

# The Evolving Challenges of Virtual E-ducation Components and Agents

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**Information &  
Communication  
Technology Teaching  
at K.U.Leuven**

30 years

**Faculty of  
Sciences:  
COMPUTER  
SCIENCE**

**Faculty of  
Applied Sciences:  
ENGINEERING  
COMPUTER  
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**Faculty of  
Economics  
& Applied  
Economics:**

**BUSINESS  
ENGINEERING  
in  
INFORMATION  
SYSTEMS**

## Business Information Systems Group Research Topics

- The development of Software Applications, including Systems Analysis and Design.
- Database Management Systems, Data Mining and Data Warehousing.
- Knowledge Based Systems, including Decision Tables and Fuzzy Logic.
- Groupware, Office Systems and Workflow Management.
- Economics of Information Systems, and Systems Management

## General curriculum Information Systems courses

- Y1: Introduction Information Technology & Systems
- Y2: Introduction Information Systems Management
- Y3: Management Information Systems
- Y4: Methods Systems Analyses
- Y5: Economics of Informations Systems

## INTRODUCTION TO INFORMATION TECHNOLOGY & SYSTEMS

- First year class
- 60-hours, compulsory computer course for pure economics, applied economics and business engineering students
- 2 major goals:
  - \* Insight in current state-of-the-art of I.C.T., sufficient to judge in business applications.  
*Emphasis on Platforms and Networking*
  - \* Learn basic mechanisms to understand and construct computer applications.  
*There are 2 additional courses on Databases and (standard) Office software*

## Traditional E-ducation Environment **Realities...**

- The users need a minimal hardware and software infrastructure on their workstations (processor speed, disk space, memory size, workstation operating system version, sufficient Internet access bandwidth, etc...)
- The (educational) support staff may suffer from a serious load in terms of installation questions, in particular for a large number of students. In the extreme case this may even become a bottleneck for the actual educational support.
- The cost for setting up the distribution mechanism (CD production, or Web-site(s) for downloading.
- The CD as well as Web-Download distribution results in multiple, potentially conflicting versions of the education environment that must be supported.
- The CD distribution typically requires additional Web-distribution for corrections, modifications and additional exercises.

## New Generation E-ducation Environment *Requirements*

- The education environment should have a simple installation and configuration procedure.
- The education environment should provide maximal Usability for the students, based on intuitive as well as defensive style of User Interfaces.
- The education environment should provide clearly structured, step-by-step simple exercises.
- The education environment should allow the student to construct solutions for the exercises, whereby the education environment should contain hints and/or guidance in the construction of the solutions.
- The education environment should support maximal automation in the process of creating, changing, maintaining and distributing exercises.
- The education environment should require minimal maintenance from a technical infrastructure point of view.
- The education environment should integrate in a frictionless fashion with other Internet or Intranet based education tools

## Context Requirements for Web Service-based E-ducation

- when the education environment has clearly isolated “user sessions” and has the capability of distinguishing and maintaining the usage data of multiple users within the same environment.
- in case a simple user interaction, preferably on the basis of forms is used. In particular, not all current Windows-based user-interactions can be easily transformed into a Web-interface.
- when XML documents can be processed by the education environment, or XML formats can be used to import and export information with the education environment.
- when there is no need to store and maintain local data about the user on the user workstation.



## Total Cost of Ownership Shifts

Potential TCO reductions	Party	
	Student	Educational Staff
Lower Equipment Costs	X	
Lower Software Costs	X	X
No Installation Costs	X	
No Installation Support Costs		X
Flexible Access to the E-Learning application (any thin client Web Browser)	X	X
Better reliability of the E-Learning application	X	
Lower Software Distribution Costs		X
Flexible maintenance of the E-learning software and exercises		X
E-Learning environment can reach more students		X

## Type of exercises: User Interface

- Description of the exercise:
  - “Create a program that displays Hello World”
- Part of the program:

```

Class
  ROOT_CLASS
Creation
  make
Feature – Initialisation
  make is
    -- Creation Procedure
    do
    ...
  end
End – class ROOT_CLASS
  
```

# EIFFEL EDUCATION ENVIRONMENT

- “Fill-in exercise”

```
indexing
description: "System's root class"
note      : "Initial version automat..."

class
  ROOT_CLASS

creation
  make

feature -- Initialization
  make is
    -- Creation procedure.
    do
      io.putstring("hello mama")
      io.readline
    end
end -- class ROOT_CLASS
```

Welcome to "http://eee.econ.kuleuven.ac.be"

For technical information, contact: [manu.debacker@econ.kuleuven.ac.be](mailto:manu.debacker@econ.kuleuven.ac.be)

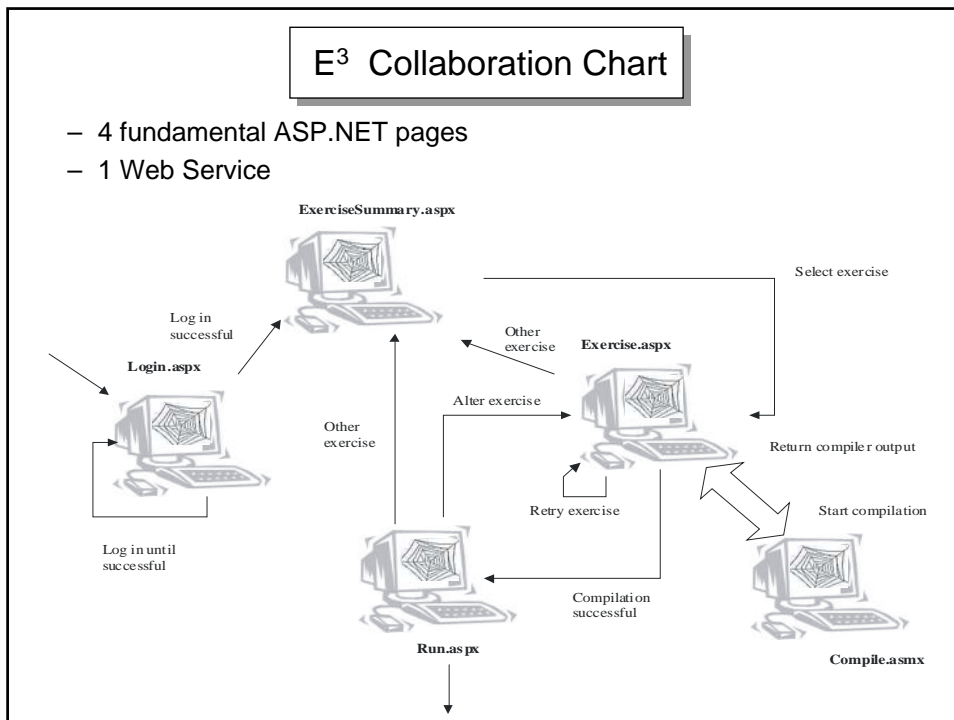
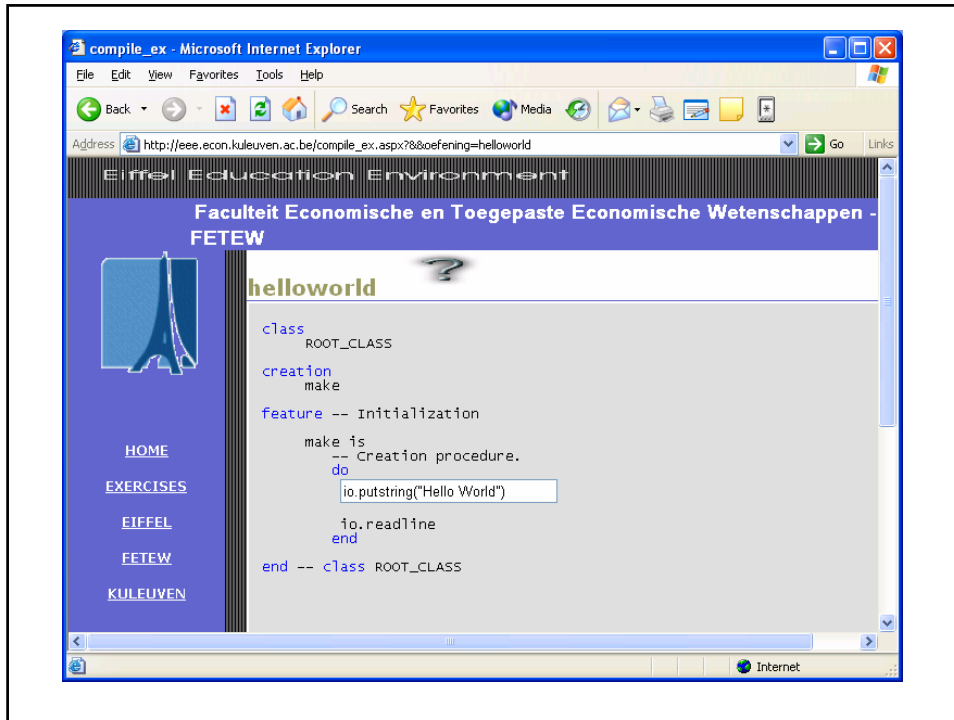
For user information, contact: [Monitoraat Informatica](#)

**User Login**

Username: manu  
Password:

Sign-in

To start the Eiffel Education Environment, simply add your **username** and **password** and push the login button. For questions and comments click the link "contacts"



## Web Services Based Education Environment Experience

- The Web Service based environment can serve a community of 900 students (with typically 30 to 50 concurrent sessions) with a 500 Mhz-based Pentium Server, at 512 MB of main memory. Disk space is managed by “flushing” all the user files overnight (compiled materials only).
- Significant improvements have been observed in the student results after the introduction of the Web Services based E-Learning environment. The Department of Applied Economics has 2 types of students, Applied Economics and Business Engineering students. The following table summarises the improvements for the same type of exams :

Average Exam Results	Before E <sup>3</sup>	After E <sup>3</sup>	Improvement
Applied Economics	8,1 / 20	9,3 / 20	15%
Business Engineers	9,3 / 20	11, 1 / 20	19%

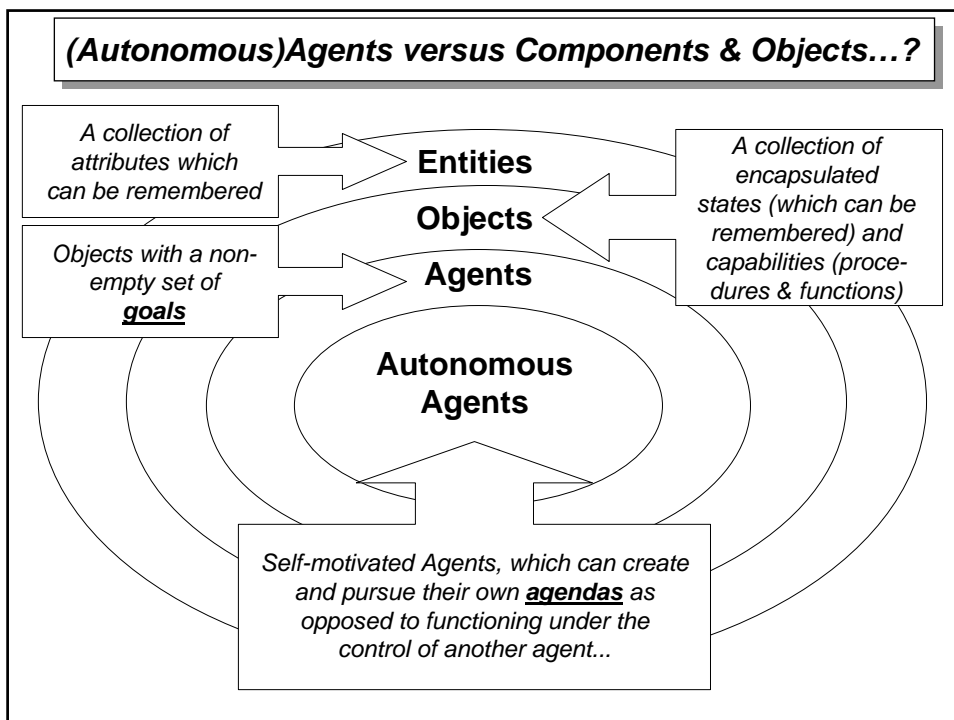
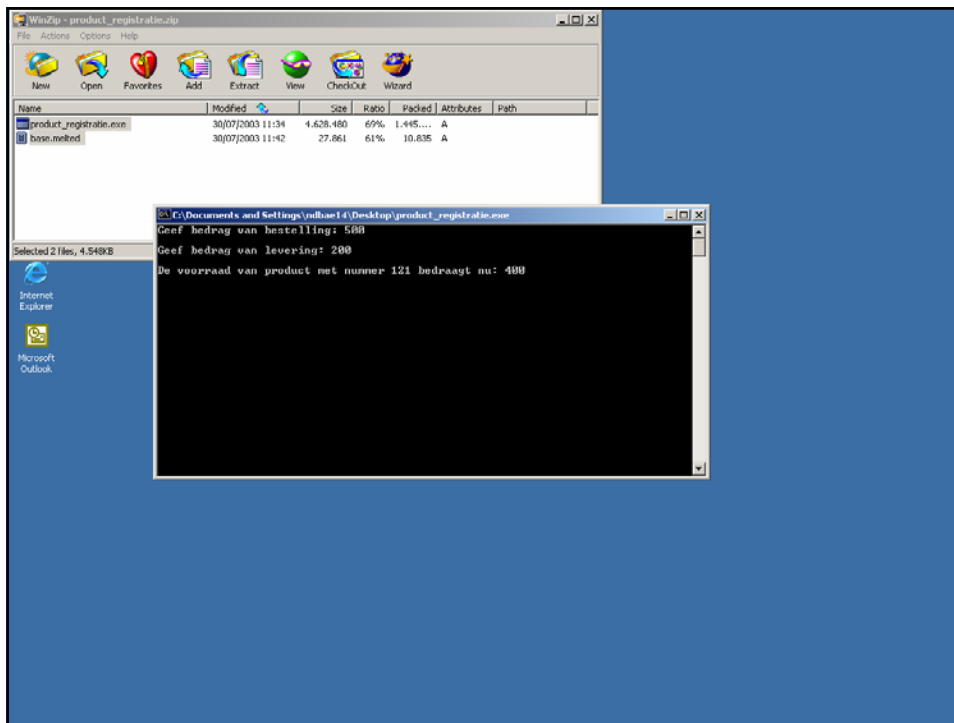
- The Total Cost of Ownership reductions are quite dramatic in this case, mainly due to the reduced support costs on behalf of the educational assistants. The TCO-cost reduction can be estimated to be about 70%. This shows also how the introduction of Web Services provides a significant return on investment.

indexing  
description: "System's root class"  
note : "Initial version automat:

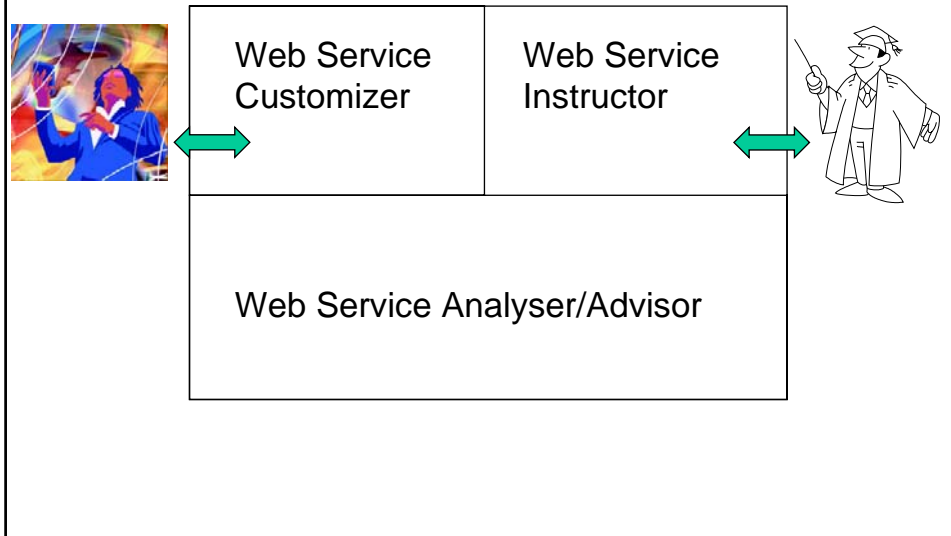
```
class  
  ROOT_CLASS  
creation  
  make  
feature -- Initialization  
  make is  
    -- Creation procedure.  
    do  
      io.putstring("hello manu")  
      io.putring(" hello")  
      io.readline  
    end  
end -- class ROOT_CLASS
```

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Error code: VEEN  
Error: unknown identifier.  
What to do: make sure that identifier, if needed, is final name of  
feature of class, or local entity or formal argument of routine.  
<http://www.eiffel.com>  
Class: ROOT\_CLASS  
Feature: make  
Identifier: putring  
Line: 18  
-> io.putstring("hello manu")  
io.putring(" hello")  
io.readline

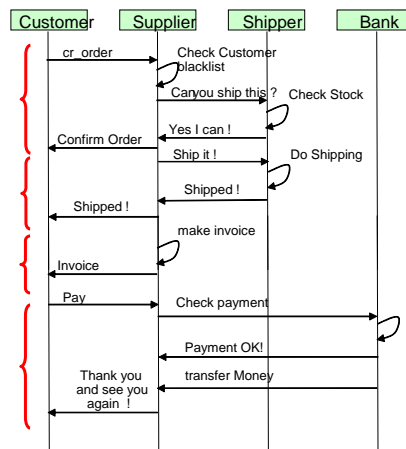


## Didactical Agent Technologies

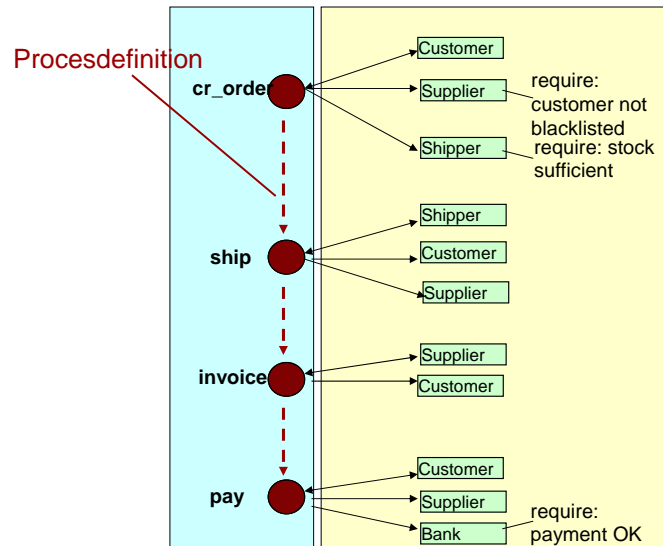


## Current Process Definitions (cfr. BPEL, BPML, ...)

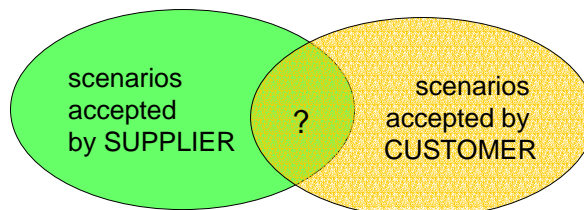
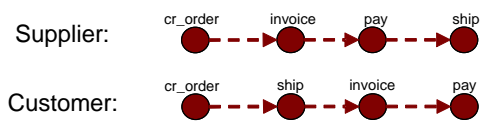
- One-to-one SOAP message exchanges across web services
- Sequence constraints on the level of individual message exchanges (bv. BPEL)
- No identification/coordination of logically coherent message exchanges

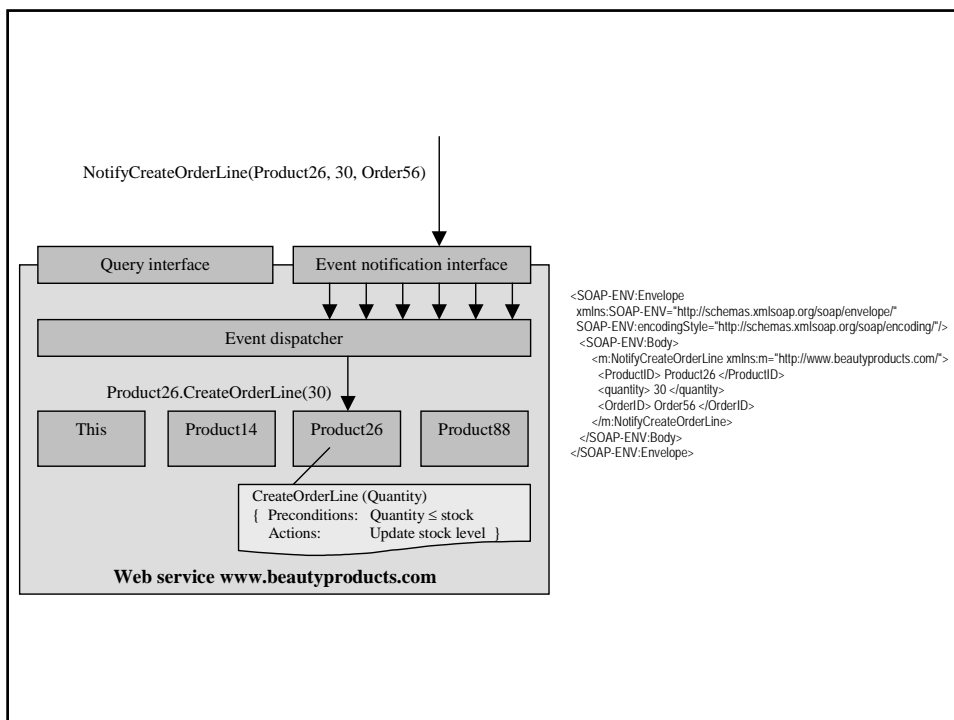
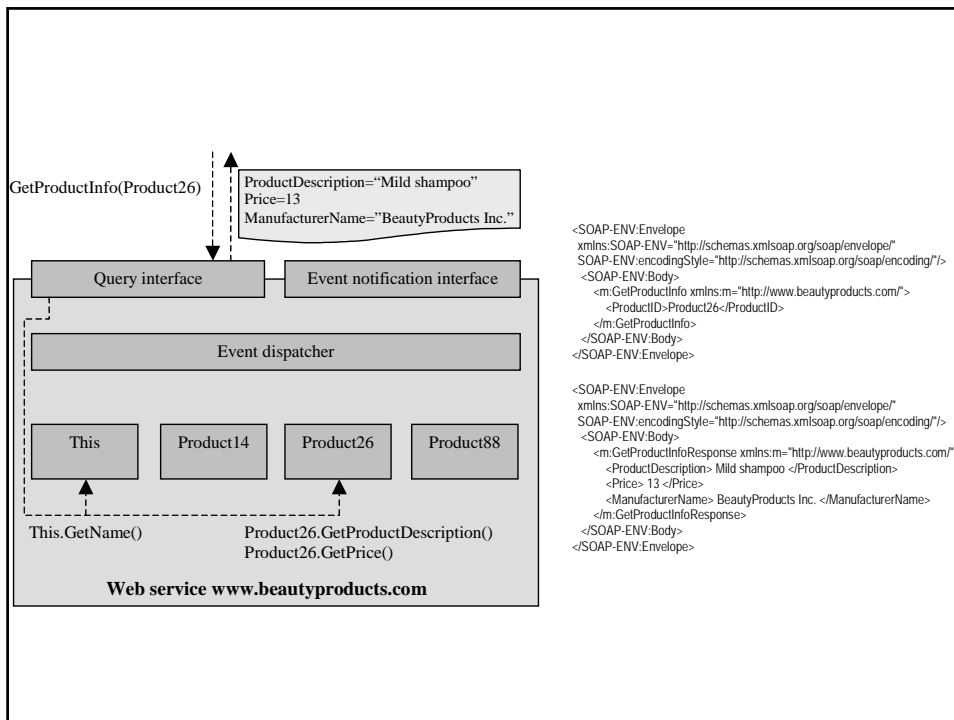


## Event-based process definitions



## Testing "compatible" web services





# General Framework for Business Process Modeling

