Impact of Standardization and Open Source Software in e-Learning

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Outline

- Technology Standards as Industry Driving Force
- Open Source Software for High-Quality Products
- Sustaining Innovation and Disruptive Innovation
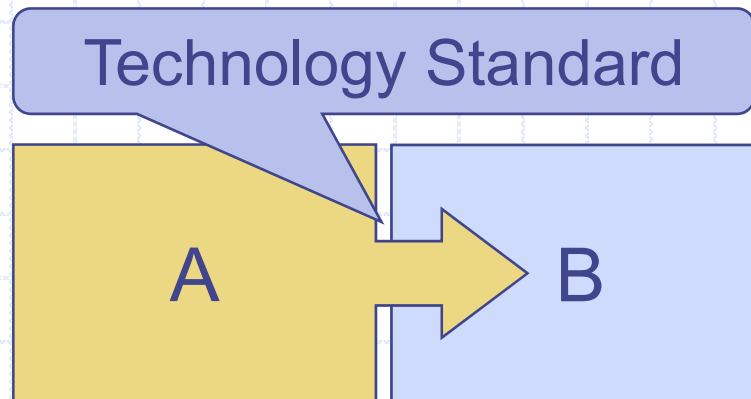- Japanese Activities
- Conclusion

What is Technology Standard?

◆ Examples

- A: Video tape   B: Video deck
- A: USB memory   B: Personal Computer
- A: Software   B: Hardware
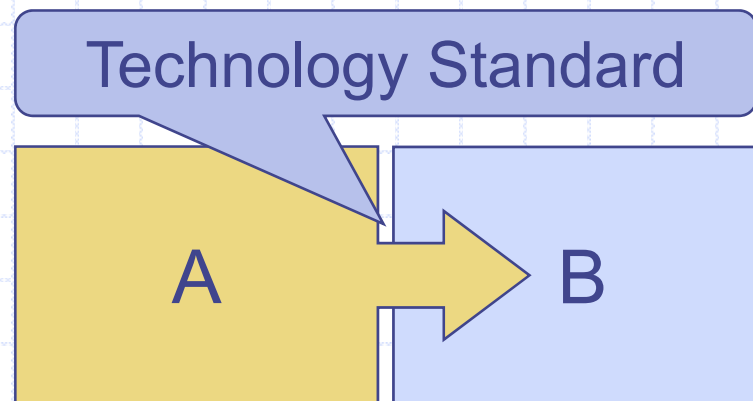
Technology Standard

A   B
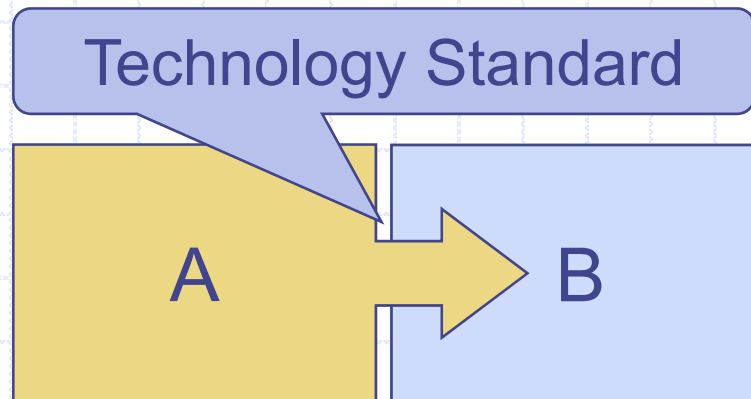
What is Technology Standard?

- ◆ Separate two entities, define interface between them
- ◆ Define functionality one entity provides to another

Technology Standard

A → B

Technology Standards as Industry Driving Force

◈ Whole system functionality is maintained with any combination of module "A" and "B" from various suppliers with various price and quality

  ■ Customer can choose preferable module

  ■ Competition between suppliers

Technology Standard

A → B

Technology Standards as Industry Driving Force

◆ Suppliers can improve their modules independently and quickly, regardless of the counter part module

  ▪ Reduce the "Cognitive Load" of module designer

  ▪ New suppliers can get into market rather easily

  ▪ Accelerates technology innovation

Technology Standard

A   B
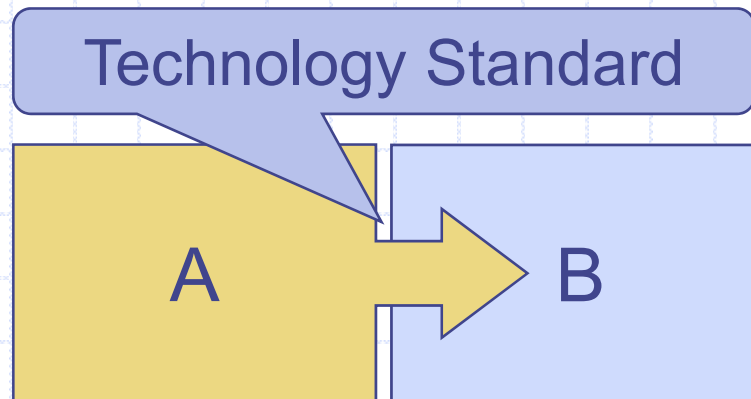
Open Source Software for High-Quality Products

- ## Power of Community
  - ### High motivation and technical skills
    - Do it as pleasure
    - Solve "interesting" problem
    - Respect and applause from other members
  - ### High quality development in short term
   - Parallel debugging, Parallel search in design space

      "Cathedral and Bazaar"

Business Model of
Open Source Software

- ◆ Individual oriented
  - ■ "Pleasure" is the motivation
- ◆ Project oriented
  - ■ "Public interest" is the motivation
- ◆ Vendor oriented
  - ■ "Providing total solution" is the motivation

Sustaining Innovation and Disruptive Innovation
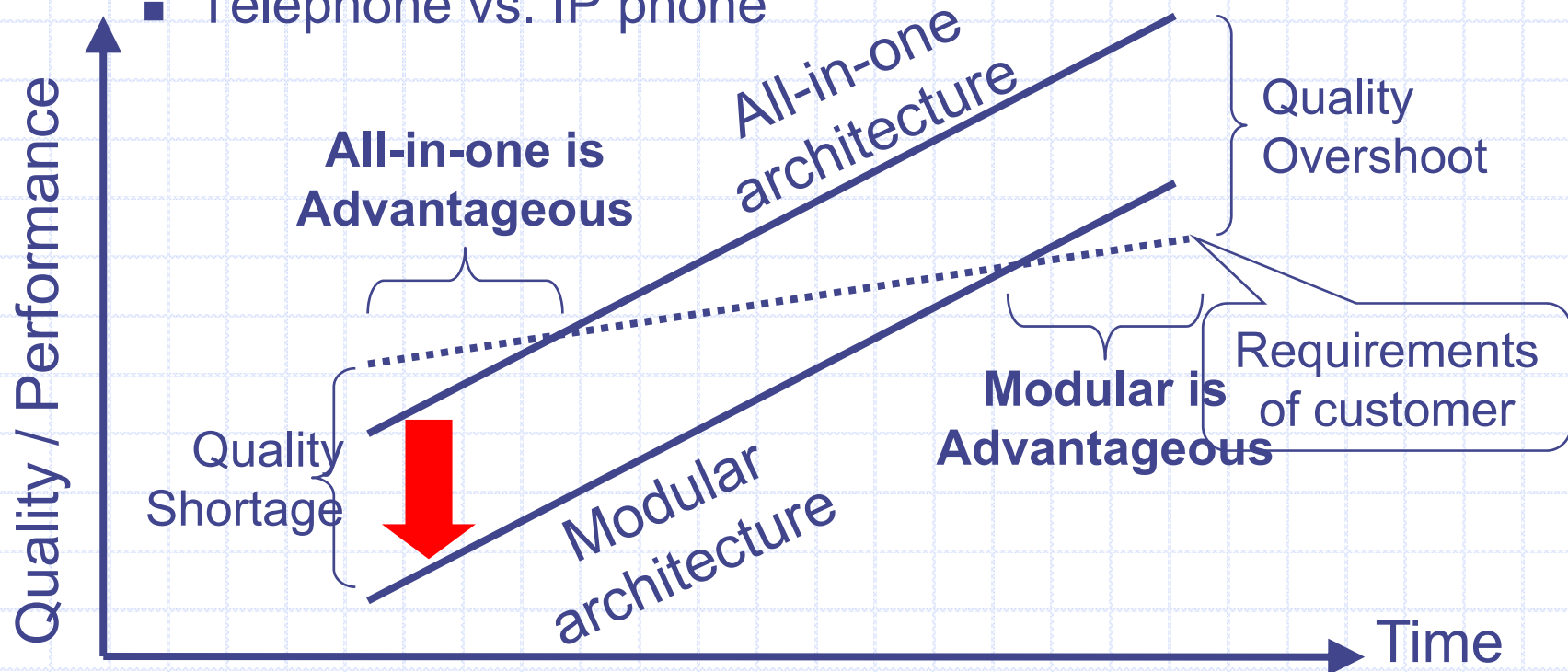
◆ Christensen

  ▪ Telephone vs. IP phone
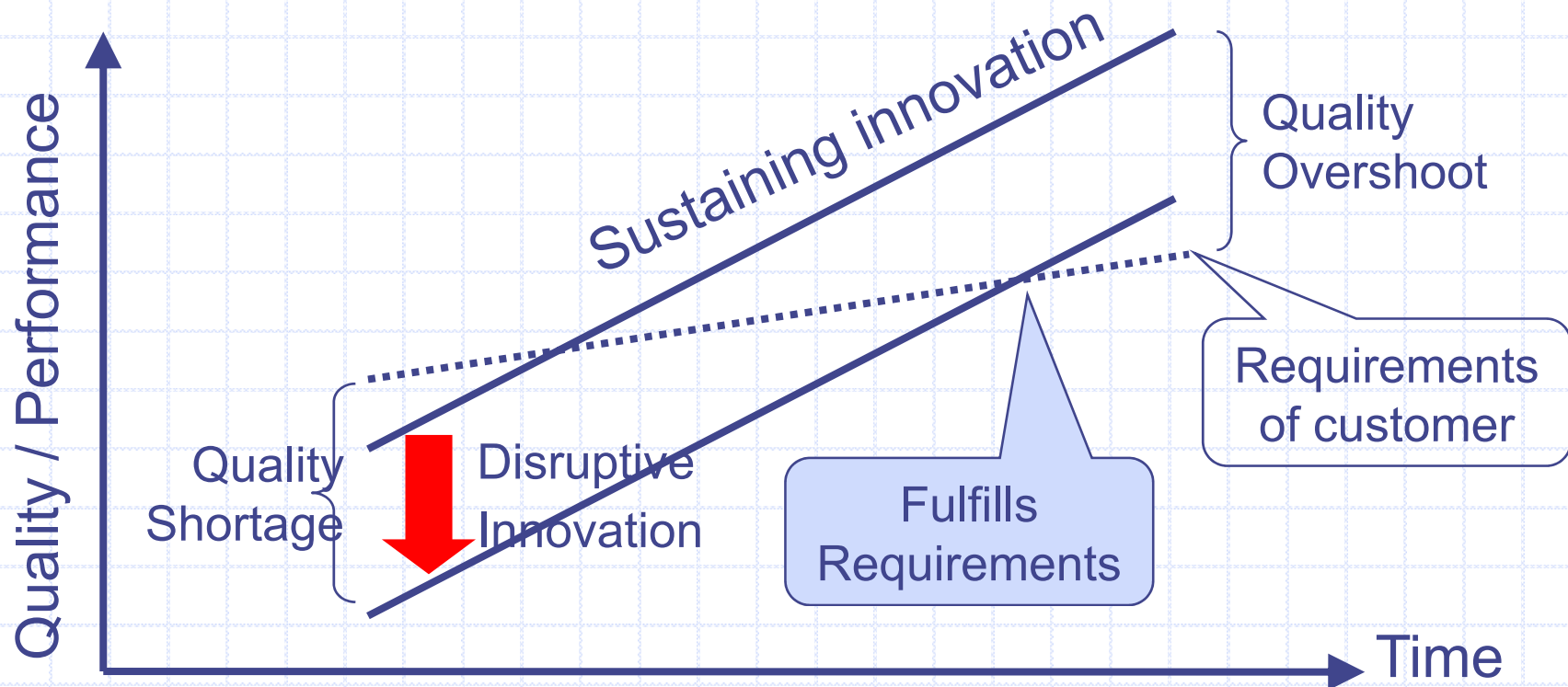
Standards can be Disruptive

- ◈ All-in-one vs. Modular Architecture
  - Macintosh vs. IBM PC
  - Telephone vs. IP phone

Quality / Performance

All-in-one is Advantageous

All-in-one architecture

Quality Overshoot

Modular is Advantageous

Requirements of customer

Quality Shortage

Modular architecture

Time

Disruptive Innovation in Education

◆ UK Open University

- http://www.open.ac.uk/

- Since 1971

- 200,000 students, 40,000 is outside UK

Why have an Open University

- To make higher education (HE) available to many more people – widening participation
- To exploit technologies, methods and pedagogy to achieve increased access to HE
- To pioneer a new system of education: 'supported open learning'
- To take the university to the student
- High quality, cost-effective, open learning – accessible and inclusive

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Best marks for teaching

		% of excellent subjects since 1995
1	Cambridge	96.00
2	Loughborough	94.74
3=	LSE	87.50
3=	York	87.50
5	Open	86.67
6	Oxford	85.71
7	Imperial College	81.82
8	University College London	77.42
9	Essex	76.92
10	St Mark and St John	75.00
11	Warwick	73.68
12	Nottingham	73.53
13	East Anglia	72.22
14=	Cardiff	71.43
14=	Luton	71.43

ALSO IN THIS SECTION

Competition for places

Best marks for teaching

Worst marks for teaching

Best student/staff ratio

Worst student/staff ratio
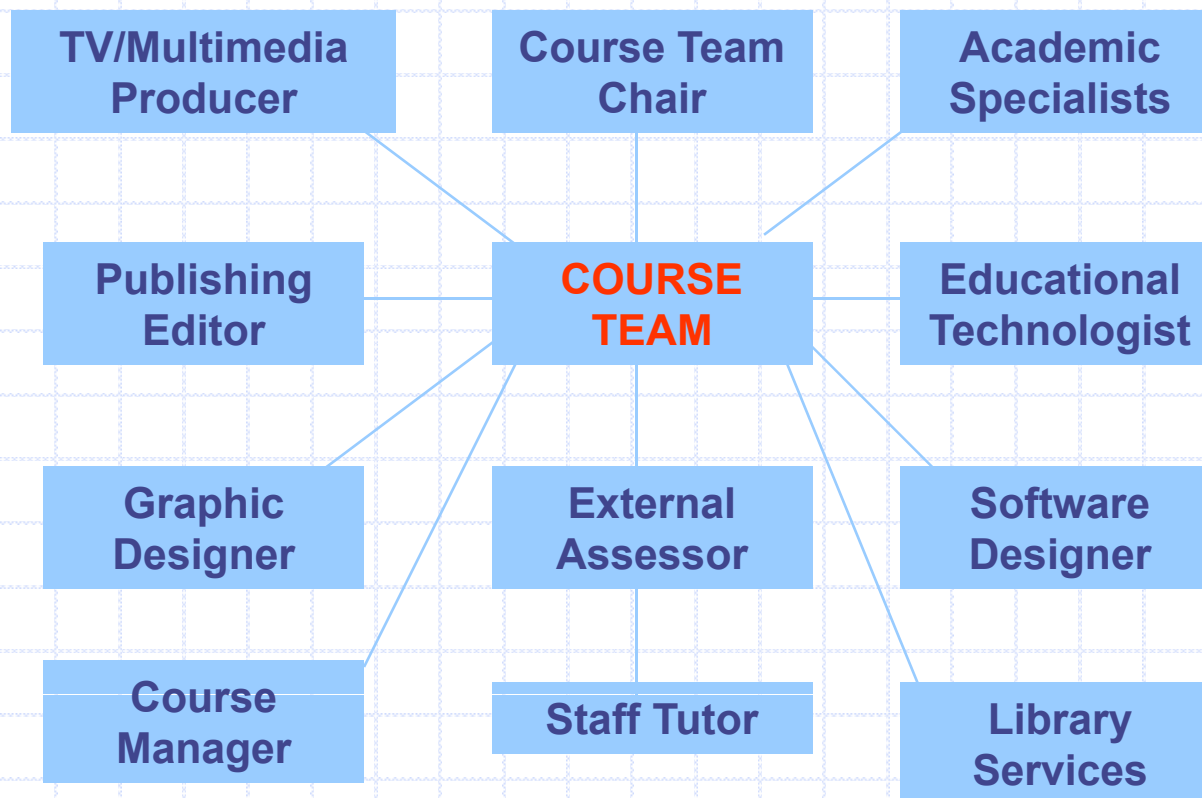
Top ten for research

Excellence without exclusivity

◈ The Open University, Europe's largest university, with over 2.5 million students since 1971, is admired as one of the most innovative institutions in the world.

◈ Its ground-breaking research & teaching, recently awarded the UK QAA's highest level of endorsement, ranks with the best in traditional universities.

  ■ The Sunday Times University Guide 2003
  ■ 2005 National Student Survey
    ◆ OU was overall #1 for assessment & feedback, organisation & management, and for teaching quality

◈ The OU's teaching methods and ideas are now used in every UK university and in leading universities worldwide.

Course Components

◆ Use any kinds of media

- Study Guide and workbooks
- Computing software, practical kits
- Face-to-face or on-line tutorials
- TV or radio broadcasts on BBC
- Alternative eLearning options
- Audio-,video-tapes, CD-ROM, DVD
- Day Workshops or Residential Schools
- Assessment and Examination

Course Production Team

◆ Structured development/operation team

TV/Multimedia Producer	Course Team Chair	Academic Specialists
Publishing Editor	**COURSE TEAM**	Educational Technologist
Graphic Designer	External Assessor	Software Designer
Course Manager	Staff Tutor	Library Services

Growth Model of Open University

- ◆ Expand target of HE with technology
  - Different business segment from traditional universities
- ◆ New organization not existing one
  - Implement new methodology and structure

  ↓

- ◆ Achieving high quality by technology refinement
  - Providing higher quality education with lower cost
  - Disruptive against traditional university in the different business segment

Japanese Activities for e-Learning Standards

- ◆ Since year 2000
  - Government and Industry
- ◆ Organizations
  - ALIC: Advanced Learning Infrastructure Consortium
    - ◆ Supported by Ministry of Industry, Economy and Trade
    - ◆ Since 2000, terminated in 2004
  - eLC: e-Learning Consortium Japan
    - ◆ Non-profit organization
    - ◆ Consisting about 100 member companies
- ◆ Emphasis on SCORM
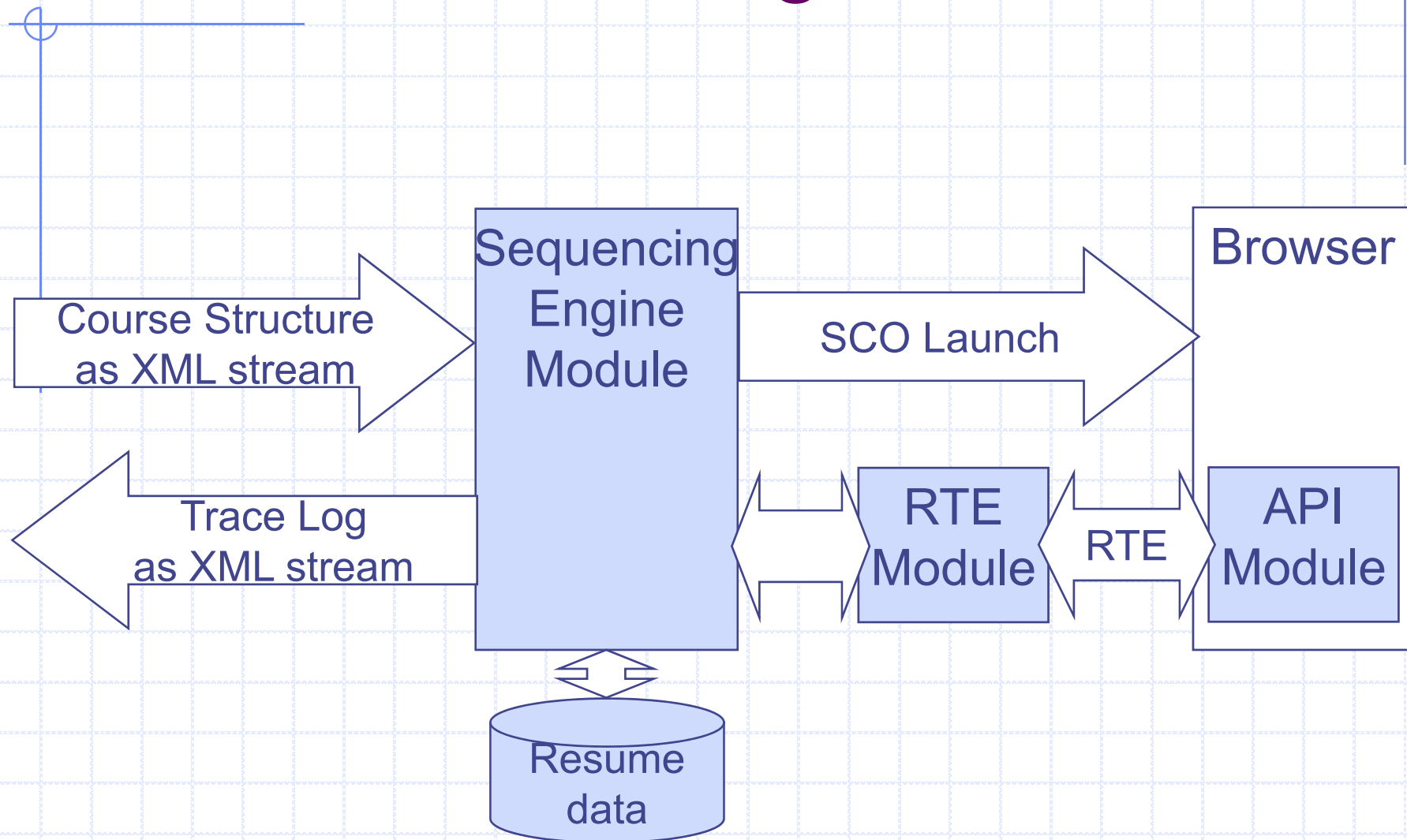 - System module development
  - Seminars & publications
  - Conformance programs

System Module Developments

- To minimize interoperability trouble and implementation barrier

- Supported by the government

- Distributed as open source

- SCORM 1.2 module in 2001

- SCRORM 2004 engine since 2002

- Mobile extension since 2005

SCORM 2004 Engine

Course Structure as XML stream → Sequencing Engine Module → SCO Launch → Browser

Trace Log as XML stream ← Sequencing Engine Module ← RTE Module ← RTE → API Module

Resume data

SCORM 2004 Engine

- ◆ Implemented as Java classes
- ◆ Distributed as an open source
  - http://www.elc.or.jp/cgi-bin/scorm_engin/lms/index-scorm.html
  - http://www.oss.ecl.ntt.co.jp/lms/
- ◆ More than 1500 downloads since 2004
- ◆ Used in several commercial LMS

Sample Screen

Mobile Extension

Protocol Transformation Server

SCORM 2004 LMS

Manifest File

Learning Result

Learning Resource

For PC

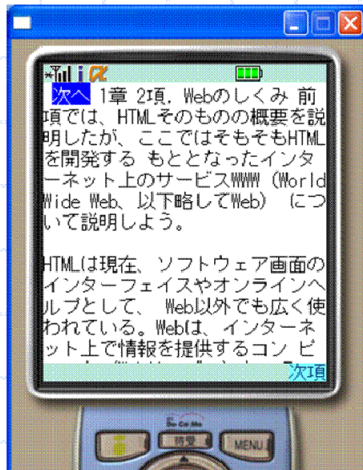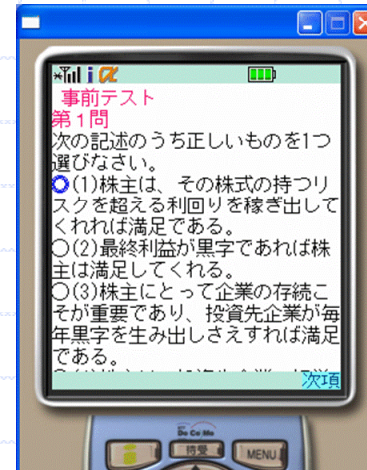For Mobile

Mobile Extension

- Based on SCORM 2004

- Content and learning result shared by PC-based and mobile-phone-based learning

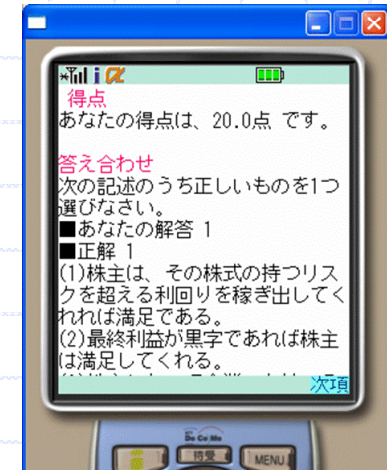- Offline learning with mobile phone

Sample Screen

a) Lecture pages   b) Test page   c) Feedback page

Seminars and Publications

◆ Seminars

- Twice a year since 2001
- For non-technical and technical people

Translations

- SCORM 1.2 in 2002
- SCORM 1.3 wd 1.0 in 2003
- IMS Simple Sequencing in 2004
- "SCORM Best Practice Guide for Content Developers" from LSAL in 2004
- SCORM 2004 3rd ed. under way

Tutorial Document

- ◆ SCORM assessor program texts
    - Includes a document about interoperability troubles and solutions encountered in actual implementation practices
- ◆ SCORM 2004 tutorial
    - For system developers and content developers
    - Document with sample content

Conformance Programs

◆ To share experience and knowledge about interoperability issues in the community

◆ For LMS and content

- Periodical events to check if they work with each other

◆ SCORM assessor

- Certify skilled SCORM content engineer

LMS Conformance

◆ 20 LMSs as of March 2007

◆ Several LMSs developed BEFORE SCORM with proprietary specification has been modified to conform SCORM

SCORM Assessor

◆ Background

  ■ Third party content conformance test is expensive

  ■ Content vendors needs engineers with skills about interoperability issues

  ⇓

◆ Authorized assessor in each vendor

  ■ Assessor training course

  ■ Content self test and report

  ■ Assessor community for information sharing

SCORM Assessor Skill Set

- ◆ Knowledge about the assessor program
  - Purpose of the program
  - Responsibility and authority of assessor
  - Content conformance procedure
  - Content registration procedure
  - Interoperability trouble management
  - Purpose of assessor community
- ◆ Knowledge about SCORM specifications
  - General
  - Content aggregation
  - Run-time environment
 - Conformance requirement

- ◆ Knowledge about SCORM application
  - Content development
  - Content test
  - Typical interoperability issues and solution
- ◆ Knowledge about related fields
  - Standardization of industrial product
  - Standardization of e-learning product
  - Communication protocol
  - Client side programming
  - Server side programming
  - Basic knowledge of computers

Increase of SCORM Assessor
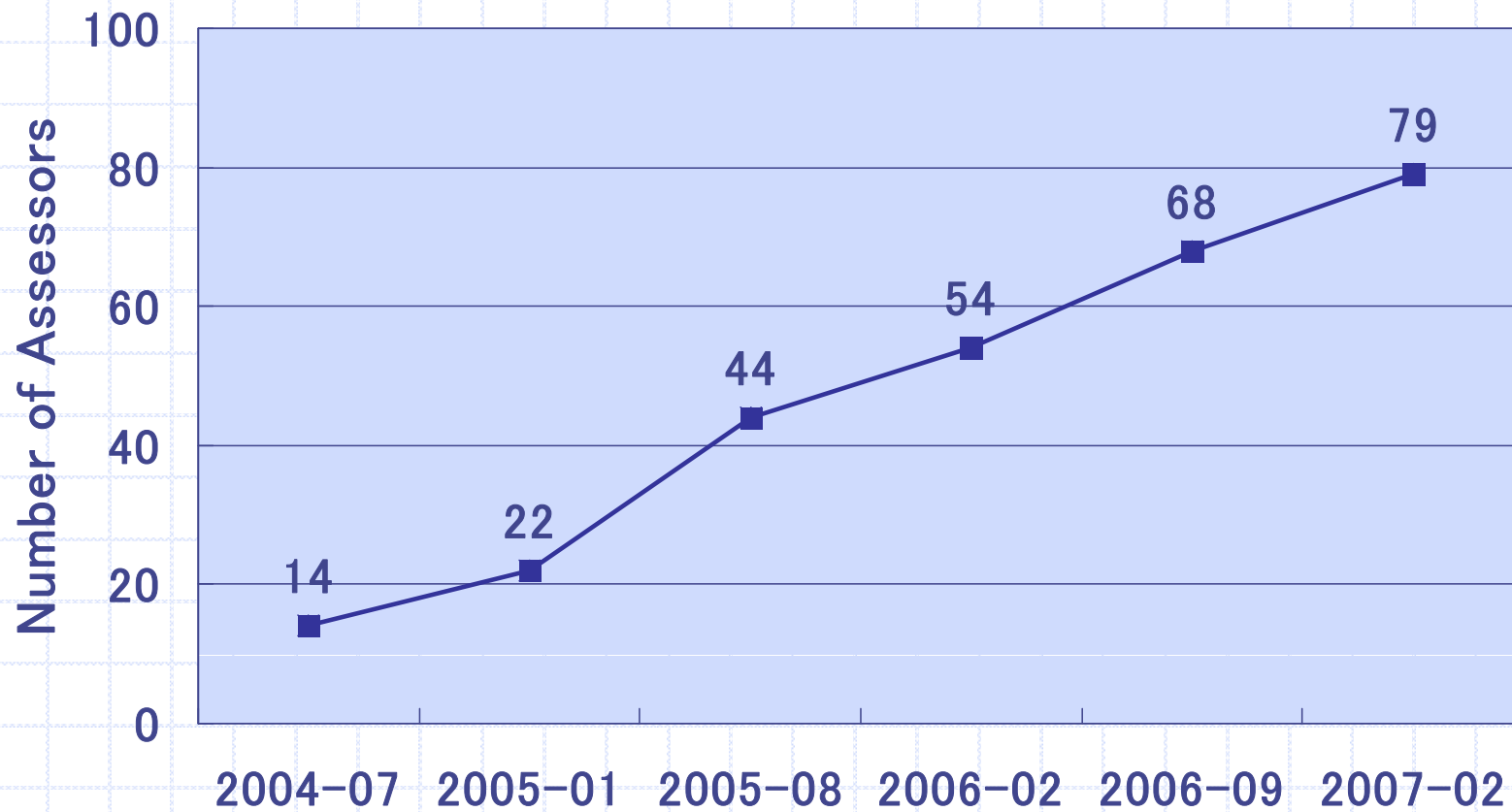
SCORM Assessor

◆ **Mutual benefits**

- ■ Assessor can get technical skills

- ■ Content vendor the assessor belongs to can achieve skilled engineer and respect from customers

- ■ Customers can choose content vendors by checking if they have SCORM assessors

Conclusion

- Technology standards as industry driving force
  - "Modules" can evolve independently to each other while whole system function is sustained
  - New suppliers can get into market rather easily, and competition accelerates technology innovation
- Open Source Software for High-Quality Products
- Sustaining Innovation and Disruptive Innovation

Conclusion

◈ SCORM promotion in Japan
  - System module developments
  - Seminars and publications
  - Conformance programs

◈ Trying to share experience and knowledge in the community

◈ To make activities sustainable, stakeholders' benefits are most important!!
  - Technical benefits
  - Business benefits
  - Customers benefits

Thank You!!

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