

# IMS Learning Design



Rob Koper

Educational Technology Expertise Centre

Open University of the Netherlands

[www.learningnetworks.org](http://www.learningnetworks.org)

IET Seminar, September, 24<sup>th</sup> 2003

**Open**UniversiteitNederland

# Content

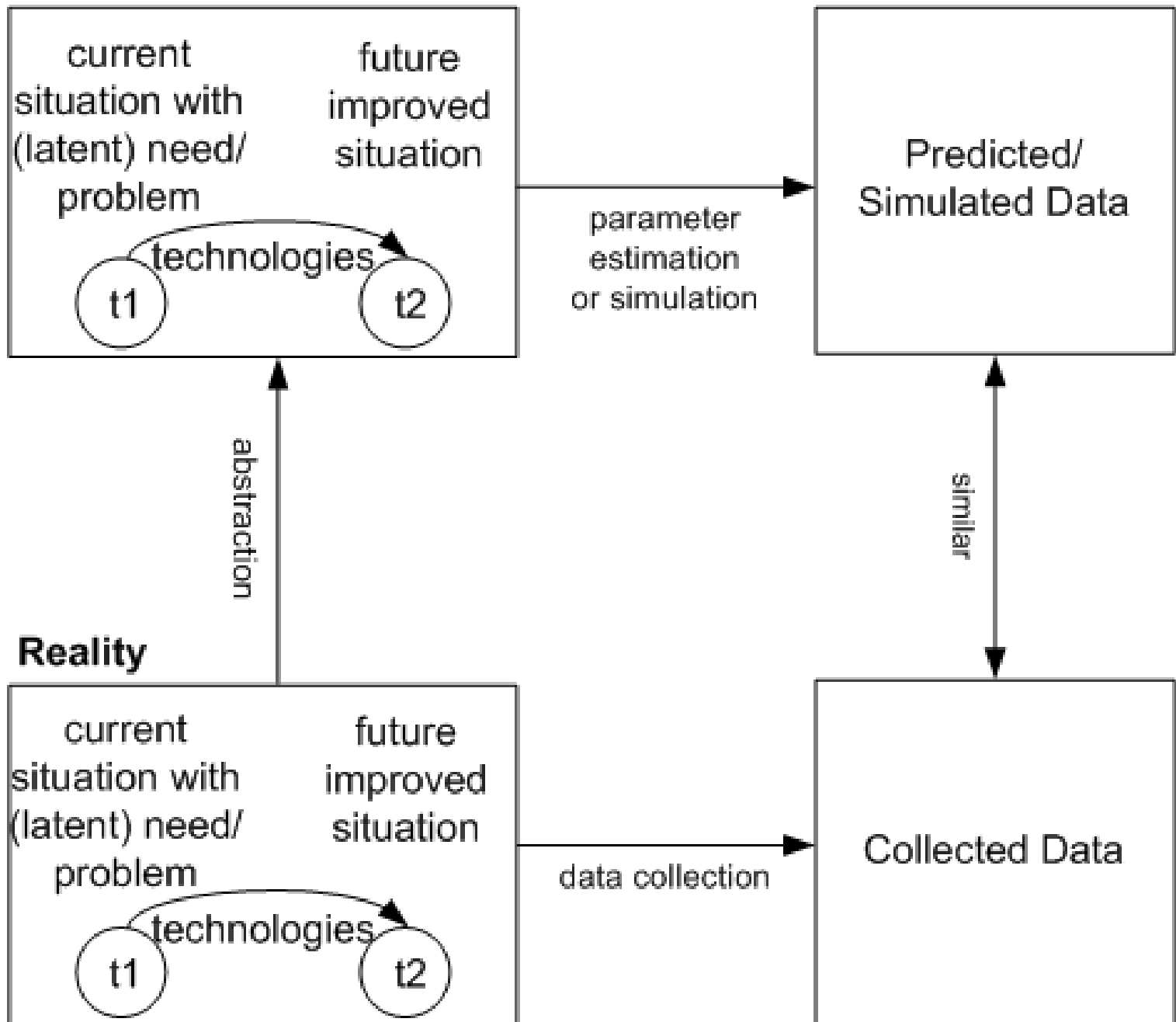
1. Innovation Model
2. IMS Learning Design (IMS LD)
  - what is IMS LD?
  - what problems does it address?
  - how/what developed
  - implementation issues
3. After break: more detailed discussion for interested people

# RTD into Learning Technologies

General Method:

1. Identify Current **Problems and Needs**
2. Create a **Change Model** that states (abstract) how the future use of some technologies can solve the problem.
3. Predict/estimate **results**
4. **Evaluate** change model by developing & applying prototypical technologies in practice and measure change
5. When successful: start **implementation**

## Change Model



# Development of Educational Modelling Language (EML) & IMS Learning Design

1. Basic Problems
2. Approach (Change Model)
3. Validation
4. Standardisation (from EML to IMS LD)

# Basic Problems

## General

1. Develop and deliver higher quality courses based on:
  - new learning design principles and
  - use of new technologies
2. Decrease costs, increase quality & flexibility
3. Decrease complexity, increase ease of use
4. Faster run through cycle:  
course development, delivery and assessment,  
including evaluation data for all components
5. No dependency on IT software/hardware providers  
(use of standards)

## Basic Problems

# Course Development

1. Be able to **improve the pedagogical quality** (e.g. new learning models based on constructivist principles/ competency based)
2. Be able to **reuse and share** course components
3. More/better **feedback** on actual use/success
4. Be able to **update faster**.
5. Be able to include **more and better** interactivity, collaborations and multimedia elements with ease
6. Be able to **collaborate better** with external parties, including consortium partners in Digital University
7. Be able to analyze effective **course patterns**

# Basic Problems

## Course Delivery

1. Be able to provide effective courses for heterogeneous groups of learners:  
**personalization/adaptation**
2. Be able to provide **courses on demand**:
  - a. arranged *content* adapted to need
  - b. use the *media* that suits the learner situation
  - c. adapt courses for use in other *settings*
3. Be able to have **easy and integrated access** to the content & services provided in a course
4. Decrease the **workload of staff** in tutoring, in the context of more flexibility and interaction



# Basic Problems Assessment

1. Be able to **integrate learning and assessment**
2. Base tests on more generic **competence levels** than on specific course configuration
3. Be able to **use new and alternative forms** of assessment
4. Be able to deliver tests in a **variety of settings** and formats (e.g. online testing)
5. Be able to compose tests based on **item banks** from different **collaborating** faculties and institutions (test interoperability)

**The approach:**

# Educational Modelling Language/IMS LD

**Basic Idea:**

Develop a 'language' to describe the content and processes within courses in a formal, semantic way, so that it is understandable by humans and can be interpreted by computers.

Compare: music notation

This description should be independent of any delivery platform => can be deployed in any platform that provides the adequate functionality

# Example semantic 'language'

Presentation oriented

```
<page>  
  <title>Study Task</title>  
  <p>Read problem and analyze it with your peers.</p>  
</page>
```

Semantic

```
<study-task>  
  <title>Study Task</title>  
  <description>Read problem and analyze it with your  
  peers.</description>  
</study-task>
```

# Some problems to solve when developing such a language

- What to model in the language?
  - \* The pedagogical structure of course?
  - \* The content domain structure of the course?
  - \* The workflow in the course?
- How specific must the language be?
  - \* For every pedagogy a different language?
  - \* Or, a more generic 'meta language'?
- How do we test the language?
  - \* build systems for every trial and have pilots?
  - \* test it with paper based prototypes?

## Some first experiments. Outcome:

- Specific solutions will need specific technologies. Too much work (update, adaptation, software, ..) So: focus on generic solutions.
- Concentrate on the pedagogical structure and workflow in a course. Not on domain.
- Develop an abstract (so-called 'meta model') of pedagogical structures and workflow of courses, instead of a specific model for every pedagogy.
- Formal design requirements where defined: ->

# Design Requirements for 'language'

- R1. Completeness (all content + process for all roles)
- R2. Pedagogical Flexibility (abstract meta-model)
- R3. Personalization (designed adaptation)
- R4. Formalization (interpretable by computers)
- R5. Reproducibility (create runs from same source)
- R6. Interoperability (independent of vendor/standards)
- R7. Compatibility (integrate existing standards)
- R8. Reusability ((de-)contextualize components)

# Outcome

## EML and IMS Learning Design

### In Short

- Objective of EML/LD is to model complete *Units of Learning* (courses) that can be transferred to different systems and contain the complete description of its designed content and process.
- IMS LD is a new standard from IMS (February 2003), based on EML (Educational Modelling Language; published December 2000)
- Provides an integrated framework for different other IMS specifications (incl. LOM, QTI, LIP, CP, RCD, SS)

How does it work?  
Basic Procedure and  
some basic concepts



# Overview of Learning Design Process

1. Selection of Knowledge Domain, Context/Setting, Objectives, Target Group
2. Selection/design of suitable Pedagogical Model
3. Select/design Learning Design Model
4. Content Selection and Design
5. Services Selection and Design
6. Integration of Learning Design, Content and Service Specifications in a Course Package

## *Outcome:*

‘Unit of Learning Package’ that can be transferred and interpreted by computers to deliver the course

# What is a pedagogical model ?

- A method that prescribes *how* a class of *learners* can *achieve* a class of *learning objectives* in a certain context and knowledge domain
- E.g. a method describing:
  - \* How adults learn Spanish as a second language
  - \* How engineers learn mathematical skills
  - \* How to learn the skill to defend verdicts in a law court?
- Formal and Informal Pedagogical Models (e.g. problem based learning, active learning, ...)

# What is a Learning Design?

- An *instance* of a pedagogical model:  
a concrete application of a pedagogical model for a specific target group, for specific learning objectives and a specific domain and setting.
- The learning design specifies the specific workflow and content in the learning process:

*which role has to performs which activities, using which resources and services in which order, to attain the learning objectives in the best way, taking care of individual differences*

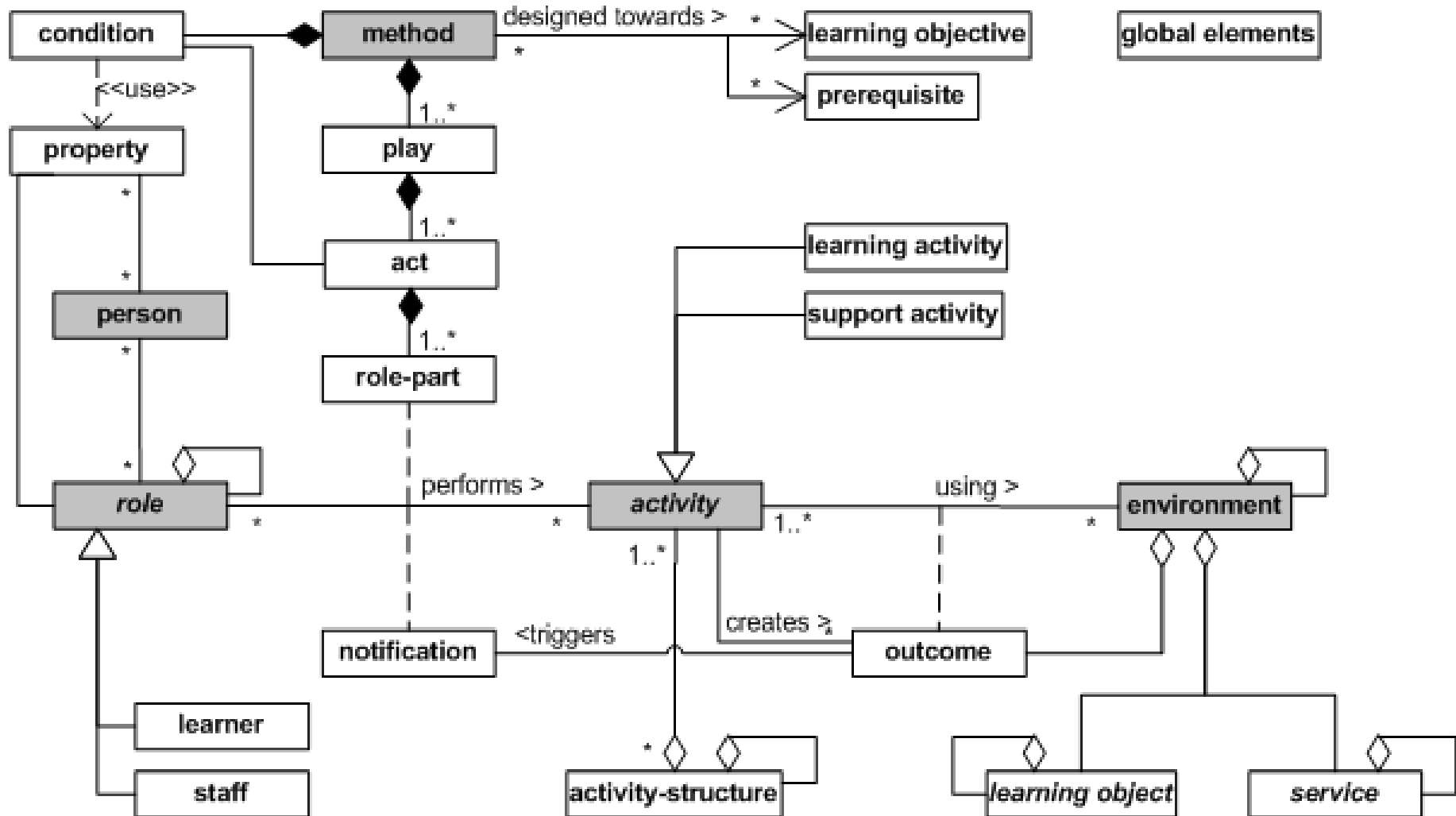
# How to attain Pedagogical Flexibility?

Several approaches possible:

- a. New formal LD specification for every pedagogical model. E.g. a spec for competency based learning, collaborative learning, mastery learning, ...
- b. A 'meta-model' approach which is an abstraction of the different newer and older pedagogical models. Similar: abstract modelling approaches.

Latter approach is selected (after experiments with the first one)

# learning design

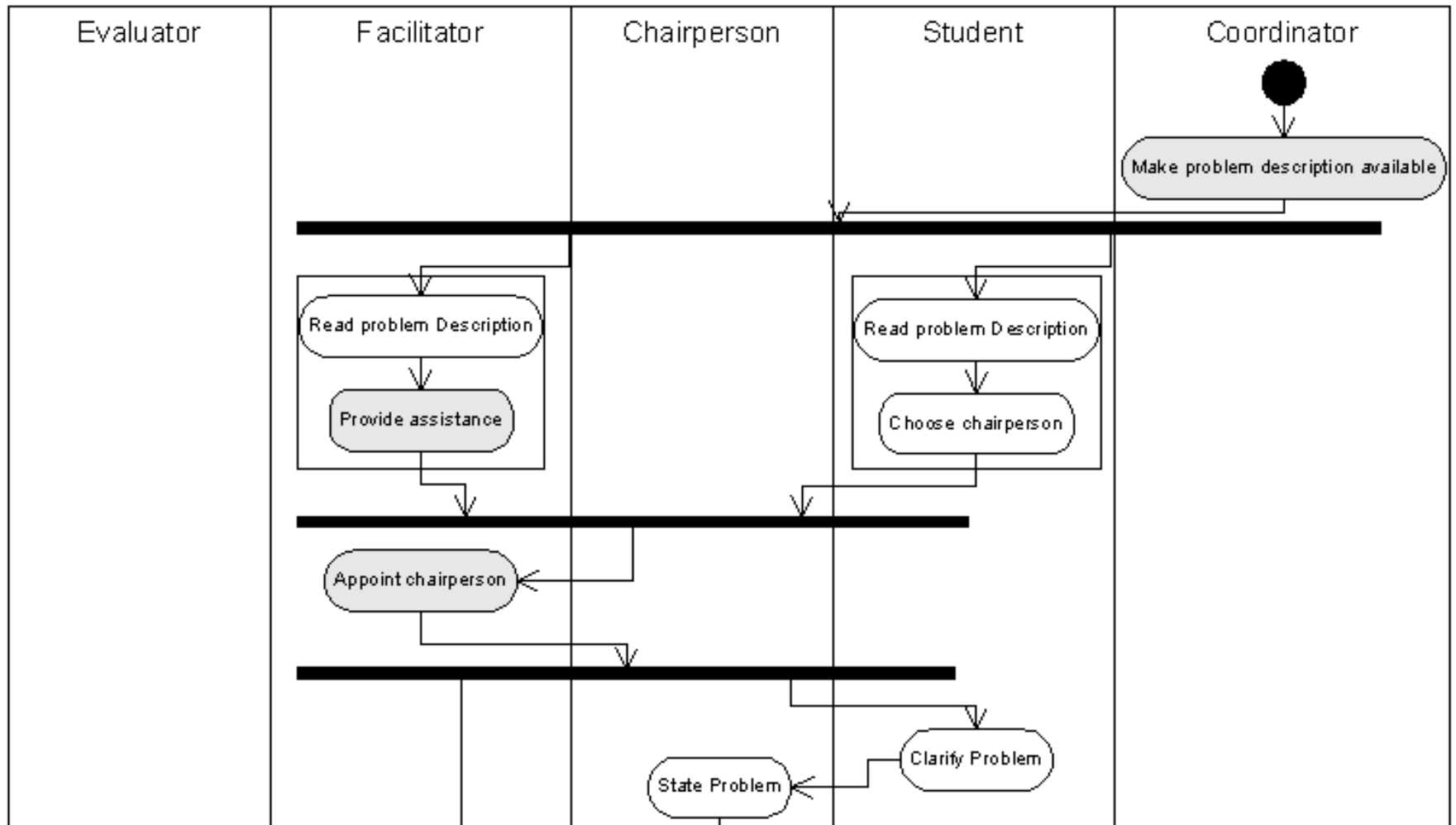


# Authoring LD

Several Approaches, example:

- Narrative of the course (free text story, focussing on the processes and resources within the course)
- Analysis of Narrative in terms of roles, activities, environments (IOs & Services) and workflow Representation in Activity Diagram

# Activity Diagram



(continued)

- Coding/selecting/adapting LD with special editor
- Creating/selecting appropriate resources/services
- Package it
- The package can be imported into a variety of LD compliant players.



# Possible

- To use the same Learning Design with different resources (works as a 'course model')
- To use the same resources with a different Learning Design (adaptation to different target groups)
- To create alternative packages on demand for different settings and a different mediamix (e.g. more print)
- To create (automatically) individual packages (current RTD work)
- To analyse patterns in LD coded courses and relate it to study success and other factors

How does it work technically?

# Content Packaging & Learning Design

## PACKAGE

### Manifest

Meta-data

Organizations:Organization

Resources:Resource

(sub)Manifest

### Physical Files

The actual content: HTML,  
Media, Activity descriptions,  
Collaboration and other files

## Unit of Learning

### Manifest

Meta-data

Organizations:L. Design

Resources:Resource

(sub)Manifest

### Physical Files

The actual content: HTML,  
Media, Activity descriptions,  
Collaboration and other files

```
<manifest>
  <metadata/>
  <organizations>
    <learning-design xmlns="[standard-namespace-
for-learning-design]">
      [add learning design elements here]
    </learning-design>
  </organizations>
  <resources/>
</manifest>
```

## Learning technologies

### *Introductie*



### *Wat doen?*

#### *Wat zijn standaarden?*

We beginnen de workshop nu door u wat aan het denken te zetten en uw voorkennis te inventariseren.

Probeer u eens na te denken over de volgende vragen. Ze zijn als u nieuw bent in dit veld niet gemakkelijk. Toch is het van belang goed na te denken welke denkbeelden en associaties u heeft met deze onderwerpen. Later krijgt u de mogelijkheid om het antwoord te herzien.

#### **vraag**

Wat zijn volgens u standaarden? Probeer een definitie te geven.

Standaarden zijn afspraken om een  
bepaalde manier te werk te gaan

- voordat u begint
- oriëntatie
- historische route
- New Orleansstijl
  - blues
  - rags**
  - songs
  - New Orleans
- swing
- tussentijdse reflectie
- bebop
- free jazz

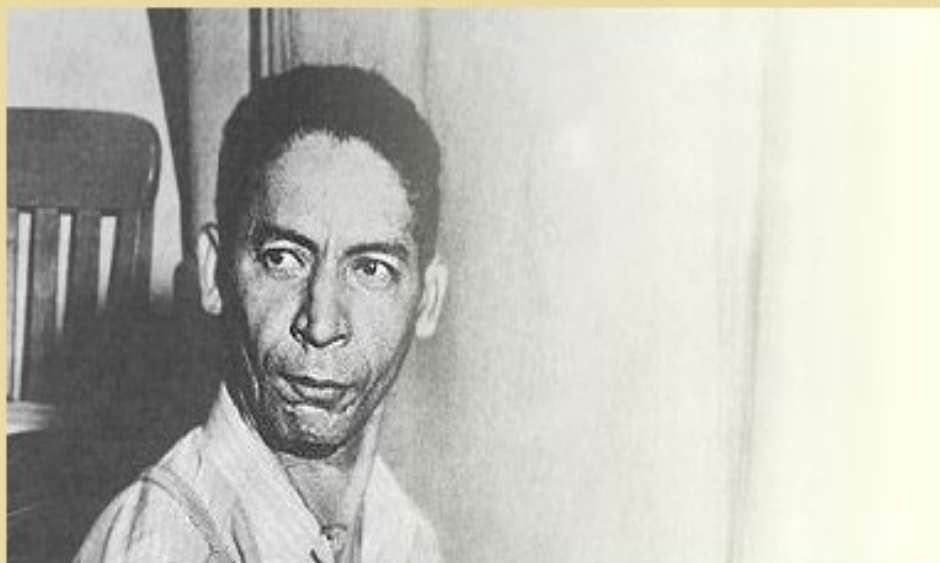
me).

siceren) kende zijn hoogtepunt rond 1910, dus jazz. De rag heeft dan ook een belangrijke rol van de jazz. Belangrijke verworvenheid van de een ritmisch onafhankelijke melodielijn tegen , wat uiteindelijk geleid heeft tot een van de jazz, namelijk de **swing** . Verder is er ook het n veranderen van de melodie, wat in de jazz zal , die andere wezenlijke kernmerk.

orbeeld uit de ragstijl.



Maple Leaf Rag (1916) van Scott Jopling



## Antwoorden op vragen doornemen

### *Wat doen?*

#### **nieuws**

*Ga voor onderlinge discussies tussen de cursusdeelnemers naar:  
<http://www.groupware.ou.nl> Log in met je acroniem en  
studienetwachtwoord.*

Samen met de hele groep gaan we nu de vragen stuk voor stuk doornemen en daarbij kijken naar elkaars antwoord. U kunt uw antwoord bijstellen op grond van de bespreking.

- Wat zijn standaarden?  
**Antwoord van de groep**

Uw antwoord:

Standaarden zijn afspraken om een  
bepaalde manier te werk te gaan.

ok

# How we tested the model

- Make different runtime systems and real education in different institutes
- Ask use cases from all around the world about their preferred and used learning designs (some of them are in the best practice guide of the IMS specification)
- Surveys and evaluations with students, teachers and developers
- We are still working on the validation (Alfanet Project, Analysis of IMS LD patterns from actual courses)



# Current status and activities

- Collaboration with Perot Systems, Edubox 3.0
- This month: 9 new full OU courses in production in Edubox
- Work on open source engine for Learning Design
- ...

## Problems:

- the tooling of the authoring environment
- Standards for the smooth integration within existing IT environments (testing, student administration, etc.
- More experience in the work processes (all is new)

# Looking back at the problems

1. Course Development
2. Course Delivery
3. Assessment

## Basic Problems

# Course Development

1. Improve pedagogical quality and consistency
2. Reuse/Share course components
3. More/better feedback on actual use/success
4. Faster update
5. Increase interactivity, collaborations and multimedia
6. Collaborate better with external parties (DU)
7. Analyze effective course patterns & models

# Basic Problems

## Course Delivery

1. Heterogeneous groups of learners:  
personalization/adaptation
2. Courses on demand:
  - a. arranged *content* adapted to need
  - b. use the *media* that suits the learner situation
  - c. adapt courses for use in other *settings*
3. Easy access to different services provided in a course
4. Decrease the workload of staff in tutoring, in the context of more flexibility and interaction

# Basic Problems

## Assessment

1. Integrate learning and assessment
2. Base tests on more generic competence levels
3. Be able to use new and alternative forms of assessment
4. Deliver tests in a variety of settings and formats
5. Be able to compose tests based on item banks from different collaborating faculties and institutions (test interoperability)

# Some References

- IMS LD (download [www.imsglobal.org](http://www.imsglobal.org))
- [www.learningnetworks.org](http://www.learningnetworks.org) ([eml.ou.nl](http://eml.ou.nl))
- Koper, E.J.R. (2003). Combining re-usable learning resources and services to pedagogical purposeful units of learning. In A. Littlejohn (Ed.), *Reusing Online Resources: A Sustainable Approach to eLearning* (pp. 46-59). London: Kogan Page. ISBN 0749439491
- Jochems, Van Merriënboer & Koper (Eds) (2003;in press). *Integrated eLearning*. London: Kogan Page.
- Rory McGreal (2003;in press). *Reusing Learning Objects*. London: Kogan Page.

End