

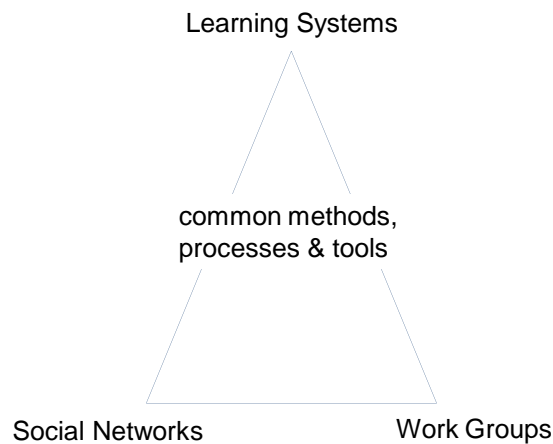
# Learning Software Engineering - Online

29<sup>th</sup> Pacific NW Software Quality Conference

Oct 10-12 2011

*Kal Toth, kalmancloth@gmail.com*

## Unstated Goal



## Perspectives Addressed

### Online/hybrid delivery of SE Courses and Programs

- UBC, Simon Fraser, TechBC, OSU, PSU

### Evolution of e-learning delivery

- Emergence, systems, tools
- Broadcasting sessions / lectures
- Learning management systems
- Asynchronous and synchronous collaboration
- Social, professional, and work networks

### E-Learning Challenges and Success Factors

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## Advanced Software Engineering Education

Professional Development

Graduate Certificates

Masters Degrees

Software and IT professionals and practitioners

Primary Objectives:

- Enhance professional software competencies
- Develop job-ready technical team leaders and managers
- Flexible delivery and access

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## Curriculum and Careers

**SE Courses / Topics**

- principles/processes
- project management
- agile development
- team collaboration
- quality engineering
- reqts & analysis
- architecture
- design techniques
- testing & implt'n
- estimating
- decision-making
- strategic issues
- process improv't

**Career Progression Possibilities**

```

graph BT
    SW_Developer[SW Developer] --> SW_Analyst[SW Analyst / SW Architect]
    SW_Developer --> Product_Manager[Product Manager]
    SW_Developer --> SW_Quality_Engineer[SW Quality Engineer]
    SW_Analyst --> Team_Leader[Team Leader / Manager]
    Product_Manager --> Team_Leader
    SW_Quality_Engineer --> Team_Leader
    Team_Leader --> Project_Manager[Project / Group Manager]
    
```

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## Learning Elements, Methods, Mechanisms

<u>SE Curriculum:</u>	<u>Elements:</u>	<u>Learning Methods:</u>	<u>Online Mechanisms:</u>
processes project mgt agile dev team collab quality eng'g reqts & analysis archit / design testing & implt'n estimating decision-making strategic issues process improv't	Read Listen Think Critically Analysis Solve Problems	Presentations Examples Case Studies Problems Questions Responses Individual Assignts Group Assignts Feedback Evaluation	<ul style="list-style-type: none"> <li>• Broadcast Content</li> <li>• On-Demand A/V</li> <li>• Narrated PPTs</li> <li>• Repositories</li> <li>• Online Feedback</li> <li>• Discussion Forums</li> <li>• Web Conferencing</li> <li>• New Media</li> </ul>

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## Evolution of E-Learning

Open University (UK), U of Athabasca, ...

### Broadcast Lectures:

- Satellite distribution with feedback via text channels (NTU)
- Classroom recorded and distributed (tape, disk, streamed)

### Work Group Teleconferencing [synchronous learning]:

- Telephony-Based Conferencing Technologies
- Functions, Features, Performance, Costly, Constrained Access

### Asynchronous Learning Networks [Sloan Foundation, Drexler, ...]

- Greatly facilitated by the emergence of the Web and common usage
- Benefits: anytime, anyplace, reflection, language, personality issues
- Counter-Arguments: Isolation, engagement, authentication

### Learning Management Systems: E-College, WebCT, Bb, D2L, ...

- Access to materials, collaboration, assignment handling, grading support, ...

Web conferencing; Social Networking / Media; Workgroup Tools

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## E-Learning Versus Traditional

Experts: no significant differences in learning outcomes

- Different e-learning methods probably fit different subjects (but not well understood)

Distinctions Blurring: Online Learning, Social & Work Networks

- How we learn, increasingly like how we work
- When we work, we are constantly learning
- Collaboration at work and at school are social experiences

**We should harmonize our social, learning, and work processes!**

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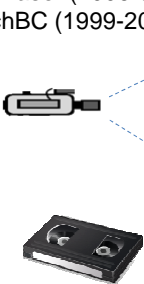

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## Earliest Delivery Models

(some blending on face-to-face & asynch learning)

**Asynch Learning (LMS):**

- WebCT at UBC (1995)
- Virtual-U at Simon Fraser (1996-98)
- Custom LMS at TechBC (1999-2000)

**OMSE:**

- Recorded Lectures
- Some web-based content
- LMS: E-College (LMS) experiment (2003)

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## Broadcasting Lectures

SFU: 1990s, PSU: 2003 ...

Remote control cameras and push-to-talk mics  
PC, projector, doc camera controlled by instructor

**Support personnel:**

- Remote control cameras
- Audio-video captured, digitized, streamed via media server
- "Live Streams" (delayed 5-10 secs)
- Archived streams on-demand

**Issues:**

- Teleconferencing return channels not integrated

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## Learning Management Systems

### Useful Capabilities:

- Managed access to course info and resources
- Assignment management, grading support, usage tracking
- Online (asynchronous) discussion forums
- Integration with registration and grading
- Guidance, pacing, announcements, EM, student lists

UIs have been somewhat clunky but getting better.

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## Mini-Lecture Approaches

### Attempts to overcome student-faculty isolation:

- Pre-recorded studio lectures (canned)
  - more costly to produce; harder and more costly to update
- Narrated PowerPoint lectures
  - Cheaper and easier update

### More study / assessment needed:

- Learning and engagement effectiveness

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## Online Learning Issues

Learning effectiveness of online methods

Faculty workload and ownership of their instructional materials

Student isolation – from faculty and other students

LMS Pros/Cons: good, bad and annoying features & performance

Overlooked Costs: conversion, training, learning (fac+stud)

Integration: LMS with registration and grading not seamless

Emerging Issues:

- How to integrate online systems with web conferencing, chat, twitter, and social networking capabilities

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## Student Preferences

Student Preferences Vary:

1. Opposed to online learning – only face-to-face acceptable
2. Prefer face-to-face over online
3. See value in blending online with face-to-face
4. Prefer online over face-to-face
5. Are unable to attend face-to-face – online is only choice

Wants:

- Social media features (like those used at home)
- Groupware features (like those used for work)

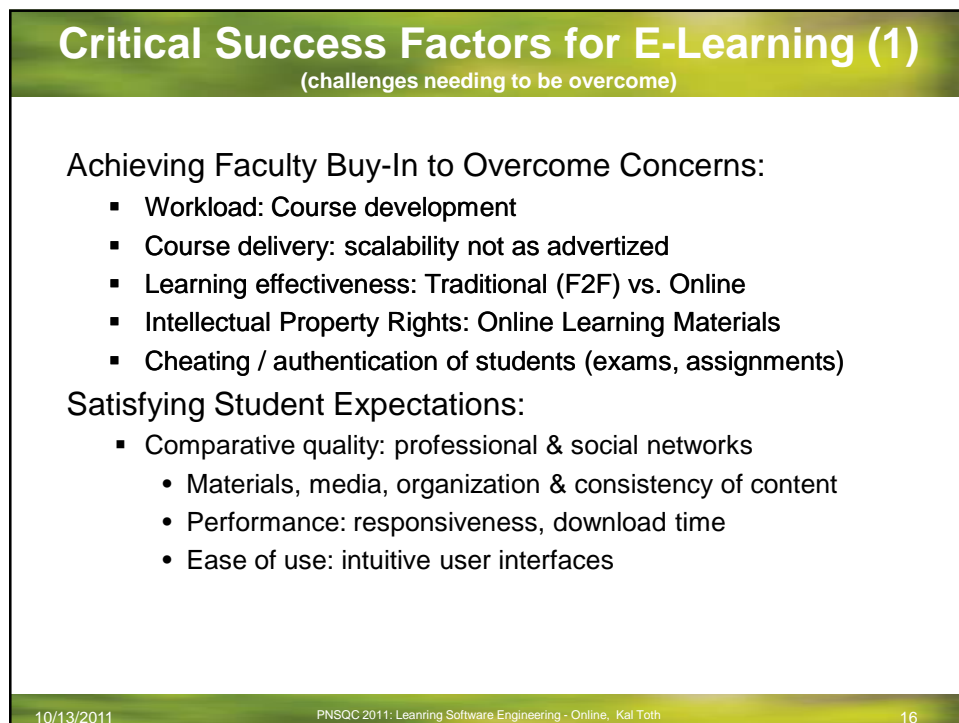
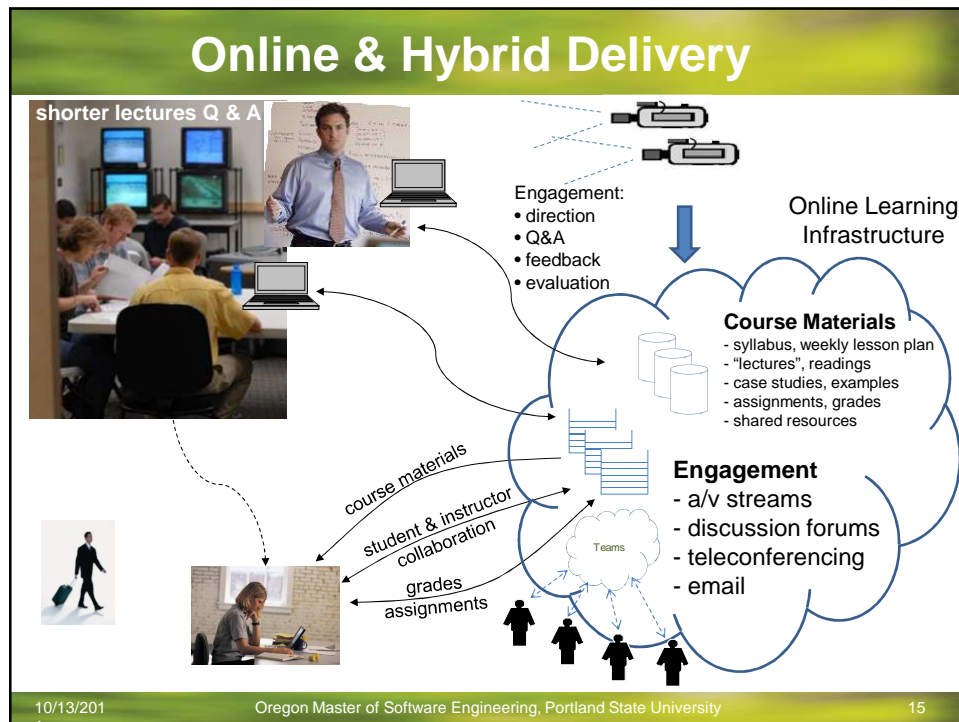
Criticisms:

- Performance, Quality of UIs, “Clunkiness”, ...

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## Critical Success Factors for E-Learning (2)

### Technology / Infrastructure:

- Delivery: good, bad and annoying features
- Help desk, performance, technical support / fixes
- integration with registration/grading

### Administration and Finance:

- Conversion costs, training, learning - underestimated
- Scalability potential - overestimated
- Need for marketing - underestimated
- Scholarly value of online pedagogy – under-recognized

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## Hybridizing/Blending Trend

### Blend traditional F2F classroom with online learning methods

- Students use the same learning management system for web-enabled, online-only, and hybrid courses
- Same assignments, grading, EM, pacing, ...
- Hybrid courses increase focus on online activities
  - Online discussions, group web-conferences, online exercises
  - Face-to-face sessions shorter, sometimes even optional  
(Reduces demand for scarce classroom space)

Distinctions blurring here too: web enhanced, online & hybrid

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## Hybrid / Blended Approach (1)

All students use the same LMS / course shell

- assignments, grading, EM, pacing, etc.

Face-to-face sessions are short lectures or Q&A sessions

- streamed over the web: support “live” & delayed access

Increased use of online discussions off-set reduced class time

- Reduces demand for scarce classroom space

Attending face-to-face sessions is optional

- Some students experience “hybrid”; others online (only)
- Online students rely more on streams & mini-lectures
- Face-to-face participation not evaluated
- But participation in online discussions is evaluated

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## Hybrid / Blended Approach (2)

Enriched Classroom Streams Using “Echo 360”:

- Merges A/V, presentation, doc camera streams
- Improved integration of information streams
- Better student control when viewing streams
- Higher overall resolution/quality of the mixed info streams

Flexible Synchronous Collaboration Using “Elluminate”:

- Work group activities: web conferencing, shared space
- More effective engagement → Audio/Video + collaboration
- Lower cost → Elluminate human controllers, reduces costs
- Instructors → Learning curve, training, setup coordination
- Empowered students to directly use Elluminate for projects

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## Benefits of Online Hybrid Learning Approach

### Better learning:

- Integrates benefits of e-learning with traditional learning
- Asynch increases depth and breadth of engagement
- Students learn from each other as well as instructor

Reduces demand on [expensive] classroom facilities

### Students:

- Integrates well with lifestyle of busy working professionals
- Reduced commute, residency, parking, and other costs

### Faculty:

- Telecommuting reduces travel and office space costs
- Increases size of available pool of faculty

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## Annex: Screen Shot Illustrations

Desire-to-Learn (D2L): Learning Management System

Echo 360: Lecture Capture and Streaming System

Elluminate: Teleconferencing and Information Sharing System (now called Blackboard Collaborate)

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https://d2l.pdx.edu/d2l/oms/content/home.d2l/oua-24037

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Echo360 - Windows Internet Explorer

http://echo360.pdx.edu/ess/echo/presentation/1af55e60-d1d4-4563-9f6c-95929ae0236

Assignment 2

- Not quite as straightforward as appeared for some people
- First level analysis identifies properties like "testable" and "complete"
- Deeper analysis
  - "Testable" is different things in different languages
  - "Complete" is usually not possible - what's the alternative is testable?

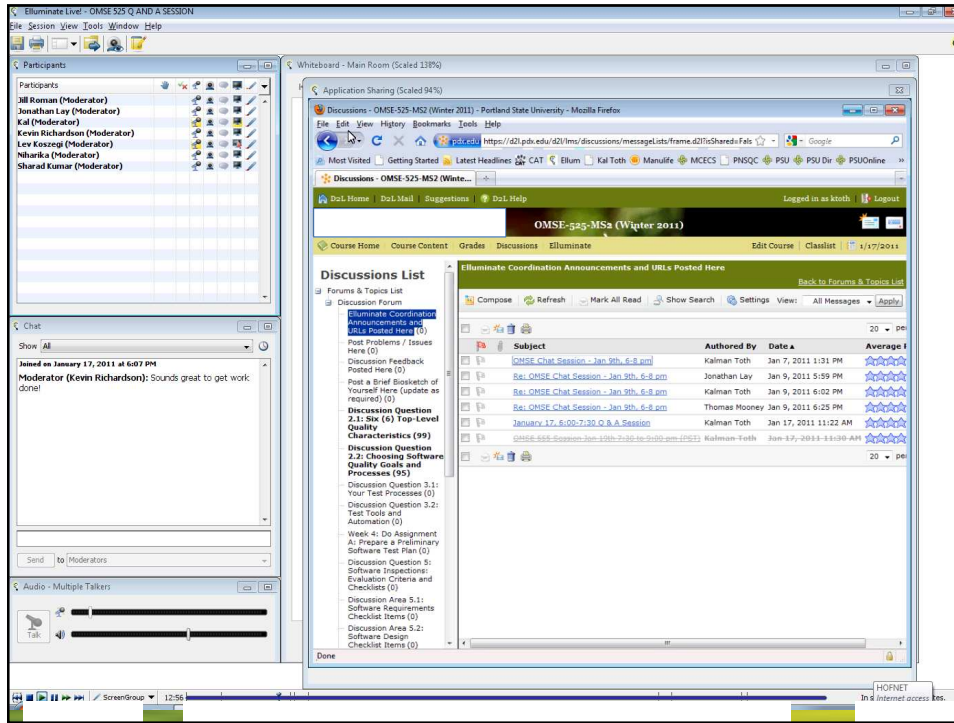
SW REQUIREMENTS (OMSE 525 Winter 2011-0018 Winter Term 2011)

Wagner, Vicki  
wagner@pdx.edu

Date: Feb 21, 2011 7:30:00 PM

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# Questions?

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