Internet of Education

Mitja Jermol
Jozef Stefan Institute, Slovenia
&
Knowledge 4 All Foundation, UK

Ljubljana, November 2013
The future of learning is...
The future of learning is...
The future of learning is...
The future of learning is... open, social, personal.
The future of learning is... open social personal augmented
The future of learning is...

- open
- social
- personal
- augmented
- visual
The future of learning is...
The future of Academia is...

- open
- social
- personal
- mobile
- augmented
- visual
The future of [Academia] is...

- Open
- Mobile
- Social
- Personal
- Augmented
- Visual
The future of learning is...

- open
- social
- personal
- augmented
- visual
- mobile

Academia
The future of learning is:

- open
- social
- personal
- augmented
- visual
- mobile

Collaborative Academia...
The future of learning is...
Peers (Chronicle)
A rush...
Google and edX Create a MOOC Site for the Rest of Us

September 10, 2015, 3:28 pm
By Steve Kolowich

Until now, massive open online courses have mostly reinforced existing hierarchies in higher education. MOOC providers have recruited elite institutions and offered them and their professors the opportunity to broadcast their courses to the world.

But now edX, a nonprofit provider founded by Harvard University and the Massachusetts Institute of Technology, is joining forces with Google to create a spinoff Web site where ordinary folks—and professors at colleges that have not been invited to join high-profile MOOC consortiums—can not only sign up for a MOOC but also build one themselves.

The new site, MOOC.org, will provide tools and a platform that “will allow any academic institution, business, and individual to create and host online courses,” says a blog post by Dan Clancy, a research director at Google. In an interview, Anant Agarwal,
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September 10, 2013, 4:31 pm

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The French Ministry of Higher Education has announced the launch of France’s new strategy for digital learning in higher education (France Université Numerique) which includes a massive open online course (MOOC) and blended learning portal.

Over 100 higher education institutions have signed on to participate in France’s new national portal for massive open online courses (MOOCs) and blended learning. The French Ministry of Higher Education has created the portal as part of the France Université Numerique initiative, which aims to increase access to high quality online learning opportunities in French.

France’s MOOC portal will use the open-source edX technology to host its online courses. EdX is a not-for-profit enterprise that brings new methodologies and technologies to online and on-campus learning. The first twenty courses will start in January 2014.

Geneviève Fioraso, French Minister for Higher Education and Research, said in her announcement of the initiative, “First of all, digital technology will be a tool for student success. By 2017, 100% of students should have access to high quality digital courses, at each step of their education, for all types of education.”
A rush...
A rush...
Europe hopes for common Mooc market and single currency

U.S. Teams Up With Operator of Online Courses to Plan a Global Network

By TAMAR LEWIN
Published: October 31, 2013 | 0 Comments

Coursea, a California-based venture that has enrolled five million students in its free online courses, announced on Thursday a partnership with the United States government to create “learning hubs” around the world where students can go to get Internet access to free courses supplemented by weekly in-person class discussions with local teachers or facilitators.

The learning hubs represent a new stage in the evolution of “massive open online courses,” or MOOCs, and address two issues: the lack of reliable Internet access in some countries, and the growing conviction that students do better if they can discuss course materials, and meet at least occasionally with a teacher or facilitator.

A rush...
Just another hype?
Just another hype?
Just another hype?
Just another hype?
Who is Taking Courses Online?

A profile of 1,500 students pursuing fully online programs

The average online student is a 33-year-old white woman who is earning a salary of $65,000 per year.

73% are pursuing a degree
8% are pursuing a license
19% are pursuing a certificate

65% Enrolled at nonprofit college or university
35% Enrolled at a for-profit

70% are women
5% are veterans or active military

STUDENT DISTANCE TO PHYSICAL CAMPUS

80% live within 100 miles
69% live within 50 miles

MOOCs rising

Over little more than a year, Coursera in Mountain View, California — the largest of three companies developing and hosting massive open online courses (MOOCs) — has introduced 328 different courses from 62 universities in 17 countries (left). The platform’s 2.9 million registered users come from more than 220 countries (centre). And courses span subjects as diverse as pre-calculus, equine nutrition and introductory jazz improvisation (right).

Supply and demand

- Number of courses available on the platform
- Number of user accounts on the platform (millions)

2012
2013

Student origins

- China 27.7% United States
- India 8.8%
- Brazil 5.1%
- United Kingdom 4.4%
- Spain 4%

Courses offered

- 6% Mathematics
- 30% Science
- 13% Business
- 12% Engineering

4,600,000 College students are taking at least one class online

By 2014 that number will increase to 18.65 Million

1/2 of the 4500 brick-and-mortar colleges in the US offer their degree programs online

96% of traditional universities offer at least one class in an online-only format

Open Course Ware offers 4200 complete courses online FOR FREE

Classes And Careers.com

Emerging hubs

http://infographicsmania.com/author/stavrosz/
http://www.scientificamerican.com
http://chronicle.com

Business interest
NYT February 2013: So far, most MOOCs have had dropout rates exceeding 90 percent.
EUROPE’s response

31/10/2013

http://openeducationeuropa.eu/en/european_scoreboard_moocs

UnX, Miríada X, OpenupEd, OpenCourseWorld, Iversity, FutureLearn
Lectures distribution
Lectures distribution

- No of learners
- MOOCs
- Online libraries and course materials
- Basic
- Additional
- Specific
- Specialisation
Lectures distribution

- MOOCs
- Online libraries and course materials
- LMS materials
- Basic
- Additional
- Specific

Specialisation
Lectures distribution

- MOOCs
- Online libraries and course materials
- LMS materials
- Basic
- Additional
- Specific

Specialisation
AI methods

Learner

Learning channel

Information/Content

Teacher Human/Machine
AI methods

Diagram showing the relationship between a learner, teacher (human/machine), and information/content. The learning channel connects these components.
AI methods

Content structuring and information understanding
AI methods

Teacher Human/Machine

Learner

Learning channel

Information/Content

User modelling and assessment

Content structuring and information understanding
AI methods

Teacher
Human/Machine

Real-time personalisation

Learner

User modelling and assessment

Learning channel

Information/Content

Content structuring and information understanding
AI methods

Teacher Human/Machine

Real-time personalisation

Learning channel

Learner

Intelligent assistants

User modelling and assessment

Information/Content

Content structuring and information understanding
User profile

- **External Source**
  - # Sessions (% of all incoming traffic)
  - # of Users (persistent cookies)

- **Page Type**
  - # Sessions (% of traffic from source)
  - # of Users (persistent cookies)

- **User Type**
  - Pie Chart: % of Sessions by User Grouping

- **Device Type**
  - Pie Chart: % of Sessions by Device type

- **Time Spent**
  - Stacked Bar: Shows Time spent in 1 min increments

---

**User and current visit:**

- **User:** 20208908727048187
- **Country:** US [NC]
- **City:** High Point
- **# Visits:**

---

**AI technology**
User profile

- User Type
  - Pie Chart (% of Sessions) by User Grouping

- Page Type
  - # Sessions (% of traffic from source)
  - # of Users (persistent cookies)

- Exit
  - # Sessions (%) of preceding Page Type Sessions with no subsequent monitored activity for same Users (persistent cookies)

External Source
- # Sessions (% of all incoming traffic)
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Content understanding

AI technology
AI technology

User profile

# Sessions (% of all incoming traffic)
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Content understanding

AI personal assistants

Text understanding
Technology solutions, business models and best practices solving cultural richness and diversity
Media processing, analytics, translation

Technology solutions, business models and best practices solving

cultural richness and diversity

Language technologies
Media processing, analytics, translation

Technology solutions, business models and best practices solving cultural richness and diversity
Technology solutions, business models and best practices solving cultural richness and diversity

Example of an event
Storyline as an event sequence

Language technologies
Country/region as a testbed
Country/region as a testbed

Country/region as a testbed
Country/region as a testbed

Opencast and OCWC OER initiatives
Business initiatives
National initiatives

Missing: Testbed and commitment to apply
Internet of education
Based on:
- Videolectures.net success
- Open education projects at Universities
- E-education program supported at the Ministry
- Many successful elearning technology developers and providers and
- Industry lead initiative for Smart Specialisation

Slovenia is proposing to take a lead in OpeningUpEducation initiative set by EU by:
- Providing EU state level commitment for the programme by all stakeholders
- Offering Slovenia as a testbed to develop, test and deploy best practices

OpeningUpEducation Slovenia
• **Higher education** - provide initial steps towards the creation of the “OpeningUpSlovenia University”

• **Compulsory education** – provide initial steps towards the creation of OpeningUpSlovenia Schools

• **Vocational education and training and adult education** – provide initial steps towards the creation of OpeningUpSlovenia Vocation

**Initial projects**
Initiators

- Knowledge 4 All Foundation Ltd.
- Jožef Stefan Institute
- University of Maribor
- University of Primorska
- University of Ljubljana
- University of Nova Gorica
- Ministry of Education, Science and Sport
- OS Savsko Naselje primary school, representative of the national primary schools cluster
- Vrtec Trnovo kindergarten, representative of the national kindergarten cluster
- Chamber of Commerce and Industry of Slovenia
- The Managers' Association of Slovenia
- Chamber of craft and small business of Slovenia
Expressed interest

- International Centre for Genetic Engineering and Biotechnology (I)
- Politecnico di Milano (I)
- Karst Research Institute, Postojna, (SI)
- University of Graz, (A)
- University of Vienna, (A)
- Open University, (UK)
- British Telecom (UK)
- University of Nantes (F)
- German Research Center for Artificial Intelligence (DE)
- Karlsruhe Institute of Technology (DE)
- University of Bremen (DE)
- University of Frankfurt (DE)
- Universidad Politécnica de Madrid (ES)
- Universidad Politecnica de Valencia (ES)
- National Technical University of Athens (GR)
- Instituto de Desenvolvimento de Novas Tecnologias (PT)
- SINTEF (NO)
- VTT Technical Research Centre of Finland (FI)
- ...
• Links:
  ◦ Twitter #ioe2013
  ◦ http://www.k4all.org/openingupslovenia/
  ◦ http://www.k4all.org/
  ◦ http://conference.ocwconsortium.org/2014/

• Sponsors:
  ◦ http://www.translectures.eu
  ◦ http://mediamixer.eu/
  ◦ http://www.xlike.org/
Technology trends
- Mobile technology and devices
- LMS, course authoring and management systems
- Digital content repositories and services
- Social software
- Semantic and language technologies
• Mobile technology and devices
• LMS, course authoring and management systems
• Digital content repositories and services
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• Semantic and language technologies

• Cloud computing
• Augmented reality
• Artificial Intelligence (from analytics to companions)
• Smart environments and sensor networks (IoT, FI)
Technology trends

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- Cloud computing
- Augmented reality
- Artificial Intelligence (from analytics to companions)
- Smart environments and sensor networks (IoT, FI)
- 3D printing
- Intelligent/cognitive devices and embedded systems
- Nanotechnology
Technology is there I
Technology is there II
Increasing market
 Increasing market

- "691,000 students in the US, with an annual value estimated at around $20bn". (BBC News)
Increasing market

- „691,000 students in the US, with an annual value estimated at around $20bn“. (BBC News)
- „340,000 students taking UK university courses in their home countries“. (Irish Times)
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• „Indian public opinion was outraged after a series of attacks on Indian students in Australia in 2009. Applications from Indian students slumped by 50% - and threatened an industry which had grown to become Australia's third biggest export“. (Australian Technology Network)
Increasing market
"The number of students around the globe enrolled in higher education is forecast to more than double to 262 million by 2025". (University World News)
Increasing market

- „The number of students around the globe enrolled in higher education is forecast to more than double to 262 million by 2025“. (University World News)
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• „The number of students around the globe enrolled in higher education is forecast to more than double to 262 million by 2025“. (University World News)

• „The number of students seeking study abroad from China and India alone could rise to 8 million – nearly three times more than today.“ (University World News)

• „The total number of universities in the world are counted to 17036“. (According to International Journal of Scientometrics, infometrics and bibliometrics)
The countries which play host to the most international students in absolute terms are:

- United States (18%),
- United Kingdom (10%),
- Australia (7%),
- Germany (7%),
- France (7%),
- Canada (5%),
- Japan (4%),
- Russia (4%), and
- Spain (2%)
University hotspots – geographical distribution of highest impact institutions, 2009

Location of top-50 universities by main subject areas

Big players understand the market potential.
Big players understand the market potential
Big players understand the market potential
Big players understand the market potential

**Figure 3: Which Universities Use Enablers?**

<table>
<thead>
<tr>
<th>Company</th>
<th># of Partners</th>
<th>Non-Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embanet-Compass</td>
<td>35</td>
<td><strong>BOSTON UNIVERSITY</strong></td>
</tr>
<tr>
<td>Deltak</td>
<td>26</td>
<td><strong>PURDUE UNIVERSITY</strong></td>
</tr>
<tr>
<td>Academic Partnerships</td>
<td>14</td>
<td><strong>FIU FLORIDA INTERNATIONAL UNIVERSITY</strong></td>
</tr>
<tr>
<td>Bisk</td>
<td>12</td>
<td><strong>UNIVERSITY OF NOTRE DAME</strong></td>
</tr>
<tr>
<td>Pearson</td>
<td>10</td>
<td><strong>ARIZONA STATE UNIVERSITY</strong></td>
</tr>
<tr>
<td>Educators Serving Educators</td>
<td>7</td>
<td><strong>AMERICAN INTERNATIONAL COLLEGE</strong></td>
</tr>
<tr>
<td>Learninghouse</td>
<td>5</td>
<td><strong>Albany State University</strong></td>
</tr>
<tr>
<td>Colloquy</td>
<td>4</td>
<td><strong>GEORGE MASON UNIVERSITY</strong></td>
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<td>2tor</td>
<td>4</td>
<td><strong>USC University of Southern California</strong></td>
</tr>
<tr>
<td>Altius Ed</td>
<td>1</td>
<td><strong>TIFFIN UNIVERSITY</strong></td>
</tr>
</tbody>
</table>
Big players understand the market potential.
What is out there?

- Large scale reasoning
- Cognitive systems
- Interoperability models and solutions
- Self-awareness
- Language technologies
- Semantic and Context technologies
- Machine learning
- Multimodal interfaces
- Information retrieval
- Ubiquitous sensing
- Knowledge discovery
- Internet of things (everything)
- Data collection and storage
What is out there?

Mass data
Multimodal data
Some meta-information
How do I find the right information?

Where to look?
How do I find the right information?

Is it accurate?

Where to look?
How do I find the right information?

Is it accurate?

Where to look?

How to select and filter?
How do I find the right information?

Is it accurate?

Where to look?

How to select and filter?

How to cope with all the news?
How do I find the right information?

Is it accurate?

Where to look?

How to select and filter?

How to cope with all the news?

What to do with it?
How do I find the right information?

Where to look?
How to cope with all the news?
How to file and categorize it?

Is it accurate?
How to select and filter?

What to do with it?

How do I find the right information?
Is it accurate?

Where to look?

How to select it?

How to file and categorize it?

Never have so many people written so much to be read by so few...”
- Katie Hafner

How do I find the right information?
• **Learning**
  ◦ Technology driven
  ◦ Self-learning
  ◦ Open access

• **Teaching**
  ◦ Does not work only with ICT
  ◦ instructors engage in dialogue, develop critical thinking skills and spark passion about a discipline.

Returning back to teaching - „blended approach“
We are ignoring...
The generations that are coming are different – ICT, videos, interactive games are embedded in their mental models.

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The generations that are coming are different – ICT, videos, interactive games are embedded in their mental models

Serendipity: rapid development of new technologies

We are ignoring...
We are ignoring...

- The generations that are coming are different – ICT, videos, interactive games are embedded in their mental models
- Serendipity: rapid development of new technologies
- Mass content, information
• The generations that are coming are different – ICT, videos, interactive games are embedded in their mental models
• Serendipity: rapid development of new technologies
• Mass content, information
• Networking as a fundamental mechanism

We are ignoring...
• The generations that are coming are different – ICT, videos, interactive games are embedded in their mental models
• Serendipity: rapid development of new technologies
• Mass content, information
• Networking as a fundamental mechanism
• Learning machines

We are ignoring...
The generations that are coming are different – ICT, videos, interactive games are embedded in their mental models.

Serendipity: rapid development of new technologies.

Mass content, information.

Networking as a fundamental mechanism.

Learning machines.

It is not about competition it is about collaboration.

We are ignoring...
### Status Quo

<table>
<thead>
<tr>
<th>Customers</th>
<th>Domestic students</th>
<th>International students</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product offerings</td>
<td>Vocational and further education and training</td>
<td>Higher education</td>
<td>Research</td>
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<tr>
<td>Education disciplines</td>
<td>Arts</td>
<td>Engineering</td>
<td>Science</td>
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<tr>
<td>IT</td>
<td>Design</td>
<td>Other</td>
<td>Other</td>
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<tr>
<td>Sales</td>
<td>Schools</td>
<td>Open days</td>
<td>Agents</td>
</tr>
<tr>
<td>Delivery</td>
<td>On campus</td>
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<td>Student services</td>
<td>Student administration</td>
<td>Career centre</td>
<td>Other</td>
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<tr>
<td>Back office</td>
<td>HR</td>
<td>IT</td>
<td>Finance</td>
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<td>Customers</td>
<td>Domestic students</td>
<td>International students</td>
<td>Industry professionals</td>
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<tr>
<td></td>
<td>School leavers</td>
<td>High-end</td>
<td>B2B</td>
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<tr>
<td></td>
<td>Mature age</td>
<td>Mass market</td>
<td>Content consumers</td>
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<tr>
<td></td>
<td>Parents</td>
<td>Content wholesalers</td>
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<td>Product offerings</td>
<td>Vocational and further education and training</td>
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<tr>
<td></td>
<td>Content aggregation</td>
<td>Entertainment</td>
<td>Financial services</td>
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<tr>
<td>Sales</td>
<td>Other</td>
<td>Digital</td>
<td>Other</td>
</tr>
<tr>
<td>Delivery</td>
<td>Digital</td>
<td>Partnerships</td>
<td>Other</td>
</tr>
<tr>
<td>Student services</td>
<td>Student administration, career services, other (outsourced)</td>
<td>Customer relationship management (cloud)</td>
<td></td>
</tr>
<tr>
<td>Back office</td>
<td>Outsourced</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Ernst & Young
### Customers

- **Domestic students**
  - School leavers
  - Mature age
- **International students**
  - High-end
  - Mass market
- **Industry professionals**
  - B2B
  - Executive education
- **Other education providers**
- **Content wholesalers**
- **Content consumers**
- **Service providers**

### Product offerings

- Vocational and further education and training
- Higher education
- Research
- Entertainment
- Financial services
- Mass distribution
- Other

### Sales

- Other
- Digital
- Other
- Other

### Delivery

- Digital
- Partnerships
- Other
- Other

### Student services

- Student administration, career services, other (outsourced)
- Customer relationship management (cloud)
- Outsourced

### Back office

- Outsourced

---

*Source: Ernst & Young*
Implications for Academia
The war of titans (network and globalisation)
  ◦ What is there for small nations, 3rd world countries?

Implications for Academia
Implications for Academia

- The war of titans (network and globalisation)
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- New systems – old paradigms
• The war of titans (network and globalisation)
  ◦ What is there for small nations, 3rd world countries?
• New systems – old paradigms
• Loosing quality by inflated programs
  ◦ Academia is not an industry

Implications for Academia
- The war of titans (network and globalisation)
  - What is there for small nations, 3rd world countries?
- New systems – old paradigms
- Loosing quality by inflated programs
  - Academia is not an industry
- Polarisation:
  - “Louis Vuitton on Fifth Avenue” type of universities at one side
  - “Wal Mart” type universities at the other
  - ... and nothing in between
The war of titans (network and globalisation)
- What is there for small nations, 3rd world countries?

New systems – old paradigms

Loosing quality by inflated programs
- Academia is not an industry

Polarisation:
- “Louis Vuitton on Fifth Avenue” type of universities at one side
- “Wal Mart” type universities at the other
- ... and nothing in between

Cross-accreditation is still a political incentive
- Bologna refform in Europe

Implications for Academia
“Other institutions will look at edX certificates – which, after all, are based on courses developed by Harvard, MIT and Berkeley – and say they might accept them as credit towards a course of study.” (Listener)

The ideal behind MOOCs courses is "the promise of scaling a university education to everyone... well everyone with an Internet connection, that is.“ (Hack Education)