation							
Update and archive training materials				R	R		
Cross-train				R	R	C	C
Evaluation							
Expert appraisal, tryout & update				R	R	C	C
Patent's check				R	R		

Legend:**A:** Accountable: primary and final responsible**R:** Responsible: execution of activities**C:** Contributing to activities

Table 11 shows the different steps in the process of course design. Design, Develop, Evaluation and Implementation. All the steps which you can find back in the Addie model (Figure 5) and in the OKT model (Figure 6) but what is missing is a crucial phase in the development process is the Analyze or preliminary investigation phase. Basically what happens at the moment is that course developers directly start with the design phase when they are assigned to a project. But what strikes most is that the trainer or technical trainer is only involved during the course development process when the materials need to be tried out! These are two big short comes in the whole process, which need to be taken into account during the template design in Chapter 4.

3.3 E-learning at the training department

Chapter 2 discussed blended learning, where it was explained that blended learning means that different learning methods are combined to deliver training. Different methods mean that different course materials are created, for example course materials which need to be presented classroom based or course materials which can be studied by the trainees them self (E-learning). So next to classroom course design the course development team is also responsible for the multimedia products which are part of blended learning at the delivery site of the training department. Multimedia products request a slightly different process than classroom course design. This chapter describes the multimedia development process of the course development team. Multimedia is part of E-learning at the training department therefore this chapter starts to explain more about E-learning used within the training department of ASML.

3.3.1 *E-Learning and the training department*

There are a lot of terms that describe the use of technology for E-learning. Rosenberg (2001) uses the term E-learning with the following definition:

E-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based on three fundamental criteria:

E-learning is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of instructions of information, it is delivered to the end-user via a computer using standard Internet technology and it focuses on the broadest view of learning – learning solutions that go beyond the traditional paradigms of training.

Rosenberg is very clear about the fact that E-learning is more than designing a high-quality training on the web. He thinks that a company has to design a strategy that declares and introduces this new way of learning. The following subjects have to be described in this Strategic Foundation (Figure 14) , in order to guarantee that e-learning initiatives sustain; new approaches of E-learning – including online training (instructional strategy) and knowledge management (informational strategy), learning architectures, infrastructure, learning culture, management ownership, and change management and Reinventing the training organization.

When the above points are considered, the changes of integration of E-learning will be enlarged.



Figure 14. The strategic foundation for E-Learning depicts all the critical components for successful e-learning initiatives (Rosenberg, 2001).

Why E-learning at ASML? According to Rosenberg (2001) there are 11 benefits of e-learning: lower costs; enhances business responsiveness; messages are consistent or customized, depending on need; content is more timely and dependable; learning is 24/7; no user “ramp-up” time; universality; builds community; scalability; leverages the corporate investment in the web and it provides an increasingly valuable customer service. When we take a close look to these benefits then there are several good reasons for ASML to switch their courses to E-learning. Below is an overview of the benefits that Rosenberg explains and how they can be benefits for ASML.

- Lower costs; a very important benefit. Using E-learning as a way to provide training has direct consequences for the costs that are involved. It will cut in travel costs, trainees don't have to be in the Netherlands for a long time where they have to stay, it reduces the time the trainees have to spend within the training center and it reduces the need for a classroom/ trainer infrastructure.
- Messages are consistent or customized, depending on need; the instruction is for each trainee the same, therefore the trainees will get all the information they'll need and every trainee will get the same information.
- Content is more timely and dependable: information can be updated whenever needed. Because ASML is a company working with the newest technology, information changes fast and has to be spread in a blink of an eye.
- Learning is 24/7; information will be accessible all the time. Trainees can enter the information any time they like and can therefore plan their own activities.
- It provides an increasingly valuable customer service; it provides a great service for trainees to overview the course they have taken. They can plan their own time, place and work in an effective way.

After reading these benefits, it has to be clear that E-learning at ASML can be of great help. Making it work asks effort from different sides. A lot of investment has to be done in the ‘Strategic Foundation’ in order to let E-learning sustain and become the way of learning at ASML. But the benefits will work for it. Furthermore there is a multimedia team involved, management is on one line and there is one person of the training department who is busy with his last year study in Educational Management and Media (EDMM).

The training department of ASML is ready to extend the E-learning process the prerequisites are there, implementation is now a key point to look at! Before E-learning can be fully implemented, E-learning products or multimedia products need to be designed. These multimedia products need to be designed

according to a process, the next Section will explain more in detail what the multimedia development process is at the training department of ASML.

3.4 Multimedia development process within the Training department of ASML

The (instructional) multimedia development process is to develop multimedia products and services. Examples of products are: CBT's, these can be considered as the largest projects and products that are produced by the multimedia team. CBT's are usually stand alone applications that a student can follow independently of place or time at his own pace. A CBT typically teaches an entire course; Animations for classroom support, animations that are used by trainers during classroom sessions; videos, recording of Knowledge Transfers on video or CD-rom; video CD-rom applications, applications that are used stand alone to augment procedures or training material; software simulation presentations.

The multimedia development process (Figure 15) has many similarities with the Course Development Process. Due to the nature of multimedia there are significant differences between the two. This Section will describe the similarities and differences.

For large projects, the requests are prioritized by the Course Development Manager, for smaller projects this responsibility can be delegated to the Course Development Team leader. Prioritization occurs according to the criteria described in the scope document argument with topical criteria that are considered relevant by the manager (team leader). Similarly, for smaller multimedia products and projects, the go / no go decision of a project or product can shift from the Course Development manager to the Course Development Team leader.

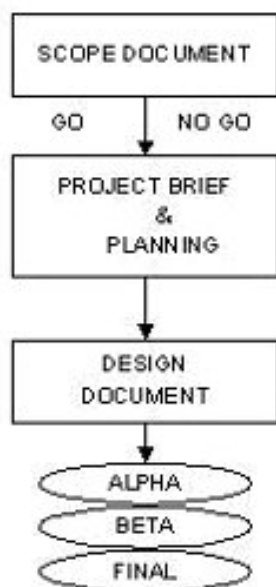


Figure 15. Short course development process.

The design phase takes the specifications and expands them to produce a design document detailed enough for programmers and media developers to work from. The design document often includes a 'storyboard' or 'paper prototype' that can be used to evaluate the success of the specification and design phase. This phase often ends with the development of a proof of concept that is used to validate and evaluate the design. There are often considerable iterations between the specification and design stages, with the specifications being revisited as the design activities provide new understandings of what may be done to meet the overall objectives. Any adjustments to the specifications impact subsequently on the design.

Product definition provides a documented understanding of the problem and the potential multimedia solution. The Course Development Manager decides whether that potential solution can be developed in-house or whether it will be outsourced. Based on the responses from the service provider will be selected with whom a binding project contract will be negotiated. This always involves a member of the Procurement Department. If the project is done in-house the initial team members of the project team are selected by the Course Development Team leader. The Senior Course Developer is responsible for developing the scope document and project brief including Work Breakdown Structure.

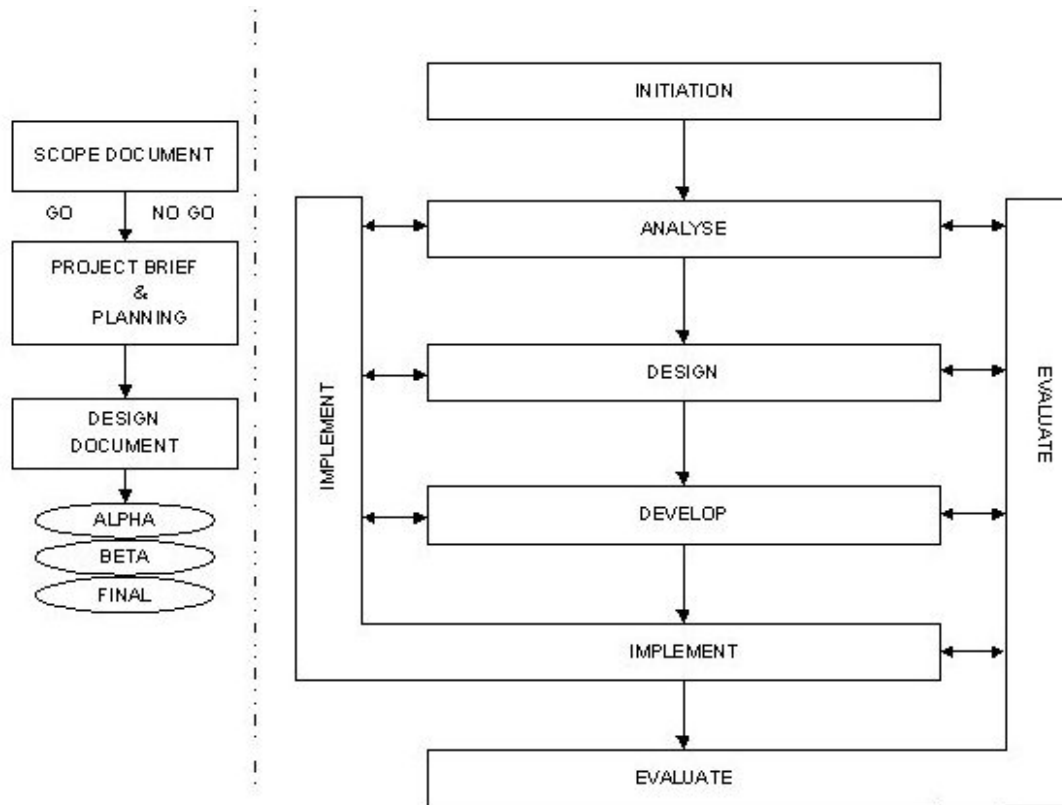


Figure 16. Multimedia development model partly based on the OKT model (Verhagen, Kuiper, & Plomp, 1999)

Designing the product involves taking the specifications and 'expanding' them into a design document detailed enough for media producers and programmers to use as they develop and integrate the different components into a completed product. Interface design involves combining the graphical treatment, content and interaction specifications into paper (or digital) mockups of the actual screens that the users will access to interact with these elements. The design document often includes a 'storyboard' or 'paper prototype'. These may include the mock sample screens as well as a flowchart to map the structure and navigation. The storyboard and flowchart can be used to evaluate the design by tracing each specification and confirming that it has been effectively transferred into the design. These design activities influence each other and often have to be revisited as decisions in one area influence decisions made in others. These iterations often include revisiting 'earlier' activities and phases. Designing the various media elements involves the detailed specification of type, number, format, quality and specific location of each media element of the product. The programming specifications are written by developers and programmers to plan the programming processes that will integrate the interface, media components and functions into the final product. If a (rapid) prototyping approach is used then the design document of the final product is created after several iterations, with each prototype being tested and evaluated to inform the next design. The prototype may be a representative

'piece' of the intended final product or it may focus on a particular component or function that needs to be clarified.

The task of specifying the product involves listing everything required from the product. Specification does not necessarily specify **how** the individual features will work that will happen during the design phase but it must give a framework of features and requirements on which to base the design. For the details of the multimedia development process refers to Appendix 5.

The development phase of the multimedia project includes the production, the testing and the evaluation of the product. The development phase starts after the design document has been evaluated, reviewed and signed-off by the sponsor and other relevant stakeholders. This will usually have been facilitated by the use of a proof of concept to demonstrate that the design will provide the desired product. The impact of changes to the design will have been noted and acknowledged by adjustments (signed-off by the sponsor) to the project budget, project schedule and work breakdown structure. In this development phase prototyping will begin, testing and evaluating each prototype as it is built. As a result of each stage of testing and evaluation the specifications and design are reviewed before the next iteration of the development phase occurs.

Testing involves checking a component or function to see that it meets a specified performance or quality. Testing is used to ensure that all built components and functions perform individually and as an ensemble according to the design intent. Evaluation is wider in scope, and involves acquiring and assessing information on the product to provide feedback on the design and content. Evaluation will be used to validate that the design complies with the requirements of the sponsors and to verify that the product is built according to the validated design.

Evaluation is an iterative process that focuses on the product's use rather than its features and functions. Done early enough it can discover design faults and reduce the costs of having to rebuild everything. It can reduce the need for a technical help desk, and can increase user satisfaction. Evaluation can also reduce 'over design' by making user needs clear.

The implementation of the product entails the actual handing over to Training Delivery of the final product of the project as stipulated in the project brief.

Table 12 gives an overview of all the tasks / steps and who is responsible.

The process is based on the OKT model (Figure 6). This model has been adapted to reflect the importance of an iterative approach where implementation is a focal point. Constant evaluation of the process steps is done to make sure that the achieved outcome does not deviate from the planned and intended outcome.

Table 12. Authorities and responsibilities within multimedia development

Tasks \ Functions → ↓	Training Development Manager	Team Leader Course Development	Senior (Multimedia) Course Developer	(Multimedia) Course Developer	Senior Instructor	Instructor
Multimedia Training Development Process	A					
Prioritize requests		R				
Assign team members		R				
Product definition			R	C		
Development planning			R	C		
Design		A				
Design product			R	R		
Develop		A				
Select&Develop materials			R	R		
Product Evaluation			R	R	C	C
Patents& Editing check			R			
Implement		A				
Implementation			R			
Evaluate		A				
Process Evaluation			R	C	C	C
Transfer to maintenance			R			

Legend:

A: Authority: primary and final responsible

R: Responsible: execution of activities

C: Contributing to activities

In general the course developer and the multimedia developer are the same person. This means that basically all course developers are also multimedia developers? The only difference is that some developers are more specialized in using special tools than others. The same as within the course development process (Table 11) the trainer is not involved in the whole process only when the product is ready for review!

As discussed in this Section multimedia development is a process build on following a sequence. The same as in the course development process the responsibility of the course developers starts from the design phase and they are involved and responsible until the materials are finalised and cross trained. But again, the technical trainer is only involved when the materials need to be tried out! To support existing course materials a lot of multimedia request come from the technical trainers. Especially they ask for multimedia products which can help to explain the regular course materials better.

The problem statement described that training delivery need to be earlier involved in the process for developing course materials; the next Section will explain more in detail how this problem statement came into being and who was involved.

3.5 Context analysis

Chapter 1 briefly explained how the problem statement came into being. Section 3.1 till 3.4 explained who is involved and the processes used, this Section will explain more in details the reason of this project how it is measured and possible solutions. As stated in Chapter 1 the training department needs a process to modernize and develop new course materials and whereby the trainers are updated during the whole process of development. This problem statement was brought up during a group interview held with the trainers.

3.5.1 *The group interview*

Why a group interview?

According to Jones and Kochtanek (2004, p, 2), “collaborative technologies can enable people in distributed environments to work together seamlessly irrespective of location, time or functional area.” Such progress is a welcome development as contemporary organizational life is characterized by cognitive work increasingly being conducted in groups because groups “have more resources than do single individuals, and therefore the potential for highly effective performance is very much present in most groups” (Hackman & Kaplan, 1974, p. 461).

The group for the group interview consists of ten people (trainers) and for an interview that is the amount of people an interviewer can handle. It was chosen to have an open discussion to get an overview of issues related to the whole group. By personal interviews it's more difficult to get one clear problem statement of a whole group Lewis (2000). The main question to the group was: *What do you think is the main problem within the training department?* This is on purpose a very vague question. The idea was that the group will come up with a top three problems. By having a group interview you get nice open discussions between all the members. The group is encouraged to discuss the matter freely, following a basic agenda. The discussion may be recorded on tape, if the respondents agree, or an observer may be present to take notes. In this case the interviewer was taking notes and remains in the background and intervenes only to bring the discussion back to the point.

Advantage group interview:

Dynamic - Group interviews are appropriate in research concerned with motives and opinions where such factors as social status and acceptance are involved. Such factors are brought out through the group interview; Effective -The group interview is relatively inexpensive as one interviewer can listen to up to ten people at a time; Spontaneous - The spontaneity of the discussion may produce information and attitudes that cannot be obtained by other methods Merton, Fiske, & Kendall, 1990).

Possible disadvantage of a group interviews:

Representation - It is usually very doubtful whether such a group can be regarded as really representative of the population at large; Analysis - Statistical analysis of the material is usually difficult, if not impossible; Impact? -The influence of the more vocal group members on group opinion is hard to estimate. Shift in behavior -In the group situation, people may assume roles and behavior that are not characteristic of their usual behavior.

3.5.2 *The steps of the group interview*

As a starting point, a regular meeting is used to open a discussion about the course development and review of the materials. The whole idea was to give the lead to the trainers to come up with a list of issues. The outcome of the first meeting was that a new meeting needs to be arranged to discuss only this topic due to the fact that one hour was clearly not enough time. In the mean time all trainers where

asked to write down all issues they see within the department which resulted in an issue list of 54 issues (Appendix 4).

Two person were assigned to collect all the issues raised by all team members and during the follow-up meeting the issues were discussed (everybody explained what they mean with the points they have brought up.)

An excel file was created with all issues, trainers were asked to give points for every issue between the 1 and 20 points (Appendix 6) and number in order of importance. (i.e. 1 = most important, 20 = least important. All the points given by the trainers per subject where collected in one overview Figure 17.

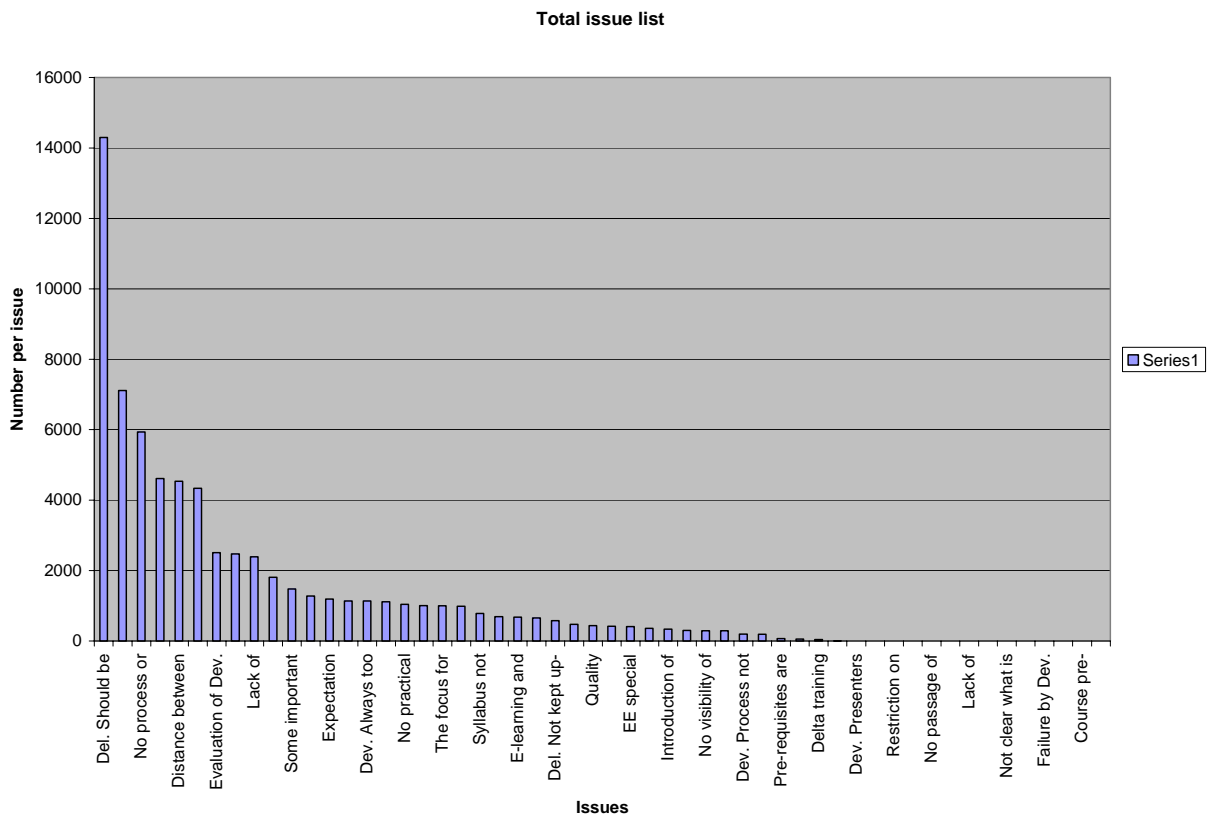


Figure 17. Overview diagram all issues

The issue list of 54 items (Figure 17) is reduced to a top 6 items issue list (Table 13). The result is that 6 issues clearly got more points than all other issues (Appendix 4).

Table 13. Top six issues

1	<i>Delivery. Should be involved early in the development of new materials</i>
2	No policy to determine level of content, requirement for detailed information not considered relevant
3	No process or responsibility exists to ensure that the developed material is "acceptable" for hand-over
4	Procedures and lab guides should reflect the functionality of training machines, many procedures not suitable.
5	Distance between departments
6	Development. Presentations appear just to be slides imported from KT's, but no "developed" material added.

A tentative conclusion on the basis of the available data is that there is a need to structure the process of developing the course materials better. Trainers were asked to look at the six issues from Table 13 and try to come up with a possible solution for all of the six issues. What gives the following proposals? Basically the number one, two and three of the issue list gives the basis of the problem statement of this thesis.

“How can a training delivery team be involved from the start in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process? How can the latest information related to new or upgraded course materials be incorporated in new and existing products? How can trainers be utilized to better support the trainees (customers)? “

Looking at this problem statement a new way of working for the Course developers and the trainers needs to be implemented. The way of working needs to be more structured, for example by use of templates. Learning scenarios need to be implemented which can support this “new” way of learning. A more structured way of working in the form of a predefined template needs to be made which can be used within a Course management system. These templates support the whole development phase step by step where the trainers are involved from the beginning. This structured process in the form of templates will be discussed in Chapter 4.

Issues four, five and six will not be discussed or worked out further. Issue 4 is part of the course development update process. There should be a regular meeting to look critically at all the training materials for each subsystem (course). Issue 5 could be solved very easily by bringing the developers and the trainers closer to each other. Involve the developers more into the trainings, such that they can see and feel how the training delivery is working. It will be much easier to communicate; picking up a phone is still more difficult for most people than directly talking with a person. And there is no difference between calling Veldhoven and or Tempe / Korea. It could solve a lot of frustrations and miscommunication. Issue 6 is a topic that could be solved when the delivery team is involved earlier in the course development process. It does not have to be a problem it can be a big benefit because the developer does need to get his source information from somewhere, the focus should not be on how they got the material but on HOW the materials can be used in a constructive way.

So let the course developers make trainer notes with every presentation they make. In these notes the purpose and the goal of the slide, (why do you created this slide, what do you want to tell with this slide) should be pointed out: - Remarks which need to be pointed out from the slide, - Nice to know background information for the trainer.

3.6 Concluding Context review of course design at ASML training

This chapter described the processes and the way of working at the Training Department and especially the way of working of the course development team. The training department in general is discussed with a focus on the processes. In Section 3.3 and 3.4 it was pointed out that the trainers at this moment much too late are involved in the course and multimedia development. Section 3.5 explained the way the problem statement came into being by having a group interview where all trainers were involved. Out of the group interview the possible solution for the problem statement is proposed.

A new process in combination with a structured way of working in the form of templates will be designed to support the course developers and the trainers. Blended learning a way of flexible learning was discussed in Chapter 2. A way to use this flexible learning is to use a tool such as a course management system CMS. The CMS which will be used is Moodle where the Addie model in combination with the Participation Process will be used to design the template. The learning scenario which will be focused on will be the stretching the mold scenario. This structured way of working according to a specific flow will be designed in the form of templates in the following Chapter 4.



Figure 18. The course development team.

4 Design of a structured way of working “template”

One of the conclusions out of the previous chapters was that a structured way of working needs to be defined. It was mentioned that this structured way of working, called a specific workflow, can be designed in the form of templates. A key point of the templates is that they should be used during the design phase of new and or updates of courses and that trainers and course developers should work together. This means that they are going to work together in small groups. Therefore, Section 4.1 will start to explain what group based learning is. Section 4.2 will discuss the workflow principles and in Section 4.3 the design of the templates will be discussed with use of the chosen design model and learning scenario from previous chapters. The phases within the templates will be discussed in Section 4.4. Section 4.5 will explain how the template will be implemented in the Course management system. In Section 4.6 the conclusions of this chapter will be reviewed.

4.1 Group-based learning

Group-based learning, in the context of higher education can take many forms, varying with dimensions such as group size, the complexity of the problem being addressed, the choice of individual or group engagement as the mode for carrying out activities and the relationship of the project to the course to which it belongs. (Collis & Meeuwse, 1999).

Group activities require the active participation of all members but still rely on individual input for completion. The learning activities should be constructed to encourage and support all people involved. Why is group-based learning applied in higher education?

By engaging actively in their learning tasks, group members can raise their individual mental efforts, which can have a positive effect on learning outcomes (Jonassen & Land, 2000).

Interaction with fellow colleagues can be productive as the discussion that occurs can reveal cognitive conflicts and inadequate reasoning which in turn can lead to better understanding. Peer to-peer explanation has been shown to be an effective learning method within groups (Cornwall, & Schmithals, 1982; Wittrock, 1978).

4.2 Workflow

Workflow at its simplest is the movement of documents and/or tasks through a work process. More specifically, workflow is the operational aspect of a work procedure: how tasks are structured, who performs them, what their relative order is, how they are synchronized, how information flows to support the tasks and how tasks are being tracked. As the dimension of time is considered in Workflow, Workflow considers "throughput" as a distinct measure. While the concept of workflow is not specific to information technology, support for workflow is an integral part of document management and imaging software.

Workflow involves the support of groups of users working together on a joint task. Adapting the original business domain definition Lawrence (1997) for the educational domain, the following definition is used here:

Workflow is the automation of an educational process, in whole or part, during which deliverables, feedback, information or tasks are passed from one participant to another for action, according to a set of procedural rules.

Workflow can be applied to educational processes, one example of applying workflow in education is where course developer and trainers submit group deliverables via a workflow application which passes them on automatically to those in charge of (peer-)reviewing.

4.3 Design considerations for the templates

In Chapter 2 and 3 different design and pedagogical models were discussed next to the flexible learning scenarios within a CMS. The Addie model, participation model within the stretching the mold scenario came out as a possible method to be used for the training department.

The trainer will, as content expert be fully responsible for the course and can mentor, stimulate, scaffold, and personally interact with the course developer. The course will be much more than a systematic way of working according to pre-defined objectives but can also be a framework for an apprenticeship-type relationship between the course developer and trainer. For the design of the templates the Addie design model (Figure 5) and the pedagogical Participation model (Figure 9) are combined. Figure 19 shows the AP model where the A stands for the five steps of the Addie design model and the P stands for the circles which represent the cooperation of the course developer and trainer during these steps (Participatory). The template will be designed according to this new model. Starting with the analyze step followed by the design, develop, implementation and evaluation steps. During all the steps the developer and trainers work together, this is indicated by the arrows within the circles. The purpose of the template will not to design a course but a way of working for the course developers together with the trainers. This will result in trainers who are involved from the start of course design.

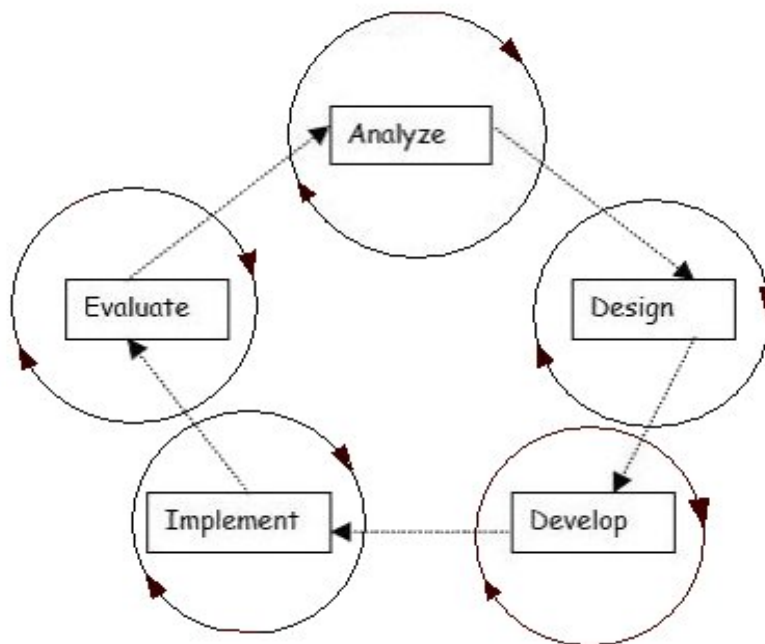


Figure 19. AP model

4.4 The phases within the template

The development process within the training department can be distinguished into 10 phases. These phases are made visible within the AP model (Figure 20). Phase 0 will not be visible within the template. This phase is for the management to assign the trainer and course developer to the project.

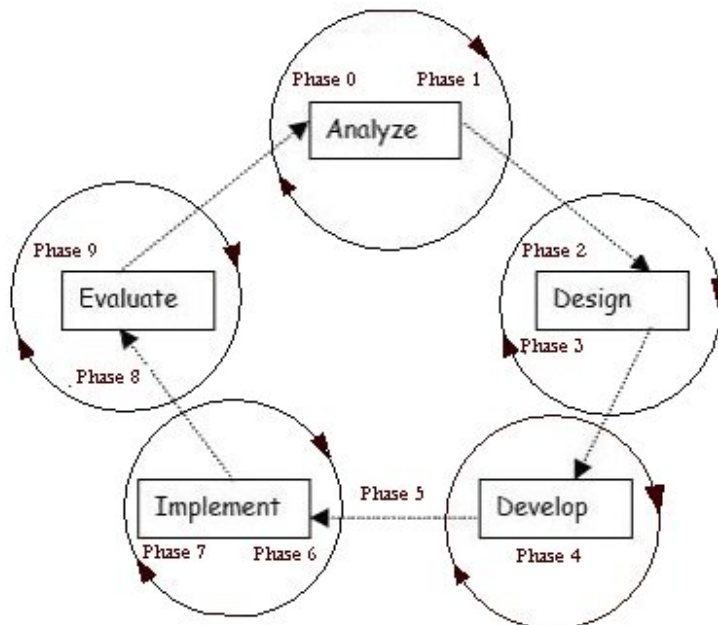


Figure 20. The course development phases for the training department implemented within the AP model.

The phases within the development process: Phase 0 Introduction new product, Phase 1 Analyze training info, Phase 2 Design Course outline, Phase 3 Design assessment and qualification sheets, Phase 4 Develop course content, Phase 5 Draft version review, Phase 6 Update all course materials, Phase 7 Implement course in training, Phase 8 Transfer course materials into CMS, Phase 9 Evaluate course. Phase 0 this is the start phase. This is the phase where the managers assign persons to the courses which need to be developed (Figure 21). The training managers are informed by the CSPL (Customer Support project leaders). This phase is not visible within the CMS. The course design for the trainers and course developers start basically when the course developer and trainer are assigned to the project. They will start together with phase 1. During the course design the trainer will be the leading person. Within every phase there will be a check moment by the trainer. At the start of the new course development, the trainer will open phase 1 and 2 within the CMS. When the course developer is ready with the first phase the materials will be sent to the trainer for review and acceptance. When the trainer accepts the materials from phase 1 phase 3 will be opened by the trainer (Figure 36). During the review time the course developer can already start with phase 2, such that they do not have to wait for the trainers responses before they can continue. So there are always at least two phases open for the course developer to work on. Details on how this will be done will be explained in Section 4.5. Basically, the Addie model is designed in the shape of a circle. It's an ongoing process, the evaluation phase is connected to the analyze phase etc. This means that course design does not end after the evaluation phase but is an ongoing process. The 9 phases will be explained next and are visible in Appendix7.

- Phase 0
- ⊕ 0 Introduction new product Analyze new product
 - 0.1 CSPL inform course developer manager and training manager about upcoming product
 - 0.2 Course developer manager and training manager define if topic need to be trained
 - 0.3 Course developer manager and training manager define if topic need to be added to existing or new course
 - 0.4 Course developer manager assign course developer to project
 - 0.5 Training manager assign trainer to project
 - 0.6 Training and course developer manager plan time for trainer and course developer

Figure 21. Phase 0 Course design ASML.

Phase 1:

Within the first phase the course developer and trainer are assigned to the project (course design). Together they are going to attend knowledge transfer(s) from the sub matter experts. After the knowledge transfer the trainer and courser developer together analyze what needs to be trained and how it needs to be trained. They agree on the topics whereupon the course developer will work out the details and send the plan to the trainer for review. When the trainer agrees on the plan he/she will open phase 3 for the course developer.

- Phase 1
- ⊕ 1 Analyze training info (by sub matter experts)
 - 1.1 Sub matter expert inform training manager and course developer manager about KT session
 - 1.2 Training manager plan trainers to attend KT session
 - 1.3 Course developer manager plan course developer to attend
 - 1.4 Trainer and course developer attend KT session
 - 1.5 Course developer and trainer discuss and agree topics
 - 1.6 Trainer will open phase 3 for course developer

Figure 22. Phase 1 course design ASML.

Phase 2:

In the second phase the course developer creates a course outline wherein the course duration, objectives, clean room actions and all requirements are sorted. This course outline also called the course syllabus will be sent to the trainer. The trainer will review the course outline and if agreed phase 4 will be opened for the course developer.

- Phase 2
- ✦ 2 Design course outline / syllabus course
 - 2.1 Course developer propose training plan
 - 2.2 Define Objectives
 - 2.3 Define training flow / timings
 - 2.4 Define cleanroom actions
 - 2.5 Define requirements
 - 2.6 Course developer send Course outline to trainer
 - 2.7 Trainer review and accept proposal and open Phase 4

Figure 23. Phase 2 course design ASML.

Phase 3:

During the agreed time the trainer is reviewing phase 2, the course developer is starting with phase 3. Within this phase the course developer is creating questions for the quiz trainees need to make after they have followed the course within ASML, this is called Assessment. The course developer within this phase will contact the subject matter experts to find out the topics which gave the most problems related to the subject in the field? These topics will be put on the so called qualification sheets.

The assessment questions and qualification sheets will be sent to the trainer for review. If he agrees on them he will open Phase 5 for the course developer.

- Phase 3
- ✦ 3 Design assessment and qualification sheets
 - 3.1 Design the qualification sheets (syllabus fine)
 - 3.2 Define assessment
 - 3.3 Course developer send assessment and qualification sheet to trainer
 - 3.4 Trainer review and accept proposal and open Phase 5

Figure 24. Phase 3 course design ASML.

Phase 4:

Within this phase the course materials will be created. The starting point for the course developer is the trainer's presentation. Within this presentation, note pages will be created for every slide. These note pages will explain what need to be told be the trainer about the slide during the course. These notes pages are called the trainer trainer guide. Due to all the development work within this phase the course developer will send the presentation with note pages already for review to the trainer and will continue with the module and lab guide development. A lab guide is the flow and explanation of all procedures which need to be trained and explained within the clean room. When the trainer has reviewed and agreed the materials phase 6 will be opened.

- Phase 4
- ⊕ 4 Develop course content
 - 4.1 Trainee module
 - 4.2 Trainer presentation
 - 4.3 Trainer Instruction guide
 - 4.4 Trainer lab guide
 - 4.5 Course developer materials to trainer
 - 4.6 Trainer review and accept materials and open Phase 6

Figure 25. Phase 4 course design ASML.

Phase 5:

During this phase the course developer will try out the created materials on the trainer. After the try out the course developer and trainer will discuss the training schedule the timings, certification sheets, trainer presentation etc. After the discussion, the trainer will open phase 7 and 8 for the course developer.

- Phase 5
- ⊕ 5 Draft version review (course developer deliver training to trainer)
 - 5.1 Course developer versus trainer
 - 5.2 Discuss duration
 - 5.3 Discuss Certification sheets
 - 5.4 Discuss flow of materials
 - 5.5 Discuss Content
 - 5.6 Discuss schedule
 - 5.7 Trainer review and accept proposal and open Phase 7 and 8

Figure 26. Phase 5 course design ASML.

Phase 6:

All materials will be fine tuned by the course developer, all feedback will be implemented. Trainer will receive the materials and start to study the materials to be able to deliver it to trainees.

- Phase 6
- ⊕ 6 Update all course materials
 - 6.1 By course developer
 - 6.2 Trainee module
 - 6.3 Trainer presentation
 - 6.4 Trainer instruction guide
 - 6.5 Trainer lab guide
 - 6.6 Course developer send updates to trainer
 - 6.7 Trainer review and accept updates

Figure 27. Phase 6 course design ASML.

Phase 7:

The training for trainees will be planned. Trainees will be invited by the training coordinator, classroom booked and machine time reserved. The course developer will deliver the first class to the trainees. The trainer will sit in and if possible will deliver already a part of the training.

- Phase 7
- ⊕ 7 Implement real training
 - 7.1 Course developer delivers first class to trainees
 - 7.2 Prepare classroom
 - 7.3 Prepare trainee handouts
 - 7.4 Prepare trainer materials
 - 7.5 Prepare machine
 - 7.6 Trainer attend review course

Figure 28. Phase 7 course design ASML.

Phase 8:

The objectives defined in phase 2 the training module from phase 6 and the assessment questions from phase 8 will be used as source and will be transferred into the online course. This will be done in cooperation with the administrator of the CMS.

- Phase 8
- ⊕ 8 Implement materials as E-learning content into CMS
 - 8.1 Discuss materials with administrator CMS
 - 8.2 Transfer objectives into CMS
 - 8.3 Transform trainings module into CMS
 - 8.4 Implement assessment questions into the CMS
 - 8.5 Trainer accept training materials

Figure 29. Implement materials into CMS.

Phase 9:

The course will be evaluated with the trainees. Comments will be written down and will be implemented. The whole training will be fine tuned and accepted by the trainer. Course developer makes sure that the training will be archived within the ASML archiving system.

- Phase 9
- ⊕ 9 Evaluate course
 - 9.1 Discuss evaluation reports from trainees
 - 9.2 Discuss training flow
 - 9.3 Discuss Course content
 - 9.4 Discuss Course outline
 - 9.5 Course developer updates last details
 - 9.6 Trainer accept training materials

Figure 30. Phase 9 course design ASML.

4.5 Template implemented in the Course management system Moodle

The main purpose of the analysis phase described in Chapters 2 and 3 was to identify the problem space and highlight the user requirements. In the design phase, a conceptual model of the intended product will be developed to give an initial indication of the goals of the template.

The target user groups for the template are course developers, trainers, subject matter experts, and any other users who are involved in the production of instructional materials in blended learning scenarios. The template is expected to be used for both novice and expert users. It should be possible to implement the template developed in any course management system.

The one which will be used as an example will be Moodle (Sub-section 2.7.2). The template will incorporate the basic functionalities of the CMS environment and guide the course developer and trainer on how these functionalities are to be applied to achieve effective instruction. Functionally, the template will provide an indicative layout of elements comprising especially the learning activities.

Other design considerations relate to ease of use. The template design is expected to make it easy for a course developer and trainer to use it. The template will employ an easy-to-understand language scheme. For ease of navigation through the course development, in addition to the navigation already available from the CMS, the template will give verbal guides to the course developers and trainers about what action is next expected of them. The trainers will have the highest level of control which means that they can open and close phases for the course developer. Within the CMS there is a different view for the trainers and course developers, which will be pointed out by the use of screen dumps (Figure 32).

The screenshot shows the Moodle course design template interface. At the top right, it indicates the user is logged in as 'atilburg Ad' with a 'Logout' link. Below this, there are controls for 'Switch role to...' and 'Turn editing off'. The main content area is titled 'Topic outline' and features a diagram titled 'A changing pedagogy in learning at ASML'. The diagram illustrates a cyclical process with the following phases: Phase 0 (Analyze), Phase 1 (Design), Phase 2 (Design), Phase 3 (Design), Phase 4 (Develop), Phase 5 (Develop), Phase 6 (Implement), Phase 7 (Implement), Phase 8 (Implement), Phase 9 (Evaluate), and Phase 10 (Evaluate). The 'Design' phase is noted as containing '9 phases in addie'. Below the diagram, there is a 'Forum About this Template' and options to 'Add a resource...' and 'Add an activity...'. The 'Course Summary' section on the right contains a quote: "How can a training delivery team from the start be involved in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process. How can the latest information related to new or upgraded course materials be incorporated in new and existing products. How can trainers be utilized to support the trainees (customers) better?". The 'Blocks' section at the bottom right is currently empty.

Figure 31. Start screen template for course design

In the top right corner of Figure 31 the trainer can switch roles. Figure 32 shows the details.

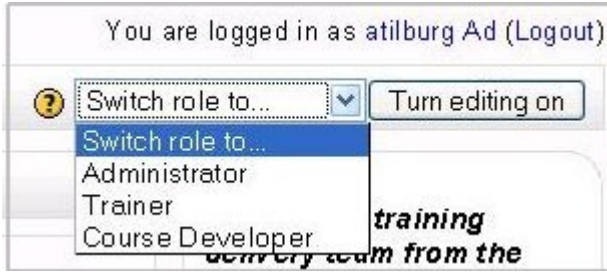


Figure 32. Trainers and/or course developers view

Figure 33 shows an example of one of the phases within the CMS.

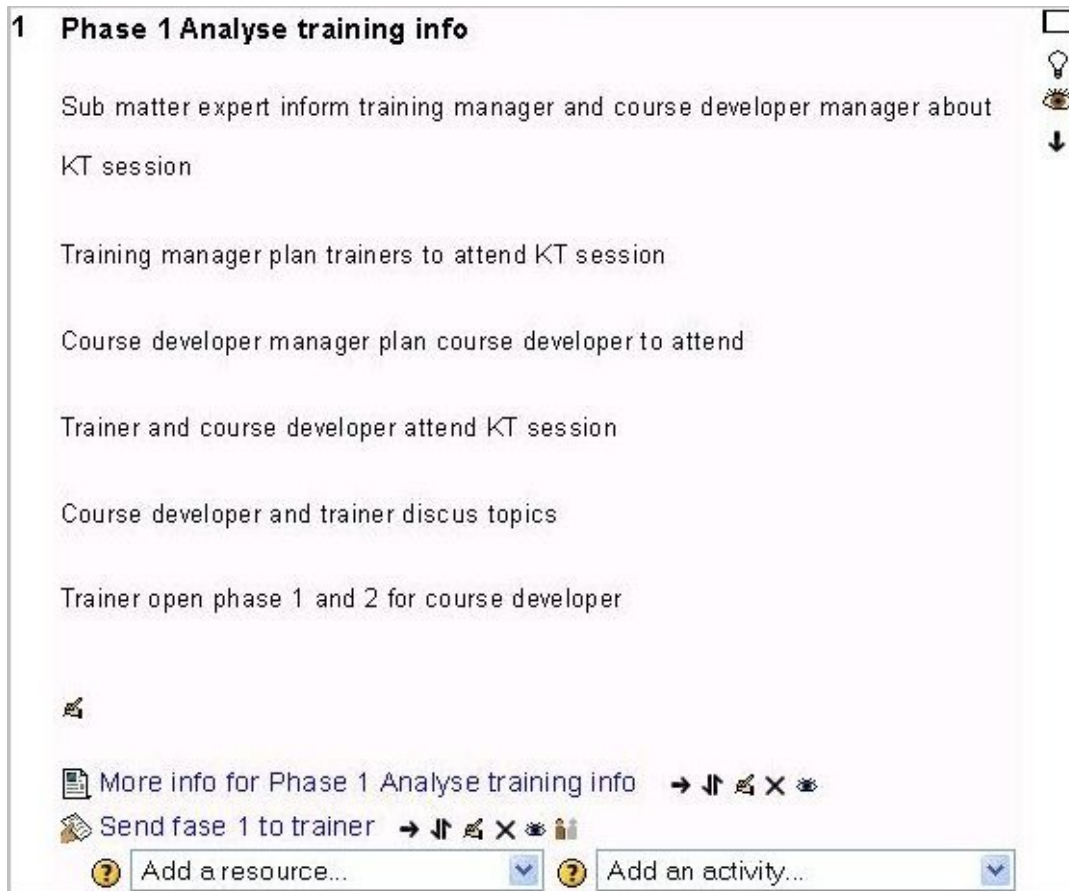


Figure 33. Example of one of the phases (Phases 1) within the CMS Moodle

The trainer can open/close phases for the course developer. When the phases are not opened by the trainer the course developer is not able to see closed phases. A screen dump as an example of a course developer view is shown Figure 34, it shows phase 4 open and phases view 5 till 9 closed. The trainer can always see all the open and closed phases (Figure 36)

Design Template

4	Phase 4 Develop course content	<input checked="" type="checkbox"/>
	Trainee module	
	Trainer presentation	
	Trainer Instruction guide	
	Trainer lab guide	
	Course developer materials to trainer	
	Trainer review and accept materials and open Phase 6	
	More info for Phase 4 Develop course content	
	Send phase 4 to trainer	
5	Not available	<input type="checkbox"/>
6	Not available	<input type="checkbox"/>
7	Not available	<input type="checkbox"/>
8	Not available	<input type="checkbox"/>
9	Not available	<input type="checkbox"/>

Annotations:

- Phase open for course developer (points to the checked checkbox for Phase 4)
- Phases closed for course developer (points to the unchecked checkboxes for Phases 5-9)

Figure 34. Course developer view phase 4-9

If the trainer is logged in within the CMS he can turn editing view on/ of (Figure 35). When editing view is on the trainer has some extra options within the CMS shown in (Figure 36).

You are logged in as **atilburg Ad: Trainer** (Return to my normal role)

Return to my normal role
Turn editing off

Figure 35. Logged in as a trainer

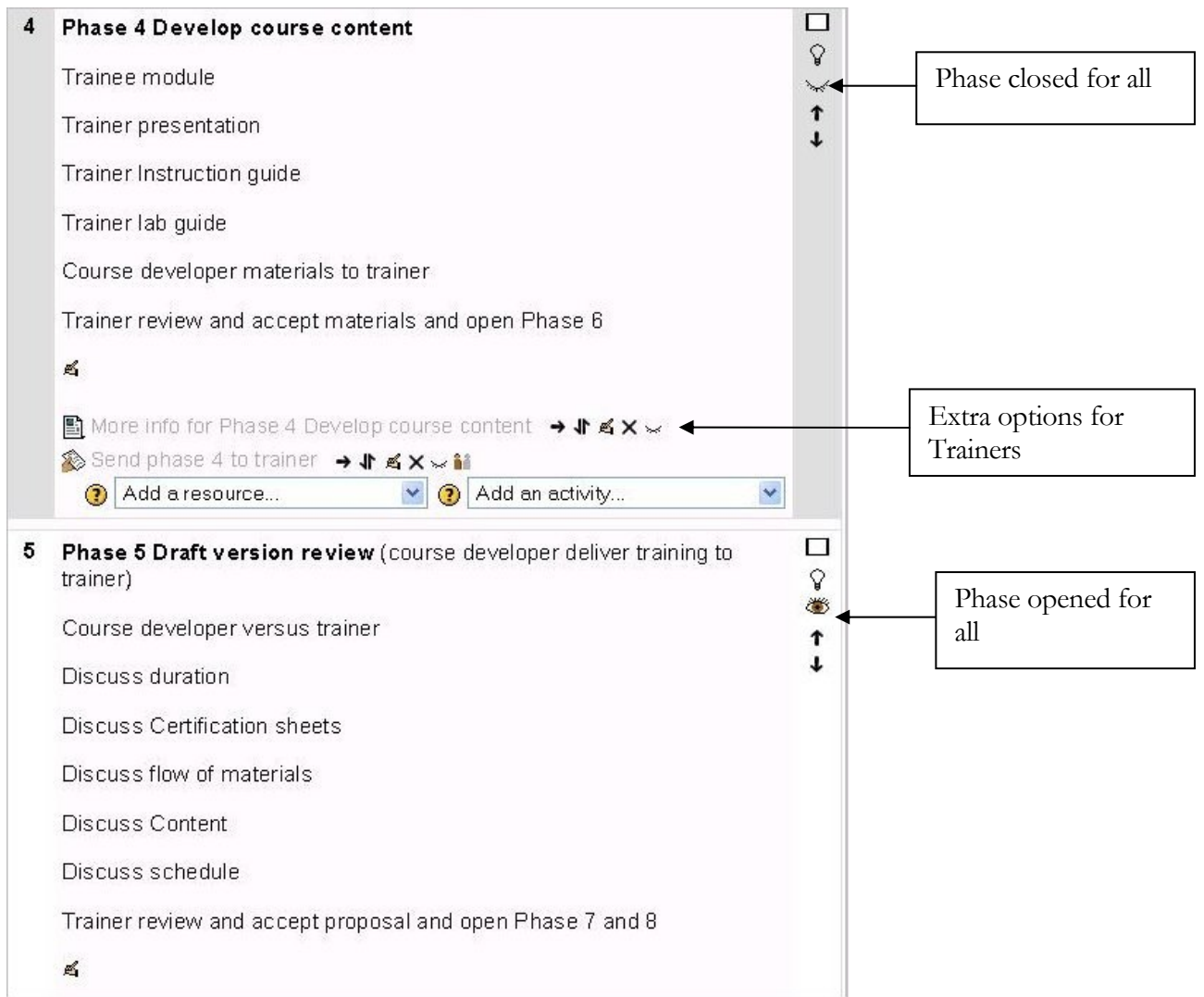


Figure 36. Trainers editing view of the course design template

4.6 Conclusion

The idea of the templates was to involve the trainers sooner within the development process. This is done by making the trainers responsible for of the workflow during the course design. The templates are very easy in use. Within the templates the same terms (ASML terminology) are used. The course materials will be created within the same formats as they always are. PowerPoint, course outline, qualification sheets, lab guide templates etc will be used. The course design template has many similarities with the existing way of working of course developers. Main difference is that the trainers are involved from the beginning and basically are in the lead of the whole workflow process. Managers are able to see at all times the status of the course development process. Further time will be gained due to the fact that course developers do not have to deliver 3 cross training sessions anymore. Due to the fact that the trainers are involved from the beginning they are already familiar with the topics and are probably able to deliver the whole first class to trainees directly by themselves. It is recommended that the course developer will attend the class to support the trainer. Course developers are at this moment working all by themselves so this will be a changing pedagogy in learning at ASML. What this new way of working means will be discussed more in the next chapter Evaluation conclusions and reflection about “The changing roles”.

5 Template evaluation and conclusions

This chapter will discuss the results of the evaluation. The development research approach of Reeves (2000) can be used to visualize this (Figure 37).

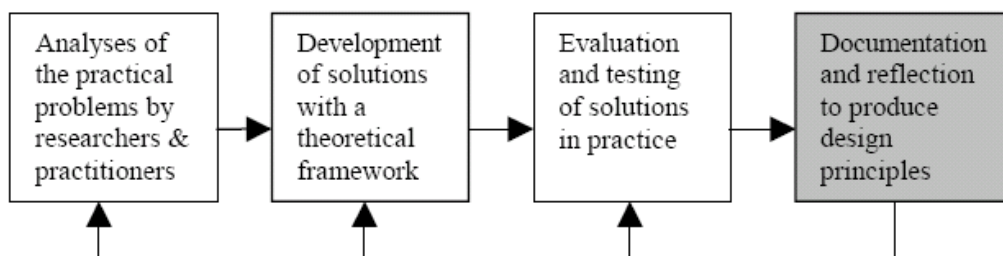


Figure 37. Research approach (Reeves, 2000, p. 25).

This thesis started with an analysis of practical problems related to the training department of ASML. In Chapter 1 the research question(s) and the reason of this project were explained. Because blended learning will be more and more the way of working within the training department, Chapter 2 explains what blended learning is in general and how blended learning is related within the training department with the different design models and learning scenarios. Chapter 3 explained more in detail the training department of ASML, the role of the trainers the course developers etc. We also discussed how E-learning is used within the training department at this moment. Out of the problem statement was defined that templates will be created to support the course developers and trainers within the course development (development of solutions with a theoretical framework). Chapter 4 shows the templates, explains the design model and scenario which is used and how the templates look like.

The evaluation method which is used is a formative evaluation which is a method of judging the worth of a program. Formative evaluation focuses on the process (Bhola, 1990). The evaluation will be performed by using a questionnaire where course developers and trainers are involved. The training department is divided in four main categories (topics of the machine), handling, stages, sensors, and metrology (Figure 38). To make the evaluation as realistic as possible these categories are made visible in the CMS and a questionnaire will be performed within every category.

This chapter will discuss the evaluation and testing of the templates. For the evaluation a questionnaire is developed. The methodology and procedure (Section 5.1) the instruments used (Section 5.2) the data of the questionnaire will be discussed in Section 5.3 and the summary of the main findings in Section 5.4. In Section 5.5 the conclusions of the evaluation.

5.1 Method and procedure

In Section 5.1.1 the way of working, the method used will be explained. In Section 5.1.2 when the evaluation was executed and who was involved will be explained.

5.1.1 Method

The best persons to evaluate the template are the persons who have to work with the template. Therefore trainers and course developers are asked. Four groups of two persons are invited to perform the evaluation. For every category (Figure 38) a trainer and course developer were invited.

The method which is used is a formative evaluation with a usability test therefore the following steps are taken: The course developer and trainer behavior will be observed, informal talks will be held with the course developer and trainer, and a short assignment will be given to them followed by a short discussion (feedback) from the course developer and trainer. After this they were asked to fill in a questionnaire of 41 questions.

The usability testing is used to measure the usability of the template. Usability testing focuses on a particular object or a small set of objects. In this case the objects are the phases within the template.

During usability testing, the aim is to observe the course developers and trainers using the template in as realistic a situation as possible, to discover errors and areas of improvement.

5.1.2 Procedure

Every group (trainer and course developer) were invited for one hour in a classroom at different times to get a realistic working environment. The reason for the invitation and a short explanation of the thesis are given. A short introduction of the templates was explained to the trainer and course developer with use of a projection beamer. Then they were asked to login the CMS with the pre-created accounts (see Section 5.2 for the details how to login the CMS environment). Special accounts are created for the trainer and course developer such that all information / feedback they give will be used anonymously.

The trainer and course developer both receive copies of Section 4.5. In this section 4.5 the basic principle and tasks are explained within the phases. Verbally, a short assignment was given to the trainer and course developer. The assignment for all the groups was to check all the phases and look if there were any remarks about the process steps within the phases. When the trainer is logged in he can see all the phases but the course developers can only see the phases which are opened when they are logged in. As a start only phase one and two were opened for everyone by the administrator. The course developers have to ask the trainer to open the phases 3-9 to be able to look through all the phases. (Participatory) During the verbal assignment it also was explained that a questionnaire will be held after they have looked through the phases to get a more structured feedback. The questionnaire is available within the last phase within one of the course categories (phase 9 of the template) (Figure 39). In this way the trainer and course developer are forced to glance through all the phases of the template. For the questionnaire see Appendix 8.

5.2 The Instruments for the evaluation

A CMS Moodle (Section 4.5) was used to create the templates. The CMS Moodle is accessible via the writers own website www.aties.net. To get access to the Moodle environment the selection *education* has to be made. The five categories from the introduction of this chapter will then be visible (Figure 38). For each category a trainer and course developer are assigned. Guests are not allowed within the CMS to keep all the information confidential.

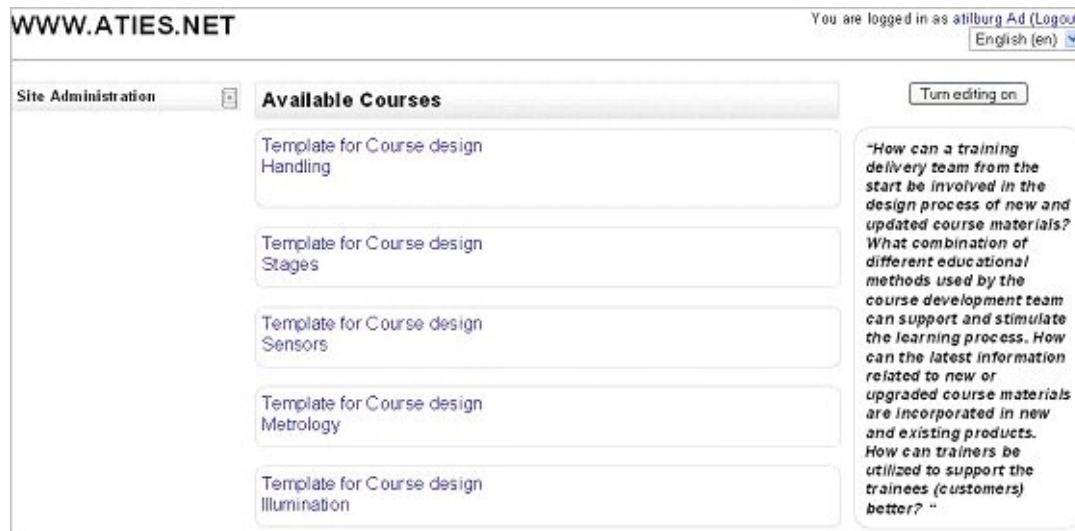


Figure 38. Five categories within the CMS Moodle.

The results of the trainers and course developers will be used anonymously but the difference between trainers and course developer feedback will be pointed out within Section 5.4. Within every topic a separate questionnaire is accessible within phase 9 (Figure 39).

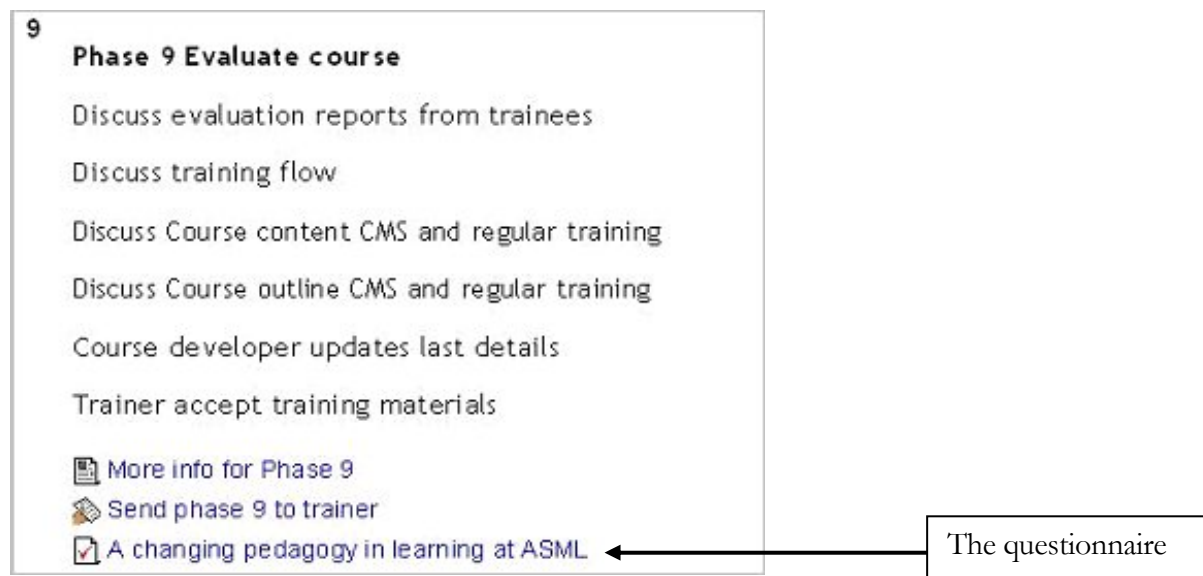


Figure 39. Phase 9 consist of the questionnaire.

The questionnaire has 41 questions which are divided in five groups (Table 19) The groups are related to the chapters of this thesis: General (Chapter 1), Course development within ASML (Chapter 3), Blended learning and learning scenarios (Chapter 2), Support of

the template when these are implemented (Chapter 4), and Concept and terminology of the templates within the 9 phases (Chapter 4). See Appendix 8 for the whole questionnaire.

5.3 The data of the evaluation

The questionnaire was performed by 4 trainers and 4 course developers.

The multiple choice questions have a five points scale to be able to give valuable input. The data of the multiple choice questions are shown in Section 5.3.1 The data of the open questions of the questionnaire are discussed in section 5.3.2

5.3.1 The data of the questionnaire

The data below is from the open questions of the questionnaire. Within Table 14 until Table 18 does the T stands for trainers C for course developer and the numbers for the amount of trainers / course developers that gave an answer.

Table 14. Category general questions

<i>Questions</i>	<i>No</i>		<i>I don't know</i>		<i>Maybe</i>		<i>Yes</i>		<i>Definitely yes</i>	
	C	T	C	T	C	T	C	T	C	T
1 Satisfied with the way of working	2	2		1	2	1				
2 How often contact with trainers or course developer?			1		3			4		
3 Trainer: what is course developer developing now?		1						2		
4 Course developer: Do you inform the trainer?					2		2			
5 Who invite you to KT?	1		2	2			1	1		
6 Do you attend KT's?			1	1	2	3	1			

As shown in Table 14 the trainers and course developers are not satisfied with course development within the training department. Both agree that they do not have a lot of contact together. The course developers attend more knowledge transfers then trainers. It is visible within the whole evaluation that some subject groups have more contact together then others.

Table 15. Category Course development within ASML questions

<i>Questions</i>	<i>No</i>		<i>I don't know</i>		<i>Maybe</i>		<i>Yes</i>		<i>Definitely yes</i>	
	C	T	C	T	C	T	C	T	C	T
7 Are you able to apply participatory design?		2	1	1	2		1	1		
8 Difference in design approach?	1					1		3	3	
9 Do you know the ADDIE model?		3			1	1	3			
10 Do you recognize the 5 phases in the template?	1				1	2	3	1		
11 Workflow / process of the template clear?							3	4	1	
12 Do you know how to use the template?						1	3	3	1	

Looking at Table 15 then it's clear that they all recognize all the phases within the template and that the workflow and process is clear. The trainers were not familiar with the ADDIE model but the course developers are. The workflow of the templates is clear for all.

Table 16. Category Blended learning and learning scenarios

<i>Questions</i>	<i>No</i>		<i>I don't know</i>		<i>Maybe</i>		<i>Yes</i>		<i>Definitely yes</i>	
	C	T	C	T	C	T	C	T	C	T
18 What is a CMS?	4	4								
19 Can a CMS support you?	1			1		1	3	1		1
20 Do you know what blended learning is?					4	4				
21 Do you see any problems using a CMS?	3	1		3	1					
22										
23 Which scenario is most valid?	3	3	1			1				
24 Which scenario will fit best with the training department?	1		1	1		2	2	1		

Table 16 shows that the trainers and course developers know what a CMS is and agree that it can be a benefit for the training department to use one. Further it is clear which learning scenario is in use at this moment (back to basic) but are there different opinions about which learning scenario will be best when the template is implemented. The course developers are more positive about the use of a CMS then the trainers are.

Table 17. Category support of the template

<i>Questions</i>	<i>No</i>		<i>I don't know</i>		<i>Maybe</i>		<i>Yes</i>		<i>Definitely yes</i>	
	C	T	C	T	C	T	C	T	C	T
25 Will the trainer be earlier involved within course development?					2			4	2	
26 Will the control of the quality of the materials improved?							4	3		1
27 Can the duration of handover the materials be shorter?						2	4	2		
28 Will the collaboration be improved?					1		3	3		1
29 Will the quality of the course materials improved?					1		3	3		1
30 Will the development time be shorter with the template?	2				1	1	1	3		
31 Do you understand the role of the trainer?					1		2	4	1	

Out of Table 17 it's very clear that almost all course developers and trainers think that the template can support them better in the future during course development. Some course developers think that the development time will increase using the template. The trainers all agree that they will be earlier involved when the template will be used. The role of the trainer (responsibility) is clear by all.

Table 18. Category concept and terminology of the templates within the 9 phases

<i>Questions</i>	<i>No</i>		<i>I don't know</i>		<i>Maybe</i>		<i>Yes</i>		<i>Definitely yes</i>	
	C	T	C	T	C	T	C	T	C	T
32 Phase 1, do you know the sub matter expert?			1		1	1	1	2	1	1
33 Phase 2, do you know what objectives are?							2	3	2	1
34 Phase 3, Is it clear what define assessment means?						1	2	3	2	
35 Phase 4, do you know what a instruction guide is?					1	3	1	3	3	1
36 Phase 5, is the review phase important?							1	4	3	
37 Phase 6, is it clear what a lab guide is?							1	2	3	2
38 Are the steps “in more info for phase 7” clear?						1	3	3	1	
39 Phase 8, do you know who to contact for implementing the materials in the CMS?				1		2	4	1		
40 Do you know how to archive course materials?	1	1	1	1	1	1	1	1		

In Table 18 is shown that the template is clear and that the template will have a positive influence for future course development. The trainers all understand the basic development terminology like what objectives, instruction guide, or assessment means. Archiving in general is not very clear within the department.

5.3.2 Open questions and Verbal feedback from trainers and course developers

Question 13 till 18 are question where more then one answer could be given or need to be selected. The trainers and course are very consistent within these questions. They all think that the template can really support the training department better. But they have the concern that more time needs to be planned by management and that this can be an issue. The role of the trainer and course developer will change according all of them. The cross training or hand over time can definitely be reduced when the template is in use. And a very nice comment from some is that they think that the course materials will be improved. The verbal feedback which was received during the time they work through the phases is that these uses of the template is a simple and a realistic method and were the training department can gain a lot with. There where no specific questions asked or developed for the general feedback. Within the questionnaire was question 41 designed for all feedback trainers and or course developers want to give.

5.4 Summary of the main findings

Out of the data from sub-section 5.3.1 are some points very clear for every group of questions. A summary of the closed question feedback and the verbal feedback is given in Table 19 per group of questions.

Table 19. Summary of main findings from questionnaire

	<i>Trainers</i>	<i>Course developers</i>
<i>General (1 - 6)</i>	Not satisfied with the way of working within the department, not involved with course development and seldom attend knowledge transfers.	Maybe satisfied with the way of working, involve trainer when materials are ready for review most times attend knowledge transfers
<i>Course development within ASML (7 - 17)</i>	Not satisfied with the way of course development at this moment. Design approach the same, there will be a change in working for most people involved. The templates and how to use them is definitely clear. Concern: structured time need to be planned. Definitely benefits when the templates will be used.	Course development ok but can maybe be improved, especially for the trainers there will be a change of working. Concern: Managers of both development & delivery have to plan sufficient time for the review / discussion occurrences which are stated in the template. Other subject matter experts need to be involve. Definitely benefits when the templates will be used.
<i>Blended learning and learning scenarios (18 - 24)</i>	CMS is clear and it maybe can support during normal work. Learning scenario at this moment A Future maybe B	CMS is clear and can definitely support during normal work, learning scenario at this moment scenario A. Future B
<i>Support of the template when these are implemented (25 - 31)</i>	Definitely the template can help to improve the quality of creation of course materials: And definitely trainer's involvement will be improved. The development time of course materials will not be shorter, but hands over definitely will. Role of the trainer is clear.	The template can help to improve the quality of creation of course materials: And definitely trainer's involvement will be improved. The development time of course materials will not be shorter, but hands over definitely will. Role of the trainer is clear.
<i>Concept and terminology of the templates within the 9 phases (32 - 40)</i>	Concept is very clear. Terminology is recognized.	Concept is very clear. Terminology is definitely recognized.

Especially the trainers gave the feedback that the templates can help to improve the quality of creation of new course materials. They mean with this that the course materials will be more structured and directly ready for use in trainings. Both groups agreed that the trainers and course developer's role within the course development process will change. Therefore more about these role changes in Section 6.1.1 and 6.1.2. They all definitely agree that these templates can be used to improve the cooperation between the trainers and course developers.

5.5 Conclusion of the evaluation

Based on the formative evaluations in the form of a questionnaire, and usability testing with four trainers and four course developers from the training department of ASML the following conclusions can be drawn:

The results of the evaluation were very positive. Most of the participants demonstrated an enthusiastic attitude to the idea of the template itself and its realization in particular. In general all participants agreed that the template provides a rich framework for describing tasks according to the task-based learning pedagogical approach. They found the use of template satisfactory and helpful, and sometimes even mentioned that the quality of the course development will be improved. The trainers called the template logical, reasonable and probably useful in the real situation of course development.

However some expressed a skeptical attitude to the template although they understood the particular value of it. Their skeptical attitude is related mostly to the planning. All trainers and some course developers gave there concerns about the planning. Without support from the management, trainers and course developers will not be planned and scheduled free to do these kinds of projects.

Considering this positive and negative feedback we can draw some conclusions in respect to the following critical issues related to the primary goals of the research project:

A benefit for the manager with use of the templates is that in one overview they can see the status of the course materials.

The main idea of the templates is to involve the trainers sooner within the development process; this is done by making the trainers responsible of the workflow during the course design. It was expected that there would be some negative reaction about this workflow proposal but out of the evaluation there was no trace of resistance. Feedback they all gave is that these templates can only work if management will also plan and assign time for course design and involvement. It is positive that most course developers recognize the course design phases within the templates, because it is was not the idea to implement these templates to learn new course design methods. The focus was on the workflow process. Also a nice to hear comment was, (given especially by the trainers) is that the quality of the materials will be improved. At the end one small step of change within the process will be one giant leap within course design at ASML!

6 Conclusions recommendations and reflection

This chapter concludes the results of the project and gives recommendations for future development within the training department of ASML by analyzing main problems, proposing appropriate solutions and specifying trends and directions for further investigation and elaboration. This chapter includes the following Sections: Section 6.1 The overall conclusions with in sub-section 6.1.1 more details about the changing role for the course developer, sub-section 6.1.2 the changing role of the trainer and in sub-section 6.1.3 the conclusions related to the overall research question, Section 6.2 recommendations for the training department and in Section 6.3 a personal reflection.

6.1 Conclusions and relation with the research questions

In Chapter 1 it was explained that there is within the training department more and more resistance against using the course materials which are delivered by the course development team. But is the training delivery team able to do it better than the course developers? Training starts with the availability of course materials, (same as a study starts with buying a book) to be studied during courses. So the development of course materials is a key point in the whole process within a training department. The pressure to develop new materials is high. New production machines are developed quicker than course materials can be prepared; the waiting lists for following training is getting longer even when there is at this moment more training delivered than ever. E-learning could be a way to take away some of these problems. But moving in this direction is not that easy and can not happen at once. Due to the practical format of the trainings, blended learning will be the way the training department aims for (Chapter 2).

Within the team meetings of the delivery group discussions started how to improve the way of working within the department because the training department always focussed on quality.

According to the instructional plan, appropriate training activities and materials need to be selected. This can be in the form of Computer Based training (CBT) or regular training. To adapt to the different learning types, illustrations, demonstration materials, exercises, cases, test-rigs and animations have to be defined. No matter which form of training will be developed, the course developer must always focus on the learner activities. The success of training strongly depends on what the trainee does. For example, a person will learn better by performing a hands-on activity, than from a show-and-tell session by the trainer. But looking at the latest course materials created this was not the case anymore. The reason is less and less communication with the course developer colleagues and more and more trainings to be delivered. This was then a perfect reason for research project to investigate this further. So group interviews were setup and the results were summarized in a top six issue list within the department (Table 13). After deep thoughts and a decent preliminary investigation later, an idea was born. A literature study was performed to answer the research questions:

What is Blended Learning? In Chapter 2 Blended learning was explained: Blended learning is a combination of different educational methods, which will support and stimulate a learning process. Combinations of different educational methods are combinations of remote training, classroom training and or E-learning. A different way of stating this in that blended learning is combining the advantages of distance learning with classroom and E-learning. After explaining what blended learning is an explanation of different instructional design methods and how these “classic” methods fit into a new way of learning “E-learning” is explained.

What are design paradigms in a corporate context? The four design paradigms which were investigated in Section 2.3 were:

- Instrumental paradigm: planning-by-objectives.
- Communicative paradigm: communication to reach consensus.
- Pragmatic paradigm: interactive and repeated tryout and revision.
- Artistic paradigm: creation of products based on connoisseurship

Looking at these four paradigms the course developers at ASML are working closest to the instrumental paradigm. Before they start to develop course materials course objectives are created and a planning is made when materials need to be finished. Due to the fact that the industry ASML is working in is changing so rapidly it's almost impossible to finalize objectives and plan deadlines for course materials. The pragmatic way of working explained that course materials will be designed in combination with the users (you could say that the trainers are the users during the prototype creation). *Rapid* prototyping (Rieber, 1994; Tripp & Bichelmeyer, 1990) (Figure 8) is a design model that could fit into this paradigm but to get more structure in the design process in combination with more interaction prefer will be to choose for the ADDIE model in combination with the pragmatic design to be used to design the templates and the new way of working within the department.

The four design paradigms on how the educational design and development processes might be conducted are discussed from which the choice for the discussed instructional design methods is made. The two pedagogical models the Acquisition and the Participation models need to be discussed then.

What different pedagogical models and instructional approach are there in relation to a CMS?

This answer is given in Section 2.5 Were a pedagogical model relates to the abstract concepts about the learning- and teaching process that underly an instructional approach. Sfard (1998) identifies two basic types of pedagogical models, the Acquisition Model and the Participation Model. Table 4 gives a overview of Sfard's interpretation of these two fundamental pedagogical models.

With the Acquisition Model, the focus of learning activities is on the acquisition of pre-specified knowledge and the development of pre-determined concepts. In contrast, with the Participation Model, the focus of learning activities is on becoming a member of a community of practice, learning from the community but also contributing to it. Participation Design needs to embrace adaptation of how it is used if it is to be effective and increase in popularity. Many PD methods are already very good, but as they are applied in new environments they will need adaptation. The Participation Design method within the templates is combined with the ADDIE phases.

A participatory approach advocates actively involving 'the trainers' in decision-making processes. In general, the processes can be seen as a three-step cycle of planning, implementation and evaluation, whereby a participatory approach may be used in some or all of these steps (Figure 9).

Which learning scenarios are used within a Training Department such as ASML?

Section 2.6 discussed the four learning scenarios from Collis & Gommer (2000). The learning scenarios compared with the models from Rosenberg (2001), were scenario *A Back to basics* correspond to the Original All classroom model and scenario *C Stretching the mold* corresponds to the Final Architecture (Figure 10). Scenario *C Stretching the Mold* relates to increased flexibility with or without changing the underlying pedagogical model of ASML. *Stretching the Mold* is offering more flexibility for participation within their pre-set programs. In principle every learning organization can be divided into one of the four scenarios. Looking at the present and thinking about the future how the organization will look like. A learning organization will continuously be busy with modernization to keep the learner motivated to support them better and to prepare them for the future. That's why in every learning organization there will be a displacement of the way education is offered.

What are task based learning templates? To support the course developers and the trainers, a template is designed. Due to the fact that ASML is working a lot with work instructions / procedures does it make sense to investigate during the literature investigation into task oriented templates according to the

minimalism approach (Carroll,1998)? During this literature investigation no other actors are involved such that the question to which this should be asked is not imported.

Which templates can be used for a CMS to support a certain scenario? Trainers have to deal with new trainees, new technology, and new pedagogies. All of these are part of a blend, as stretching the mold emerges and makes learning and teaching more flexible and trainee centered. It begins by positioning trainers concerns within the larger context of some general implementation issues relating to CMS use and stretching the mold within the organization. CMSs should be flexible and have a high quality. We have chosen for a possible logical pedagogical model and learning scenario which can be used during the design of the templates in Chapter 4. These templates will be made and used in a CMS, therefore Section 2.7 discussed the CMS. In Chapter 2 and 3 different design and pedagogical models were discussed next to the flexible learning scenarios within a CMS. The Addie model, participation model within the stretching the mold scenario came out as a possible method to be used for the training department.

What will be the role of the trainer with the new learning scenario supported by use of templates? The idea of the templates was to involve the trainers sooner within the development process. This is done by making the trainers responsible for the workflow during the course design. The trainers are involved from the beginning and basically are in the lead of the whole workflow process (Chapter 4). For a further discussion see section 6.1.2.

What will be the role of the course developer with the new learning scenario supported by use of templates? Course developers are at this moment working all by themselves. By implementing this template they have to work very close with their trainer. This will result in a changing pedagogy in learning at ASML. Sub-section 6.1.1 will discuss more in detail the changing role of the course developer. For a further discussion see section 6.1.1

How can the learning scenario be implemented within the training department? This question is not answered yet. This thesis has focused on the course material development and the communication related to it within the training department. The training department in general is discussed with a focus on the processes. In Section 3.3 and 3.4 it was pointed out that the trainers at this moment are involved much too late in the course and multimedia development. Section 3.5 explained the way the problem statement came into being by having a group interview where all trainers were involved. Out of the group interview the possible solution for the problem statement is proposed.

A new process in combination with a structured way of working in the form of templates will be designed to support the course developers and the trainers. Blended learning as a way of offering flexible learning was discussed in Chapter 2. A way to use this flexible learning is to use a tool such as a course management system CMS. The CMS which will be used is Moodle where the Addie model in combination with the Participation Process will be used to design the template. The learning scenario which will be focused on will be the stretching the mold scenario. Implementation of this learning scenario needs to be investigated in a follow-up research.

Out of this and discussions with mentors the idea came up to define a “new way of working” within the training department in the format of “templates”.

This will give a consistent layout for training materials.

During the Cross-Training phase, the final training package will be transferred to the trainers from the course development team. During the cross-training, trainers can become familiar with the training materials and content during training sessions with trainees (the target group).

After the training sessions, the developer and trainer can sit together and discuss possible improvements.

The cross training at this moment is done in 3 steps:

- The 1st session is done by the course developer: the trainer attends as a trainee.
- The 2nd session is delivered on a 50-50% base by the course developer & the trainer.
- The 3rd session is delivered by the trainer; the course developer sits in as a coach.

When the new template will be implemented then this cross training can be reduced to one session because the trainers are involved from the start and should know the materials.

After implementation, depending on a change in business need, training materials might need a redesign or update. Examples for a need for redesign or update can be the implementation of a new software release or a new added option. The result will be a redesign proposal or amendment incorporating changes within the template.

One of the remarks out of the evaluation was that these templates only can work when a decent planning will be followed. This means that management need to control this and assign the trainer and course developer. A conclusion from the evaluation was that the trainers and course developers all think that their role within the department will change after implementation of the template. The next sub sections 6.1.1 and 6.1.2 will go more in detail.

6.1.1 The Changing role of the developer

What is changing for a course developer when the templates are implemented? Is he still creating course materials? The answer is yes. What will change is that course developer will have to communicate with his trainer during the whole process of course development. In general this is also not new but it was never as structured as the templates will make it. Basically, the course developer was always very independent working alone and in his own time. By implementing the templates, the course developer has to work together with his trainer and adapt to the planning and time of the trainer in the development process.

Today's course developer is required to know much more than the Instructional Systems Design methodology Section 2.2. He/she must know a multitude of authoring tools, and must also know the storyboarding and development process for designing technology-based learning programs. Technology-based learning presents four unique challenges for course developers. These are: accommodating different learning styles; addressing differing technologies in learners' computers; developing training packages for mass quantities of learners; and acquiring new skill sets. Technology-based learning also presents many new opportunities for course developers, including the chance to develop exciting tools such as wizards, coaches, and computer-based training programs.

The increasing use of ICT in education can be seen as a major change, a change which most learning environments have been getting used to during the past years. This change is not something that just happens; it is a cycle of events that results in the actual change. Out of this research it can be concluded that the template can help the course developer and trainer with future course development.

The template design is expected to make it easy for a course developer and trainer to use. The template will employ an easy-to-understand language scheme (Section 4.5). For ease of navigation through the course development, in addition to the navigation already available from the CMS, the template will give verbal guides to the course developers and trainers about what action is next expected of them. The trainers will have the highest level of control which means that they can open and close phases for the course developer. This will be the biggest change for the course developer he needs to work very close with the trainer.

Additionally the course developers within the training department are also responsible for multimedia development. But if the training department wants to continue with blended learning and wants to move from one scenario to another then this will be very difficult for the course developer to keep up. Multimedia development is a task in itself and is moving very rapidly, it could be a different role

for a course developer (multi media developer). This is not investigated within this research but could be a new research question and will be a big change for the course developers!

6.1.2 *The Changing role of the trainer*

The trainer was never closely involved during the development of course materials. The involvement started mostly during the review of the course materials. But what could be reviewed by the trainer? The way of teaching the pedagogy could be checked by the trainer. But when new topics are introduced the trainer could not give technical feedback. This is one of the reasons why the review process always took a long time due to the fact that the trainer first had to learn the new topic (Section 3.5.1). Therefore, often feedback was given much too late, after the course developer is basically finished and the trainer is already using the materials. The biggest change for the trainer with implementing these templates is that the trainers are made responsible for the workflow during the course design. Further the trainer will learn the “new” topics from the start, is able to support the course developer in a more constructive way. But the same as with the course developer the trainer has to adapt to the planning and time of the course developer within his own schedule / planning (Section 5.5).

Trainers have nowadays better connections to the Internet, and more tools as well as support available, they still are building upon their traditional ways of teaching; again "stretching the mold" Sub-section 2.7.1. In order to fit with stretching the mold, Appelt, Hinrichs, and Woetzel (1998) argue that CMSs should be configurable by trainers in order to meet the personalized requirements for optimal use of the system in their working practice. The templates are designed in this way. If the trainer has problems with the use of the CMS, he is likely to avoid non-required use. Learning to work with the CMS should not take trainers much time, and the system should be easy to integrate into existing courses. It is important that the system can adapt to the way that individual trainers want to work, as the trainers too will need to make some adaptation in their typical training practices. Trainers therefore need to know what educational target they are aiming at, in order to make good decisions. The focus can differentiate between organizational options in order to offer flexibility, or new pedagogies, or a combination of these. Without department clarity, trainers will need to develop such particular targets for themselves, which can lead to problems and concerns, or alternatively, to lack of consideration of targets at all.

Face-to-face contact with trainees is and will stay very important. Traditional ways of teaching and learning are gradually being stretched but the available Web technology is used increasingly often for organizational purposes (including course preparation) and outside-classroom activities more than it is for communication and in-classroom activities (Section 2.2). Face-to-face interaction and direct communication between trainers and trainees and among trainees is still very important in the ways in which trainers teach. Technology is used in a way which is complementary to this, but does not replace what traditionally has occurred in the teaching and learning process (De Boer, 2002).

As an in-house trainer, you're confident of your teaching abilities and are comfortable in a traditional classroom setting. Suddenly, management expects you to switch from delivering classroom instruction to developing and facilitating online learning in a virtual classroom.

When faced with this changing role, trainers may feel apprehensive and stressed about learning and using new instructional technology. Some will successfully make the transition; others may be forced to look for another job. Trainers who are adverse to take on this new role can present a major obstacle to gaining organizational support for the implementation of the company's e-learning initiative.

Visscher (1995) indicated what educational scenario to choose to relate to the introduction of a CMS, the management has the role of setting up or guiding the processes. Hall, Thor, and Farrell (1996) agree

and state that changing roles for trainers need to be supported by the vision of the training department and therefore also in how the management develops and implements incentives and reward systems. Without such a vision and associated financial and policy support, trainers concerns and problems are likely to increase as they have to try on their own to respond to new demands of increased flexibility from trainees. Trainers will have problems with CMS use if the reason for this use in their educational practice is not clear to them. Visscher (1995) noted that a clear goal is a necessity for introduction and utilization of a CMS in a training department. Plomp, Feteris, Pieters, and Tomic (1992) and Fullan (1991) note that the educational target is an important change entity and differentiates four aspects of such a target: relevance, clarity, complexity, and quality. With respect to relevance and clarity, it is important that those involved with the change know what the goals of the change are and also recognize the importance of the change. The results of the questionnaire (Section 5.3.1) showed that especially trainers think that the complexity and the quality will be improved by this change of working.

6.1.3 Conclusions overall research question

‘How can a training delivery team be involved from the start in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process? How can the latest information related to new or upgraded course materials be incorporated in new and existing products? How can trainers be utilized to better support the trainees (customers)? ‘

Most of the participants of the evaluations emphasized the helpful character of the template. But all of them see the application of the template differently. All of them were satisfied with the idea of the template and its realization (Section 5.4). They mentioned that the template is effective and efficient; however they didn't work with the template carefully so they could judge only the idea and reflect a first impression. Looking back at the research questions then in Section 4.6 is explained how the trainers will be involved from the start within course development. The design considerations for the templates are discussed in Chapter 2 which resulted in the ADDIE design model in combination with the Participation model. The development of the template in Chapter 4 resulted in a creation of the AP model (Figure 19). This AP model can support the course developers and trainers in future course development (Section 4.3).

Within this research is discussed how development can be improved between the trainers and course developers. Not discussed is if this also results in better development in general, or if the trainees will see the difference when the training department implements the template. This can be a very nice research for the future. Out of the questionnaire evaluation in Section 5.5 came up that the course developers and trainers were very positive and think that this template really can help the cooperation within the department.

6.2 Recommendations for the training department

Based on the conclusions Sub-section 6.1.3 the following recommendations for the future development of the template can be made. This research focused on improvement of cooperation within course development between trainers and course developers but can be extended in the future to include the quality of course materials. Therefore a recommendation is to carry out performance evaluation in order to test parameters such as time and effort, effectiveness, reusability etc. among specific target groups (trainers, course developers, subject matter experts). They can be asked to create real course materials and evaluate their performance. They will make a final conclusion about the ability of the template to support course developers and trainers in the future. It is then important to evaluate also what trainees think about the created course materials.

Before the templates can be used within the training department they need to be fine tuned with the official course materials in use. Like, for example, the ASML PowerPoint template for presentation design (for phase 4). But the process itself can easily be introduced and be used. The template is designed in such a way that it's not needed to have a lot of technical know how of a CMS. The template consists of a workflow, this workflow can be introduced within any other CMS or structured program. Moodle is used because of its ease of use (Appendix 1) and because it is already in use within an assessment project within the training department.

If the result of this formative evaluation / conclusion is positive, the recommendations from the responses will be taken as guidelines for further re-design and improvement of the templates and the workflow will be completed as a final product ready for implementation in the training department.

If the result of evaluation was negative then the general concept of template organization should be revised. A possible way of template organization might be based not on the pedagogical approaches but for instance on separate learning activities. This will allow course development of smaller structures (modules) which is good from reusability point of view. The department should avoid to build general models because there are too many learning activities and each of them has its own specifics, this will reduce pedagogical context and meaning for instructional design.

All the developers are involved with creating E-learning materials. This resulted in the problem that the regular training materials are not updated on time and the training delivery suffers with outdated materials and a lack of knowledge (section 1.1). From this research it's recommended to create a template such that the trainers will be involved earlier within course development process.

It was mentioned that blended learning will be the future and out of the evaluation most course developers and trainers expected that stretching the mould scenario will be the future. Therefore course materials need to be ready and implemented with a learning environment like a CMS as Moodle (Section 4.5). Implementing these materials in a CMS is specialist work. For the course development team it's recommended that then the team will be split in two, E-learning developers and course developers. The course developers are creating the regular and new training materials which need to be trained by the training delivery group and work very close with the trainers (using the template). The E-learning developer transforms the created course materials and transforms this material into E-learning materials (Figure 30). In this way the regular training materials will be updated on time and all the E-learning materials are easier to control and to organise (See the phases in Section 4.4). Next to implementing the template it seems beneficial and recommended to implement the templates also within course development of the other training groups, the PAS and Application trainings of the training department such that there will be one consistent way of working within the whole department. The trainers and course developers have to commit themselves to work together and inform management as soon as there are issues to be addressed. Management has to commit to supporting the template. For the management it means that they have to give the trainers and course developers time to work together as a team. If these commitments are given then all trainers and course developers agreed that the template can support the training department very efficiently and will improve the quality of the course materials.

6.3 Personal reflection

Everyone is involved in it, lifelong and all over the world, using fabulous amounts of money, to create a better future for each and all of us. This big 'human capital' business is in constant need of scientific support, by systematic designing, by thorough research, and by constant evaluation and improvement. Bachelor program Education, Design, Management, and Media ([EDMM](#)) and the Master program Educational Science and Technology ([EST](#)) at the University of Twente (UT) of the Faculty of Behavioural Sciences (GW). The final project was supervised by the department Curriculum Design & Educational Innovation ([CDEI](#)) (Curriculumontwerp & Onderwijsinnovatie ([C&O](#))) of the Faculty of Behavioural Sciences formerly known as Department of Educational Instrumentation (ISM) of the Faculty of Educational Science and Technology (EDTE) also known as "Toegepaste onderwijskunde" (TO).

The Department of Curriculum Design & Educational Innovation (CD&EI) is one of the departments in the faculty of Behavioural Sciences at the University of Twente. CD&EI is focussed on the education branch of the faculty. They use 'Curriculum' as an umbrella for all sorts of plans (programs, materials) for learning in education and training. The academic aim is to contribute to the methodology of curriculum analysis, design, evaluation and implementation.

During my study at the University of Twente, many thoughts have passed on what to do for a graduation project. Most ideal would be a project within ASML because of my work within the training department at ASML.

My impression is that when I would do this research again I would have planned more time for the evaluation. Within this thesis the evaluation looked almost the same as the way of working at this moment within the training department. This means that it is maybe good to inform the persons involved more within the project the next time? Further, more time could be spent to create a more realistic product to be used to evaluate.

Do I think this template or this new way of working can work? The answer will definitely be yes. ASML is growing and so is the training department. More and more there is a need for new course materials for a larger public. Blended learning will be the way of teaching. At this moment some course developers are refurbishing existing course materials into e-learning packages. These are perfect test cases to be used for this new way of working. Because the materials which will be transferred are already be delivered by the trainers. The trainer knows therefore all the ins and outs of the materials. What is good, bad and can or needs to be improved. To get quality course materials within a blended package the trainers and course developers have to work very close together. At this moment the main task for the trainers is to deliver training and there is very little time for personal development. So the first action needs to be done by the management. Firm commitments need to be given such that time will be given to work within this new way of working.

I am very happy with the choice of the design model (ADDIE, great name) and the combination with the participatory design model. It was already clear from the start that these two models would be combined in a way together. It was a matter of time and literature research to find a way to combine them. And I am very happy with the result the AP model (Figure 19. AP model) really think that this research and result (template) will be an improvement within the training department of ASML.

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Summary

This research is done within the scope of my study the Faculty of Educational Science and Technology (EDTE) also known as "Toegepaste onderwijskunde" (TO) at the University of Twente.

No day is the same so also within education. The title of this research is related to the changes which are ongoing with the training department of ASML. A training department needs to follow the changes a company experience.

The training department of ASML is divided in two teams a team of course developers and a team of trainers. The course developers are responsible for the creation of the course materials which are used by the trainers to deliver training to the field engineers.

ASML is a company active within the semiconductor industry. This industry is very liable to changes. The training department needs to take care of these changes by updating the course materials on time.

The title of this thesis "A changing pedagogy in learning" is related to the change which is ongoing at the training department of ASML. There are no two days the same and we learn different things every day so it should be with education. Training should adapt the changes in education to the time we live in. A training department has two main functions: the first main function is to spread knowledge about the product the company is making to internal and external customers. ASML is making a machine used for the semiconductor industry. The knowledge about the machines, how they work and how to maintain those, need to be trained to the engineers who directly work with the machine.

The training department can be divided into two teams, one team to deliver the knowledge, the training delivery team, and a team which develops the course materials, the course development team. When the course developers have created new or updated course materials then the trainers have to learn these materials to be able to train the trainees this new information.

During one of the team meetings of the trainers the concern was brought up that trainers are not updated and cross trained on time anymore. An excel file was created with all issues, trainers were asked to give points for every issue between the 1 and 20 points and number in order of importance. (i.e. 1 = most important, 20 = least important. All the points given by the trainers per subject where collected in one overview. The total issue list was reduced to a top 6 items issue list. Out of these top 6 the main research questions is created.

"How can a training delivery team be involved from the start in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process? How can the latest information related to new or upgraded course materials be incorporated in new and existing products? How can trainers be utilized to better support the trainees (customers)?"

After discussions with the coach (University of Twente) and the training manager Europe of ASML the following design task was agreed. The project will focus on an overview of educational scenarios which will support development of course material. Templates will be designed which can be used in a course management system according to a learning scenario. Furthermore there will be a plan made on how to implement these renewed scenarios within the training department.

The preliminary investigation focuses on the context of the problem and what the internal and external needs for the training department are.

In order to help the course development team templates, will be designed to help them to structure the way of creating course materials. Within this structure, the involvement of the training delivery team should be taken into account. These templates should be designed according to a pedagogic approach. Therefore within the preliminary investigation the different pedagogic approaches and strategies in

relation with a CMS and blended learning are studied. Out of this investigation the Addie model and Participation model came out as a possible method to be used for the training department. Both models combined resulted in a new model the AP model. This AP model is used for the development of the template. The template is divided in 9 phases.

Were first the course developer creates the materials all by them self and is the trainer only involved for reviewing is the trainer responsible for of the workflow and process during the course design and decide when the course developer can continue with the next phase. In this way the trainer is involved from the start and is aware of new or upcoming updates. Further will the cross training sections be shorter what means that the total development time can be shorter. The course developer will be able to focus more on new developments and educational modernizations. Like the use of a CMS. The management is able to check progression and status at all times of the course development. The template is evaluated by 4 groups of trainers and course developers.

The overall conclusion of the evaluation was positive.

The research question can be divided into two main recommendations:

For the first part of the research question:

“How can a training delivery team be involved from the start in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process?”

Recommended is the creation of the template and implementation of the template within the whole training department.

For the second part of the research question:

How can the latest information related to new or upgraded course materials be incorporated in new and existing products? How can trainers be utilized to better support the trainees (customers)? “

All the developers are involved with creating E-learning materials. For the course development team it's recommended that then the team will be split in two, E-learning developers and course developers. The course developers are creating the regular and new training materials which need to be trained by the training delivery group and work very close with the trainers (using the template). The E-learning developer transforms the created course materials and transforms this material into E-learning materials. In this way the regular training materials will be updated on time the E-learning materials are easier to control and the trainers are always up to date to support there internal and external customers better.

Samenvatting

Dit onderzoek is uitgevoerd in het kader van mijn opleiding Toegepaste Onderwijskunde aan de Universiteit te Twente.

Er is geen dag hetzelfde en dat geldt zeker in het onderwijs. De titel van dit onderzoek is gerelateerd aan de veranderingen die binnen de trainings afdeling van ASML gaande zijn. Een afdeling die net als andere afdelingen zal moeten aanpassen aan de veranderingen die er zich binnen het bedrijf afspelen.

De trainings afdeling van ASML is onderverdeeld in twee teams; ‘ontwikkelaars’ en ‘trainers’. De ontwikkelaars ontwikkelen trainings materialen die trainers gebruiken om training te geven aan technici (trainees) die werken aan ASML machines. Deze trainees onderhouden ASML lithograpy machines wereldwijd.

ASML is werkzaam in de halfgeleider industrie, een industrie die erg onderhevig is aan vernieuwingen / veranderingen. De trainings afdeling moet zorg dragen dat de cursus materialen aangepast zijn aan deze veranderingen. Binnen het team van de ‘trainers’ is er discussie ontstaan over de aanpassingen van de cursus materialen. Doordat er zoveel veranderingen zijn op korte termijn, is het erg moeilijk voor de trainers, om op de hoogte te blijven van deze veranderingen en vernieuwingen. Men is dan afhankelijk van de cursus materialen die worden aangeleverd door de ‘ontwikkelaars’.

Tijdens een van de team vergaderingen van de trainers is deze discussie naar voren gebracht. Aan alle trainers is toen gevraagd om een lijst samen te stellen van ‘verbeter punten’ binnen de afdeling. Alle lijsten van de trainers zijn samengevoegd tot een lijst. Aan de trainers is daarna gevraagd om een score te geven (1-20) aan de punten die zij belangrijk vinden, waarbij 20 punten staat voor de hoogste prioriteit.

Vanuit de opgetelde scores is een ‘top 6’ ontstaan, waaruit de onderstaande onderzoeks vraag is voortgekomen:

“How can a training delivery team be involved from the start in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process? How can the latest information related to new or upgraded course materials be incorporated in new and existing products? How can trainers be utilized to better support the trainees (customers)?”

Na overleg met de mentor van de Universiteit Twente is als mogelijke oplossing gekozen voor het maken van templates. Een literatuur studie is uitgevoerd waar deze templates onderwijskundig en educatief aan moeten voldoen. Daarnaast is er onderzoek gedaan naar mogelijke oplossingen met betrekking tot ‘blended learning’ en de invoering van een ‘CMS’. Onderzocht is aan welke ontwerpbenadering en onderwijskundig ontwerp model de template moet voldoen.

Er dient tevens een oplossing te worden gezocht om de trainers eerder te betrekken bij het ontwikkelen van cursus materialen. Hiervoor is het pedagogische ‘Participatory model’ naar voren gekomen. Een model dat gebaseerd is op samenwerken. Uiteindelijk resulteerde dit in een template dat is ontwikkeld volgens het ‘ADDIE ontwerpmodel’ en het ‘Participatory model’. Na het samenvoegen van deze twee modellen is een nieuw model ontstaan, het ‘AP model’ is gebruikt als basis voor de ontwikkeling van de template. De template is onderverdeeld in 9 fases.

Na invoering van de template heeft dit consequenties voor trainers en ontwikkelaars. Vooral ten aanzien van de samenwerking tussen beiden teams. Waar eerst de ontwikkelaar alléén het cursus materiaal ontwikkelde en de trainer pas betrokken werd tijdens de evaluatie van de materialen. Na invoering van de template is de trainer betrokken van begin af aan tijdens het gehele ontwerp-proces. De trainer is verantwoordelijk voor het proces en bepaald in overleg met de ontwikkelaar wanneer met de volgende fase van het ontwerp-proces kan worden verder gegaan. Hierdoor is de trainer betrokken vanaf het begin, hij is op de hoogte van nieuwe ontwikkelingen, heeft minder voorbereidings tijd nodig voor nieuwe trainingen en kan de ontwikkelaar zich focussen op ontwikkelen en het gebruik maken van onderwijskundige vernieuwingen en methoden. Zoals bijvoorbeeld het gebruik van een ‘CMS’. Voor het

management is het makkelijker de voortgang te controleren en dus op de hoogte te blijven van de laatste ontwikkelingen van het ontwerpproces.

De template is geëvalueerd door 4 groepen trainers en ontwikkelaars. De algemene reactie is erg positief, welke beschreven is in een apart hoofdstuk; Evaluatie en Conclusies. De conclusies en aanbevelingen gerelateerd aan dit onderzoek zijn samengebracht in het laatste hoofdstuk.

De onderzoeksvraag kan verdeeld worden in twee hoofddelen:

1. *“How can a training delivery team be involved from the start in the design process of new and updated course materials? What combination of different educational methods used by the course development team can support and stimulate the learning process?”*

Als aanbeveling hiervoor is de introductie van het template en implementatie van het template binnen de gehele trainings afdeling voorgesteld.

2. *“How can the latest information related to new or upgraded course materials be incorporated in new and existing products? How can trainers be utilized to better support the trainees (customers)? “*

Aanbevolen wordt om het team van ontwikkelaars te verdelen in E-learning experts en ontwikkelaars van regulier cursus materiaal. Hierdoor zullen de reguliere trainings materialen beter up to date zijn, beter te controleren en de trainers beter op de hoogte van vernieuwingen / veranderingen zodat ze interne en externe klanten beter kunnen begeleiden.

Appendix 1 Decision aspects table to help to choose your CMS

Education Did the learning environment help reach the educational goals?		
TRADITIONAL CLASSROOM ELEMENTS INCLUDE:	Available	Not Available
Accommodating the specialized needs of some students (learning styles, access issues, disabilities).		
Delivering instruction to students through lectures, labs, tutorials, readings and projects;		
Facilitating discussions among students in various forms (large group, small group, interest group);		
Grading student work based on projects, papers, attendance, participation and tests;		
Evaluating student understanding of content based on progress and/or participation in activities;		
WEB- BASED CLASSROOM ELEMENTS INCLUDE:	Available	Not Available
Carefully designed presentation of information;		
Intuitive navigation through content and activity areas for students;		
Facilitating Internet and Web-based communication (student/student, student/trainer, group);		
Providing for trainer and student accountability;		
Design of appropriate learning activities based on new delivery method;		
Grading and reporting access for students and trainers;		

Designing appropriate evaluation techniques for online delivery;		
Accommodating technical differences among student and trainer access;		
Providing for the specialized needs of some students (learning styles, access issues, disabilities).		
Ease of use Is the Web learning environment easy to use?		
DELIVERY	Available	Not Available
Compatible with existing University networking systems and software.		
Compatible with any browser.		
Built-in features for chat rooms, discussion forums, email, and/or bulletin boards.		
Can be used in synchronous or asynchronous instructional modes.		
Techniques & maintenance		
Did the Web learning environment technically function correctly?		
DEVELOPMENT	Available	Not Available
Uses intuitive user-interface for designing course materials.		
Requires no knowledge of HTML.		
Integrates HTML and multimedia materials designed with other tools.		
Provides built-in support and help.		
Facilitates pedagogically sound course design.		
Has flexible design features to accommodate diverse content, presentation and facilitation styles.		

Implements easy to use editing and revising functions.		
Allows development on any platform.		
Organization Was all needed expertise available?		
MANAGEMENT	Available	Not Available
Password capable for student/trainer/administrator access.		
Monitor student activity within site.		
Testing functions (automatic grading and mail-in).		
Storage and retrieval of student material and records.		

Appendix 2 Raised issues

1.	Restriction on being able to communicate with EE and (E) Development.
2.	Distance between departments
3.	No respect for each team's wishes
4.	Dev. don't care about what happens in class
5.	Trainer has to edit material quality and completeness
6.	No preview of training material being developed
7.	No passage of information about subsystem updates
8.	No practical training developed or available.
9.	No visibility of project planning from Dev.
10.	Little communication between the two groups
11.	Lack of support from development during first Delivery trainings
12.	Lack of opportunity for Del. To attend KT's
13.	EE special sessions are not delivered to Del. Gp.
14.	Lack of information by mail - are trainers on (needed) mailing lists
15.	Introduction of updates not planned and/or poorly communicated
16.	Del. Should be involved early in the development of new materials
17.	(See 13.)
18.	Not clear what is to be presented during Dev. Sessions
19.	Dev. Process not clear or even visible
20.	Dev. Presentations appear just to be slides imported from KT's, but no "developed" material added.
21.	Maintenance process for existing materials should be defined / be used
22.	Dev. Always too busy with "projects" to deal with basic material
23.	Delta training sessions not set at correct levels - appear to be for L4/5 audience
24.	Del. Not kept up-to-date with system developments
25.	Syllabus not correct w.r.t. delivered training
26.	E-learning and simulations are long running projects, lot of resources, but little progress.
27.	Official Material storage poorly done, several locations.
28.	Materials are often poor due to lack of quality control
29.	No way to ensure adequate and consistent depth of knowledge in training packages.
30.	No policy to determine level of content, requirement for detailed information not considered relevant
31.	No access or direction to material during development. Official materials in several different locations.
32.	No process or responsibility exists to ensure that the developed material is "acceptable" for hand-over
33.	No process exists to ensure measurable material quality.
34.	Too many differences in knowledge of subject
35.	Inconsistent responsibilities, L1 to L3 - Dev., L4 Del. Insufficient time for trainer, compared to Dev.
36.	Practical training certification objectives and suitability need reviewing
37.	Some L4 modules do not have "Framemaker" modules
38.	Dev. Presenters often unfamiliar with material and sequence of slides and have little subject knowledge
39.	The focus for Dev. Presentations not targeted at or scheduled for Trg. Del.
40.	Failure by Dev. Presenters to follow up on questions asked during presentation, promised

	feedback not given
41.	Some important changes in sub-systems and aspects of new machines not addressed in delta training
42.	No Metrology training given
43.	Dev. Presenters not up to date with practical topics, needing help from trainees
44.	Dev. Handover presentations too close together, not enough time to implement any necessary changes to material
45.	Procedures and lab guides should reflect the functionality of training machines, many procedures not suitable.
46.	Evaluation of Dev. Presentations should be reviewed by competency groups to identify problem areas
47.	Course pre-requisites and information should be defined for Dev. And Del.
48.	Delta training often carried out on unsuitable machines, giving little training value.
49.	Expectation management for trainees is poor or completely ignored.
50.	Pre-requisites are not enforced for individuals, often resulting in a lower standard of training for the group
51.	Dev. KPIs need visibility in order to allow Del. To understand their needs and priorities
52.	Dev. KPIs should reflect the needs of Del. As a customer
53.	Quality Management (QM) should be actively employed to allow the supplier/customer relationship to function.
54.	Lack of regular inter team meetings to identify and position the needs of both groups.

Appendix 3 Empty review list

Issue (See notes at bottom of spreadsheet)	Trainer 1	Trainer 2	Trainer 3	Trainer 4	Trainer 5	Trainer 6	Trainer 7	Trainer 8	Trainer 9	Trainer 10
Restriction on being able to communicate with EE and (E) Development.										
Distance between departments										
No respect for each team's wishes										
Dev. don't care about what happens in class										
Trainer has to edit material quality and completeness										
No preview of training material being developed										
No passage of information about subsystem updates										
No practical training developed or available.										
No visibility of project planning from Dev.										
Little communication between the two groups										
Lack of support from development during first Delivery trainings										
Lack of opportunity for Del. To attend KTs										
EE special sessions are not delivered to Del. Gp.										
Lack of information by mail - are trainers on (needed) mailing lists										
Introduction of updates not planned and/or poorly communicated										
Del. Should be involved early in the development of new materials										
(See 13.)										
Not clear what is to be presented during Dev. Sessions										
Dev. Process not clear or even visible										
Dev. Presentations appear just to be slides imported from KTs, but no "developed" material added.										
Maintenance process for existing materials should be defined / be used										
Dev. Always too busy with "projects" to deal with basic material										
Delta training sessions not set at correct levels - appear to be for L4/5 audience										
Del. Not kept up-to-date with system developments										
Syllabus not correct w.r.t. delivered training										
E-learning and simulations are long running projects, lot of resources, but little progress.										
Official Material storage poorly done, several locations.										
Materials are often poor due to lack of quality control										
No way to ensure adequate and consistent depth of knowledge in training packages.										
No policy to determine level of content, requirement for detailed information not considered relevant										
No access or direction to material during development. Official materials in several different locations.										
No process or responsibility exists to ensure that the developed material is "acceptable" for hand-over										
No process exists to ensure measurable material quality.										
Too many differences in knowledge of subject										
Inconsistent responsibilities, L1 to L3 - Dev., L4 Del. Insufficient time for trainer, compared to Dev.										

Practical training certification objectives and suitability need reviewing																				
Some L4 modules do not have "Framemaker" modules																				
Dev. Presenters often unfamiliar with material and sequence of slides and have little subject knowledge																				
The focus for Dev. Presentations not targeted at or scheduled for Trg. Del.																				
Failure by Dev. Presenters to follow up on questions asked during presentation, promised feedback not given																				
Some important changes in sub-systems and aspects of new machines not addressed in delta training																				
No Metrology training given																				
Dev. Presenters not up to date with practical topics, need ing help from trainees																				
Dev. Handover presentations too close together, not enough time to implement any necessary changes to material																				
Procedures and lab guides should reflect the functionality of training machines, many proceeedures not suitable.																				
Evaluation of Dev. Presentations should be reviewed by competency groups to identify problem areas																				
Course pre-requisites and information should be defined for Dev. And Del.																				
Delta training often carried out on unsuitable machines, giving little training value.																				
Expectation management for trainees is poor or completely ignored.																				
Pre-requisites are not enforced for individuals, often resulting in a lower standard of training for the group																				
Dev. KPIs need visibility in order to allow Del. To understand their needs and priorities																				
Dev. KPIs should reflect the needs of Del. As a customer																				
Quality Management (QM) should be actively employed to allow the supplier/customer relationship to function.																				
Lack of regular inter team meetings to identify and position the needs of both groups.																				

Check sum total 0 0 0 0 0 0 0 0 0 0 0

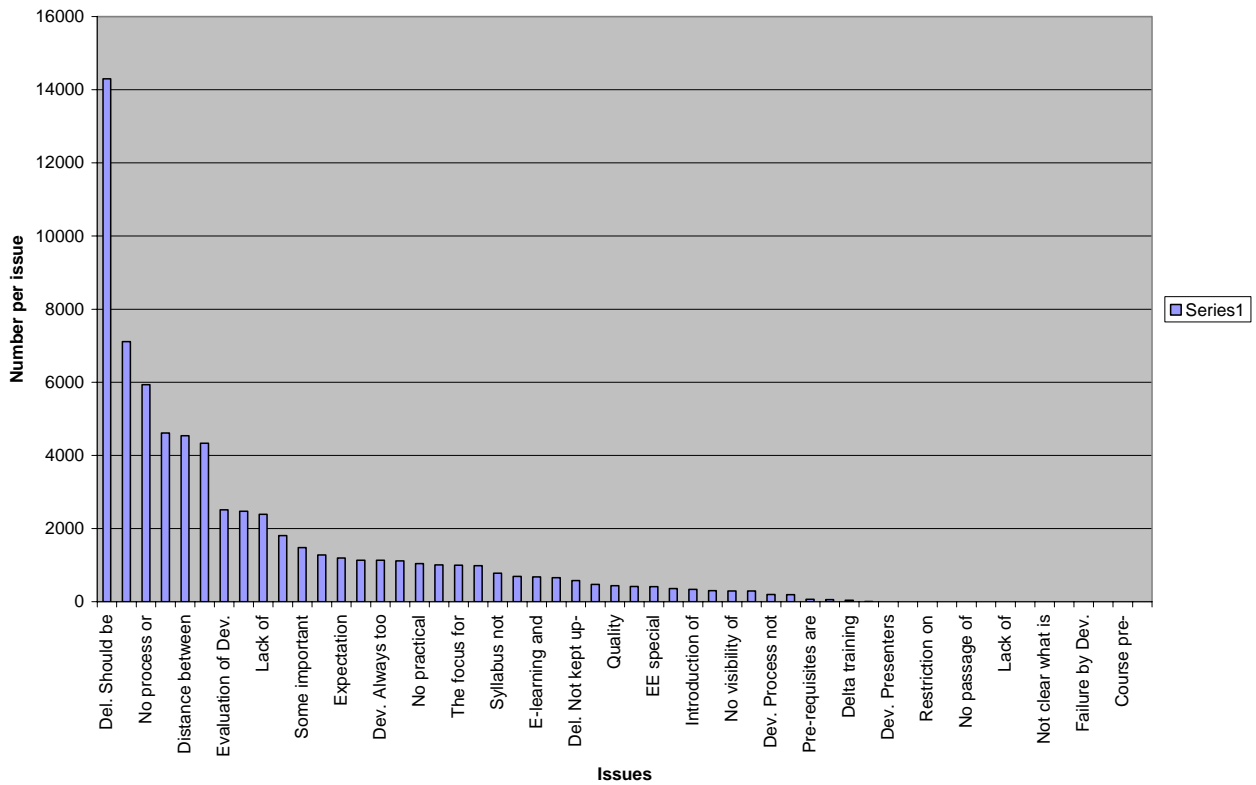
Notes:
 Select 20 items from the list above, and number in order of importance. (i.e. 1 = most imprtant, 20 = least important in the column below your name

Appendix 4 Filled Issue list sorted in order of importance

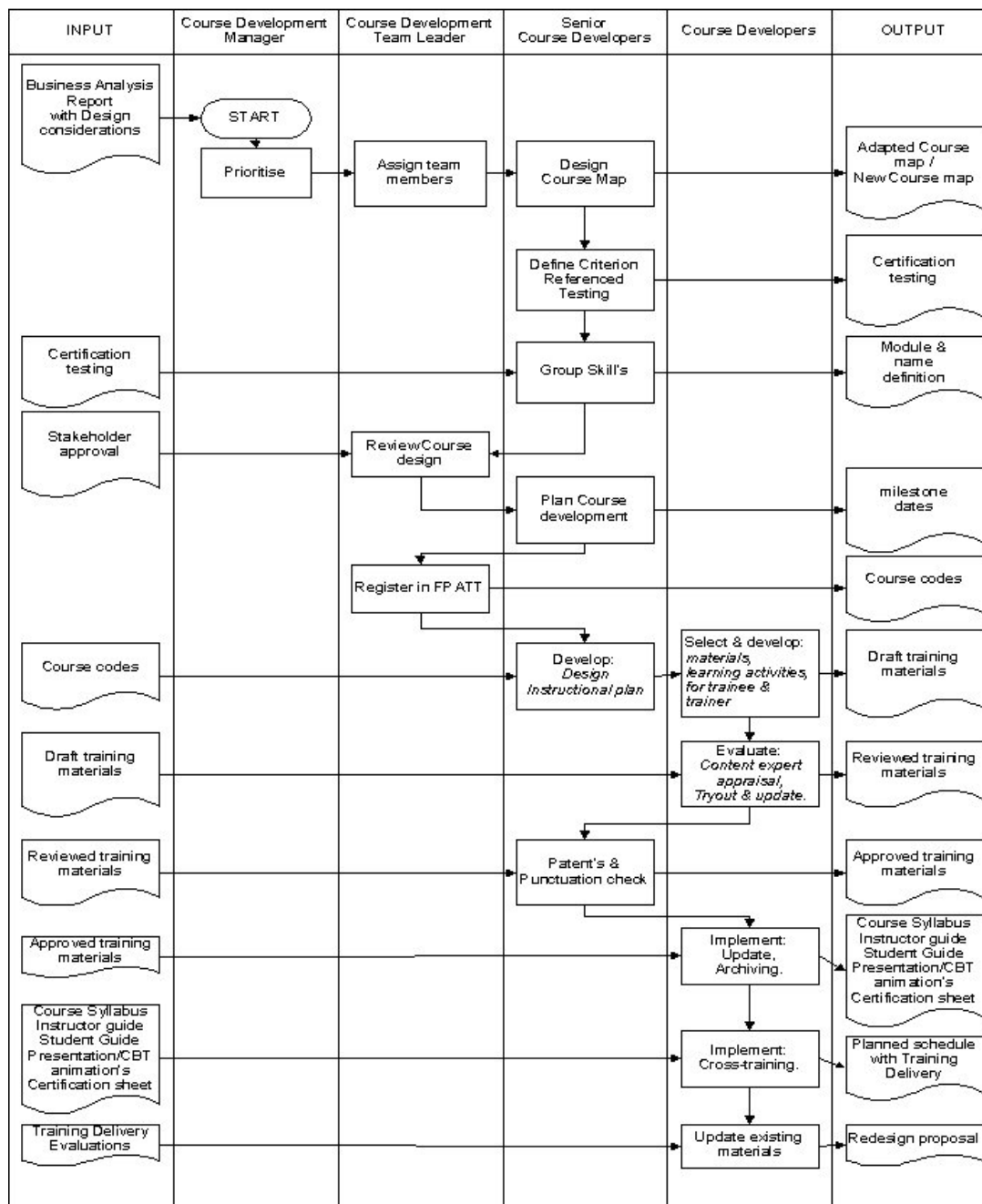
Issue (See notes at bottom of spreadsheet)	Trainer 1	Trainer 2	Trainer 3	Trainer 4	Trainer 5	Trainer 6	Trainer 7	Trainer 8	Trainer 9	Trainer 10	Total
Del. Should be involved early in the development of new materials	1		1		3	14	1	1	1	1	14297
No policy to determine level of content, requirement for detailed information not considered relevant		17	17	2	1	5	2	2	13		7112
No process or responsibility exists to ensure that the developed material is "acceptable" for hand-over	9	19	3	1	2			6	5	5	5935
Procedures and lab guides should reflect the functionality of training machines, many procedures not suitable.	2		2					4	3	14	4609
Distance between departments	11		9				4	18	10	2	4536
Dev. Presentations appear just to be slides imported from KTs, but no "developed" material added.		8	7	4	4	1	5	16		11	4336
Evaluation of Dev. Presentations should be reviewed by competency groups to identify problem areas			20		11		20	3	2	15	2511
Inconsistent responsibilities, L1 to L3 - Dev., L4 Del. Insufficient time for trainer, compared to Dev.		1			8		8				2476
Lack of opportunity for Del. To attend KTs	13	15	11		17	4	3	12	4	19	2392
Too many differences in knowledge of subject		2			12	9		7		12	1810
Some important changes in sub-systems and aspects of new machines not addressed in delta training						2					1477
Dev. Handover presentations too close together, not enough time to implement any necessary changes to material				15	9	3	7				1273
Expectation management for trainees is poor or completely ignored.			4	5	10	11	18				1193
Materials are often poor due to lack of quality control	7	13	5		6	16	16	14	9	9	1136
Dev. Always too busy with "projects" to deal with basic material	6	10	6	9		10	6	13	11	20	1134
Trainer has to edit material quality and completeness	8	5		8	20	6	9	11			1115
No practical training developed or available.	3				19			10			1044
Lack of regular inter team meetings to identify and position the needs of both groups.		18		20	14	20		19	19	3	1003
The focus for Dev. Presentations not targeted at or scheduled for Trg. Del.				3						13	1002
Some L4 modules do not have "Framemaker" modules		3									985
Syllabus not correct w.r.t. delivered training	4	11						9			781
Dev. don't care about what happens in class		4		13		13			20		692
E-learning and simulations are long running projects, lot of resources, but little progress.	5		16		13	12	10		16	8	678
No preview of training material being developed										4	656
Del. Not kept up-to-date with system developments	12		12	12		8	11	15	8	7	577
No process exists to ensure measurable material quality.		20	17			18	12	5	17		473
Quality Management (QM) should be actively employed to allow the supplier/customer relationship to function.					5						437
No way to ensure adequate and consistent depth of knowledge in training packages.		14	19	16		7	17	8	14	10	414
EE special sessions are not delivered to Del. Gp.		16	10	11			13		6		410
Maintenance process for existing materials should be defined / be used	10	9		19	15	17	19	17	7	16	361
Introduction of updates not planned and/or poorly communicated			8	7			14		18	18	340
Little communication between the two groups						15		20		6	300
No visibility of project planning from Dev.		6									291
Practical training certification objectives and suitability need reviewing				6							291
Dev. Process not clear or even visible		7			16						199
Dev. KPIs should reflect the needs of Del. As a customer					7						194
Pre-requisites are not enforced for individuals, often resulting in a lower standard of training for the group				10			15				65
Official Material storage poorly done, several locations.	14	12	15	18					15	17	57
Delta training sessions not set at correct levels - appear to be for L4/5 audience			18	14					12		39
Dev. KPIs need visibility in order to allow Del. To understand their needs and priorities				17							3
Dev. Presenters often unfamiliar with material and sequence of					18						2

slides and have little subject knowledge												
No Metrology training given						19						1
Restriction on being able to communicate with EE and (E) Development.												0
No respect for each team's wishes												0
No passage of information about subsystem updates												0
Lack of support from development during first Delivery trainings												0
Lack of information by mail - are trainers on (needed) mailing lists												0
(See 13.)												0
Not clear what is to be presented during Dev. Sessions												0
No access or direction to material during development. Official materials in several different locations.												0
Failure by Dev. Presenters to follow up on questions asked during presentation, promised feedback not given												0
Dev. Presenters not up to date with practical topics, need ing help from trainees												0
Course pre-requisites and information should be defined for Dev. And Del.												0
Delta training often carried out on unsuitable machines, giving little training value.												0
Check sum total	210	210	210	210	210	210	210	210	210	210	210	

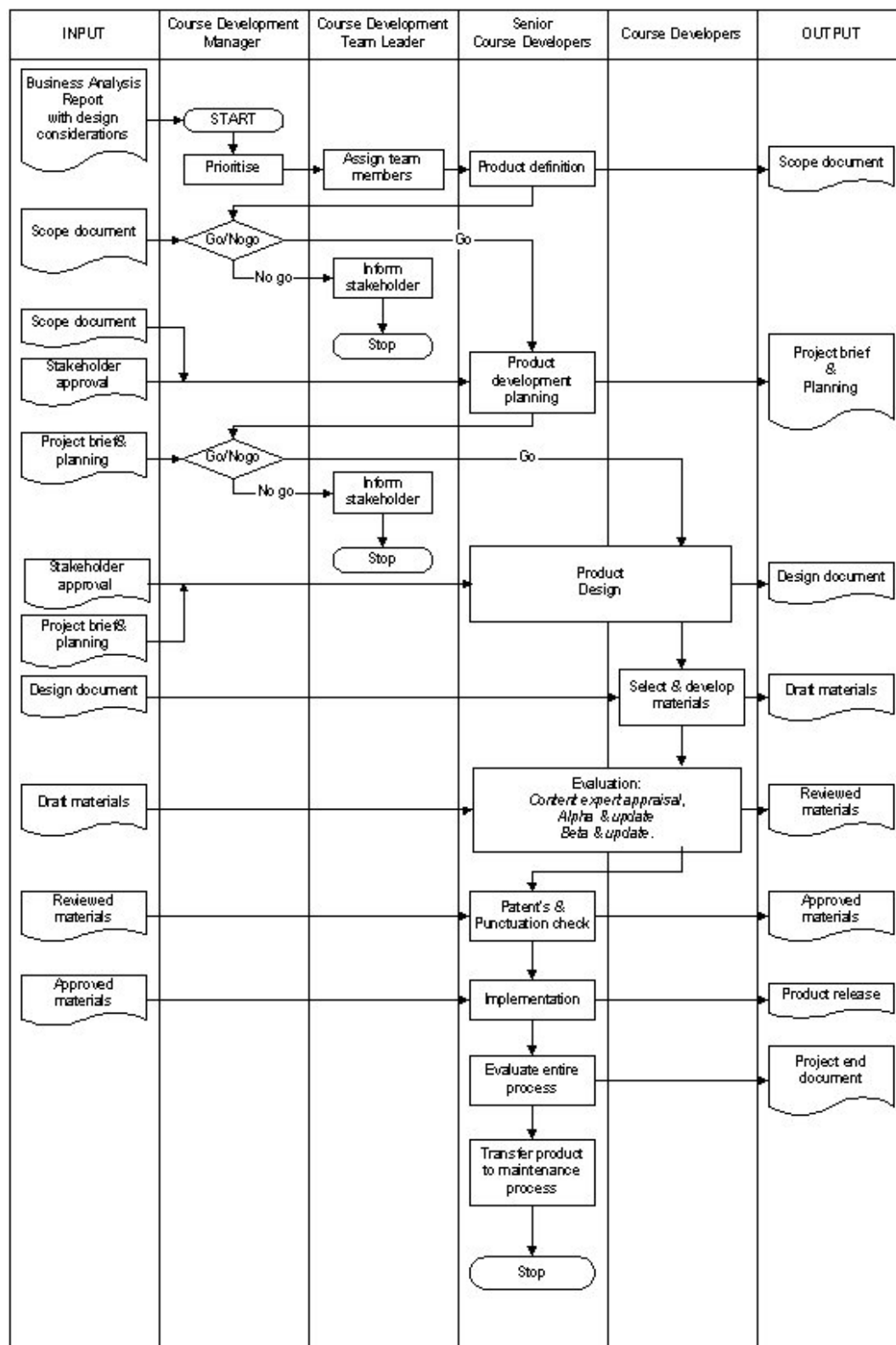
Total issue list



Appendix 5 Course development process



Appendix 6 Multimedia development process



Appendix 7 All the phases

Phase 0

- ⊕ 0 Introduction new product Analyze new product
 - 0.1 CSPL inform course developer manager and training manager about upcoming product
 - 0.2 Course developer manager and training manager define if topic need to be trained
 - 0.3 Course developer manager and training manager define if topic need to be added to existing or new course
 - 0.4 Course developer manager assign course developer to project
 - 0.5 Training manager assign trainer to project
 - 0.6 Training and course developer manager plan time for trainer and course developer

Phase 1

- ⊕ 1 Analyze training info (by sub matter experts)
 - 1.1 Sub matter expert inform training manager and course developer manager about KT session
 - 1.2 Training manager plan trainers to attend KT session
 - 1.3 Course developer manager plan course developer to attend
 - 1.4 Trainer and course developer attend KT session
 - 1.5 Course developer and trainer discuss and agree topics
 - 1.6 Trainer will open phase 3 for course developer

Phase 2

- ⊕ 2 Design course outline / syllabus course
 - 2.1 Course developer propose training plan
 - 2.2 Define Objectives
 - 2.3 Define training flow / timings
 - 2.4 Define cleanroom actions
 - 2.5 Define requirements
 - 2.6 Course developer send Course outline to trainer
 - 2.7 Trainer review and accept proposal and open Phase 4

Phase 3

- ⊕ 3 Design assessment and qualification sheets
 - 3.1 Design the qualification sheets (syllabus fine)
 - 3.2 Define assessment
 - 3.3 Course developer send assessment and qualification sheet to trainer
 - 3.4 Trainer review and accept proposal and open Phase 5

▫ Phase 4

- ⊕ 4 Develop course content
 - 4.1 Trainee module
 - 4.2 Trainer presentation
 - 4.3 Trainer Instruction guide
 - 4.4 Trainer lab guide
 - 4.5 Course developer materials to trainer
 - 4.6 Trainer review and accept materials and open Phase 6

▫ Phase 5

- ⊕ 5 Draft version review (course developer deliver training to trainer)
 - 5.1 Course developer versus trainer
 - 5.2 Discuss duration
 - 5.3 Discuss Certification sheets
 - 5.4 Discuss flow of materials
 - 5.5 Discuss Content
 - 5.6 Discuss schedule
 - 5.7 Trainer review and accept proposal and open Phase 7 and 8

▫ Phase 6

- ⊕ 6 Update all course materials
 - 6.1 By course developer
 - 6.2 Trainee module
 - 6.3 Trainer presentation
 - 6.4 Trainer instruction guide
 - 6.5 Trainer lab guide
 - 6.6 Course developer send updates to trainer
 - 6.7 Trainer review and accept updates

▫ Phase 7

- ⊕ 7 Implement real training
 - 7.1 Course developer delivers first class to trainees
 - 7.2 Prepare classroom
 - 7.3 Prepare trainee handouts
 - 7.4 Prepare trainer materials
 - 7.5 Prepare machine
 - 7.6 Trainer attend review course

- Phase 8
- ⊕ 8 Implement materials as E-learning content into CMS
 - 8.1 Discuss materials with administrator CMS
 - 8.2 Transfer objectives into CMS
 - 8.3 Transform trainings module into CMS
 - 8.4 Implement assessment questions into the CMS
 - 8.5 Trainer accept training materials

- Phase 9
- ⊕ 9 Evaluate course
 - 9.1 Discuss evaluation reports from trainees
 - 9.2 Discuss training flow
 - 9.3 Discuss Course content
 - 9.4 Discuss Course outline
 - 9.5 Course developer updates last details
 - 9.6 Trainer accept training materials

Appendix 8 the questionnaire “A changing pedagogy in learning at ASML”

Dear Colleague,

I would like to invite you to fill out the below survey related to the thesis I am writing. It's a survey on behalf of my study Education Design Management and Media at the University of Twente.

The thesis is related to your daily job activities wherefore you are selected to give your professional opinion.

The survey exists out of 40 questions and will take approximately 25 minutes.

If there are any remarks related to the questions please add these comments at the end with the question number mentioned.

The legend for the answers is:

1 NO	2 I don't know	3 maybe	4 yes	5 definitely yes
------	----------------	---------	-------	------------------

Your contribution is very important for my graduation and I would like to thank you already in advance for your cooperation.

AD

A changing pedagogy in learning at ASML

The problem statement of this thesis came into being by having a group interview where all trainers are involved. Out of the group interview the possible solution for the problem statement is proposed.

A new process in combination with a structured way of working in the form of templates will be designed to support the course developers and the trainer's.

The problem statement of the thesis is:

A training department should be working according a curriculum. In this curriculum there should be time planned to update trainers with all the new information what is developed or about the upcoming new materials. So a training department needs a process to modernize en development of new course materials and whereby the trainers are updated during the whole process of development.

General questions.

1. Are you satisfied with the way of working related to course development within the training department?

1	2	3	4	5
---	---	---	---	---

2. How often do you have contact with your course developer or trainer?
Daily, once a week, once in the two weeks, only when it's needed, seldom

3. For the trainer: Do you know what your course developer is developing now?

1	2	3	4	5
---	---	---	---	---

4. For the course developer: Do you inform your trainer about upcoming courses, or where you are busy with?

1	2	3	4	5
---	---	---	---	---

5. Who invite you to attend knowledge transfers from EE or D&E?

- a) Invited by Course developer /trainer,
- b) Invited by my manager
- c) Invited by EE and or D&E person
- d) Never invited

6. Do you ever attend Knowledge transfers from EE or D&E?

Yes always, Yes, Sometimes, never, not interested

Questions related to Course design.

7. Are you able to apply participatory design?

1	2	3	4	5
---	---	---	---	---

8. Looking at the template is there a difference related to the design approach at this moment?

1	2	3	4	5
---	---	---	---	---

9. Before use of the Template did you know about the ADDIE design model?

1	2	3	4	5
---	---	---	---	---

10. Do you recognize the 5 main course design phases of the ADDIE model in the 9 phases of the template?

1	2	3	4	5
---	---	---	---	---

11. Is the workflow / process of the template clear?

1	2	3	4	5
---	---	---	---	---

12. Is it clear what you have to do using the template?

1	2	3	4	5
---	---	---	---	---

13. Will there be a change in working? If so please select for which persons there will be a change in working when the template is implemented related to the way of working at this moment? (multiple selections possible)

- a) The trainer
- b) The course developer
- c) The manager
- d) The trainees
- e) Others.....

14. Do you have any concerns if the template will be used within the training department? Please select which concerns you have? (multiple selections possible)
- a) The role of the trainer
 - b) The role of the course developer
 - c) Course development in general
 - d) Planning
 - e) No concerns
 - f) Others.....
15. If you have any concerns please explain more in detail what your concern is?

16. Please select discrepancies you see when the template will be used related to the course development at this moment within the training department. (multiple selections possible)
- a) The role of the trainer
 - b) The role of the course developer
 - c) The way of working within the department
 - d) Course development
 - e) Training delivery
 - f) Others.....
17. Please select benefits you see when using this template? (multiple selections possible)
- a) Better hand over materials
 - b) Shorter cross training needed
 - c) Better course design
 - d) Shorter development time
 - e) No benefits
 - f) Others.....

Questions related to blended learning and learning scenarios.

18. What is a CMS?

- a) Course management system
- b) Clear management system
- c) Content material system
- d) Course material system

19. Can a CMS support you during your normal work?

1	2	3	4	5
---	---	---	---	---

20. Please select what you think blended learning is?

- a) Face to face training
- b) CBT
- c) Combinations of different educational methods
- d) No support of trainer needed
- e) All above
- f) Others.....

21. Do you see any problems using a CMS?

1	2	3	4	5
---	---	---	---	---

22. If you see any problems using a CMS please write down what your concerns are?

.....

23. If you look at the below learning scenarios, which scenario is most valid at this moment within the training department

- a) Scenario A
- b) Scenario B
- c) Scenario C
- d) Scenario D

<p>Scenario A: Back to basics: Trainees are visiting the training centre. Training will be given in the classical way, this means face to face contact between trainer and trainee and between themselves. The study program is divined by the training department and prepared by the trainer. For the internal customers (ASML employees) is the internal network (intranet) be used to support the training. Communication like invitations etc will be done with E-mail. So this is an organized educational program with classroom training</p>	<p>Scenario B: The global Campus: Trainees want to follow a structures educational program but want to follow this program from local office. The internet will be used to follow some theoretically programs. In this case trainees do not have to physically move to a training department. Very important for this way of education is the technical part of the whole setup etc. Trainees have to logon to an environment to get access to the courses, the course materials and to be able to apply for a course and later also to follow the course. Communication will be done through the site and or portal of the training department (LMS).</p>
<p>Scenario C: Stretching the Mold The trainee does not need to be personally involved with the study program but want to decide there self how and where to follow the course. Face to face of remote. The trainee wants to make his/here own study planning with or without decide in consultation of the trainer. The internet will be the most valuable communication resource. The technology is then also very important.</p>	<p>Scenario D: The new economy The trainee can decide everything by them self. The trainee wants to make all the decisions them self related to the education program they want to follow or attend. The trainee is well informed about the different trainings and which are important to attend for his/here future development. Trainee has a good communication with the training department or study advisor (boss) to define which trainings need to be attended. Most information about the courses, prerequisites etc will be vested by the internet. All information related to the courses need to be available through the internet in a portal or learning environment. The trainee wants to follow only these parts which he or she things it's important to follow.</p>

24. Which scenario will fit best within the training department when the template is be implemented?

- a) Scenario A
- b) Scenario B
- c) Scenario C
- d) Scenario D

Questions related to how you think the template can support you when the template is implemented:

25. Do you think that the trainer will be earlier involved in the course development process.

1	2	3	4	5
---	---	---	---	---

26. Will the control of the quality of the materials be improved?

1	2	3	4	5
---	---	---	---	---

27. Can the duration for hand over the materials from course developer to trainer be shorter?

1	2	3	4	5
---	---	---	---	---

28. Do you think that the collaboration between the course developer and trainer will be improved?

1	2	3	4	5
---	---	---	---	---

29. Will the quality of the course materials be improved?

1	2	3	4	5
---	---	---	---	---

30. Can the template help to shorter the total development time of course materials?

1	2	3	4	5
---	---	---	---	---

31. Do you understand the role of the trainer?

1	2	3	4	5
---	---	---	---	---

Questions related to the 9 phases of the template.

Are the concept and terminology clear for the phases within the template?

32. Phase 1 Do you know who your Sub matter expert is?

1	2	3	4	5
---	---	---	---	---

33. Phase 2 Do you know what objectives are?

1	2	3	4	5
---	---	---	---	---

34. Phase 3 is it clear what is meant with “define assessment”?

1	2	3	4	5
---	---	---	---	---

35. Phase 4 Do you know what a “trainer instruction guide” is?

1	2	3	4	5
---	---	---	---	---

36. Phase 5 is this review phase important to have?

1	2	3	4	5
---	---	---	---	---

37. Phase 6 do you understand what is meant with the lab guide?

1	2	3	4	5
---	---	---	---	---

38. Are the steps in the “more info for phase 7 “clear?

1	2	3	4	5
---	---	---	---	---

39. Phase 8 do you know who to contact to implement course materials into the CMS?

1	2	3	4	5
---	---	---	---	---

40. Phase 9 in the “more Info” Section is mentioned that the course materials need to be archived into the ASML archiving system; do you know which system this is and how to do this?

1	2	3	4	5
---	---	---	---	---

Thanks for filling in this questionnaire. If there is anything what you want to add or miss within the template please write these down below. If it is related to one of the questions also add the question number.

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