Digital World 2019

February 24-28, Athens, Greece

Education Challenges and Opportunities Amidst Disruptive E-Learning Technologies

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THE DISRUPTIVE EDUCATION LANDSCAPE

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DISRUPTION AND INNOVATION

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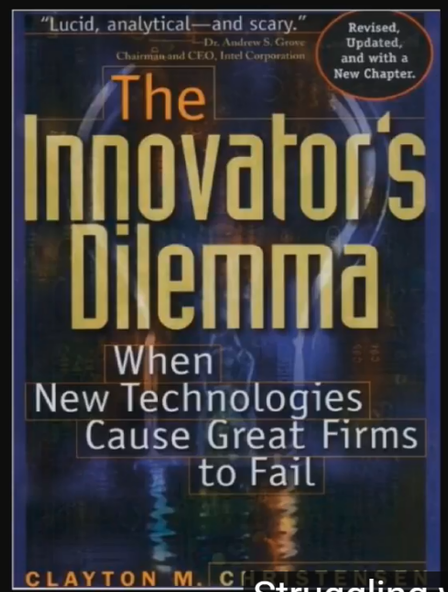
On Economics and Innovation

Creative destruction is a theory, popularized by ***Joseph Schumpeter***, of economic innovation and the business cycle. The *gale of creative destruction* describes the "process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one".

Disruptive innovation is a term defined and analyzed by ***Clayton Christensen*** in 1995. It refers to an innovation that creates a new market and value network, and eventually disrupts an existing market and value network, displacing established market-leading firms, products, and alliances. It has been called the most influential business idea of the early 21st century.

On Economics and Innovation

The Innovators Dilemma



Key Message: *There are two essential types of developments.*

- *Sustaining developments that maintain existing value chains and incumbents*
- *Disruptive developments that overturn existing value chains and incumbents*

Struggling with this, that's what a disruptor is.

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On Destruction, Innovation, and Disruption

- Creative destruction
  - Mainframes → PC's with OS → Open Source Software
  - PSTN Long Distance Calls → Internet connectivity
- Inertia of value networks
  - Digital music → disc / box / rack / store
- Resistance of value networks
  - Digital music → record labels
  - Digital cinema → theatre owners
- Group dynamics in disruptive innovation
  - Open Source Software
  - Teslarati and volunteers

On Destruction, Innovation, and Disruption

Where does lasting prosperity come from? The answer: Market-Creating Innovations.

— Clayton Christensen

It takes 30 years for a new idea to seep into the culture. Technology does not drive change. It is our collective response to the options and opportunities presented by technology that drives change.

— Paul Saffo

Invention requires a long-term willingness to be misunderstood. You do something that you genuinely believe in, that you have conviction about, but for a long period of time, well-meaning people may criticize that effort … if you really have conviction that they're not right, you need to have that long-term willingness to be misunderstood. It's a key part of invention.

— Jeff Bezos

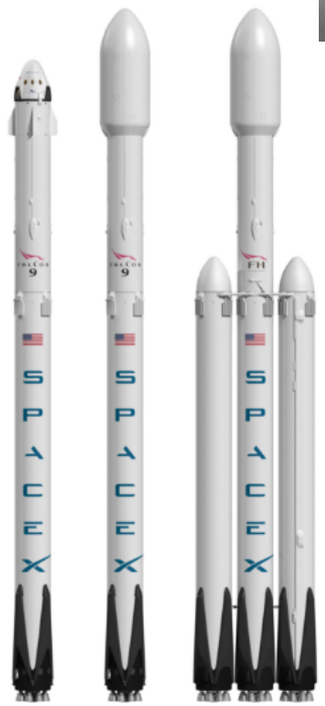
Plenty of Disruptive Innovations

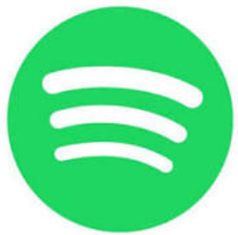
Booking.com

Uber

amazon

airbnb





DISRUPTIVE AND SOCIETAL FORCES

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Is E-Learning Potentially Disruptive ?

For most complicated issues in statistics, I go on the Web to Khan Academy. There, it is explained much better and clearer.

— Belgian High School Student

Why can't I just go on the Web and follow a MOOC on 'Introduction to Economics'. I can't get it any better than explained by a Noble Prize Winner, can I ?

— Belgian College Student Economics

I prefer to work part time during my master studies. There are many things I only learn at the company, and it enables me to know what I'm looking for, and actively improve my learning at the university.

— Czech College Student Informatics

"Education Disruption On Its Way."
Elearning! Magazine, Sept./Oct. 2014, pg. 10.

Is There Inertia in Current E-Learning ?

- LMS (Learning Management Systems) are still mainly used by lecturers to publish PDF's …
- Teaching classes are often recorded from beginning to the end, year after year …
- In order to have computer examinations, lecturers resort to multiple choice questions …

- And how are we going to overcome it …

"Who is going to send our learning Tesla Roadster into orbit and create the imagery and the same sense of possibility that nothing will ever be the same again?"
Are we Really Ready for Disruption in Learning?, Peter Philips, Feb 2018

Disruptive Forces in Education

- Massive Open Online Courses
  - edX, Coursera, Udacity, ..
- Online tools to educate students
  - Khan Academy, PatrickJMT, EdTech Talks, …
- Technology Certification Programs
  - Java, SAP, Scrum, …
- Market pull on students
  - From big companies
  - To start their own company
- And, as always, a lot of hype …

Societal Forces in Education

- Government allocation mechanisms
  - Competitive, market-driven
- Double degrees, university alliances
- Local and global accreditation bodies

Master in Management
Ranking 2018

SOME INNOVATION AXES IN E-LEARNING EDUCATION

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INTERACTIVE E-LEARNING

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Toward Interactive E-Learning Activities

- Several techniques exist:
  - Scenarios and simulations
  - Stories
  - Games
  - Quizzes and assessments
- Many more tools exist
  - With many templates, formats, scenarios, …
- People are hailing *interactive instructional simulations* as the demand for e-learning content seems to start falling

Toward Interactive E-Learning Activities

- Engaging and effective interactive content is scarce
- Should be developed in a domain-specific way
  - Taking advantage of domain intricacies
    - E.g, interactive exercises in ‘accountancy’
      - Huge improvements in results in former *threshold course*
- Provides many opportunities
  - In domain-specific interactive e-learning content
  - In generalizing it through induction

ARCHITECTURE OF COLLABORATION

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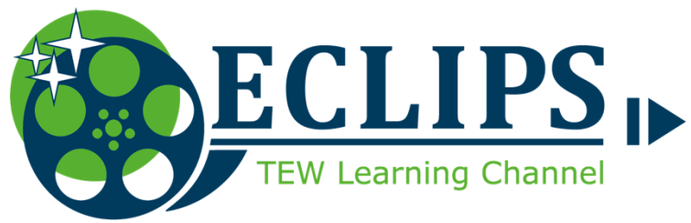
The Architecture of Collaboration

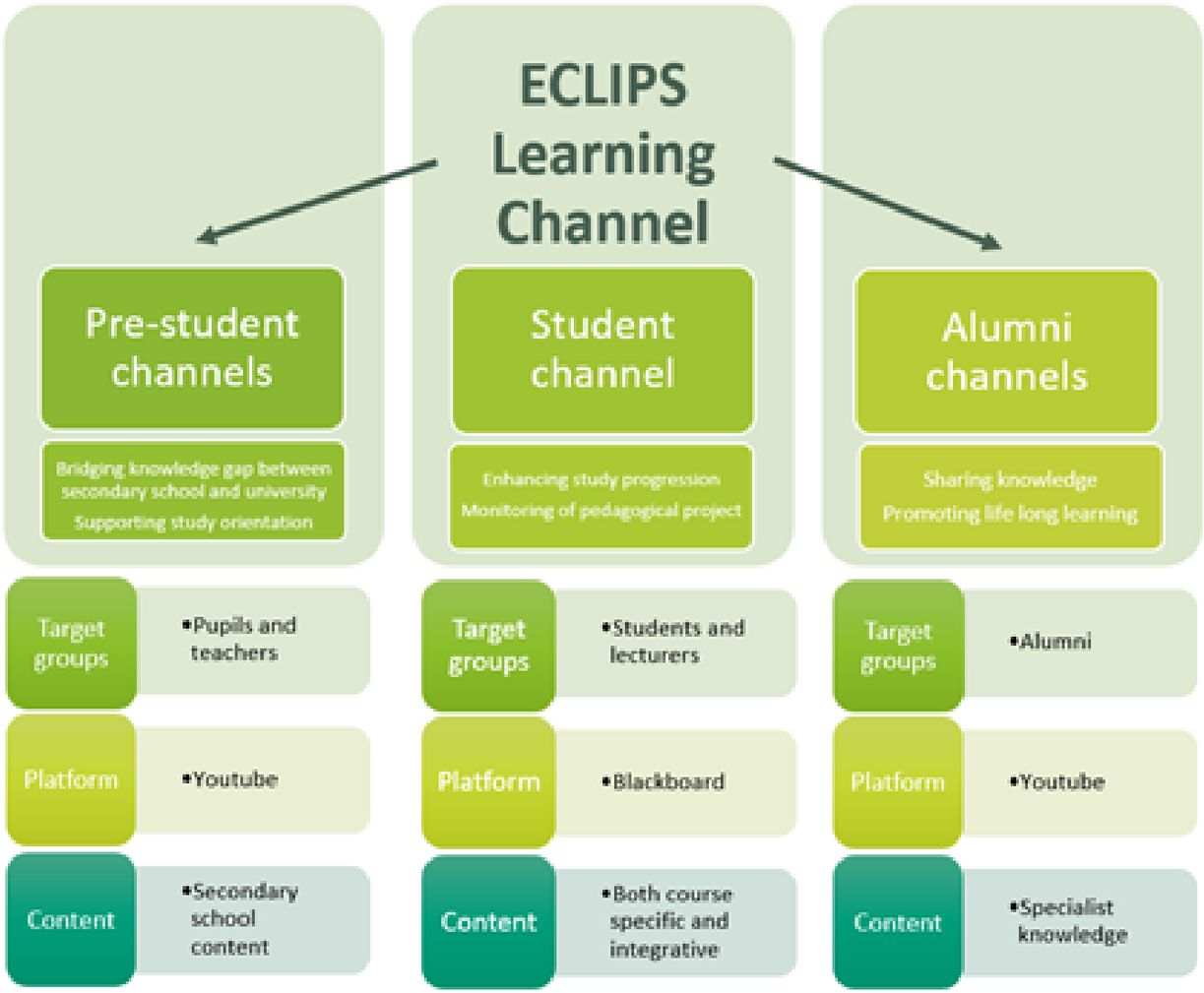
- Next to the many challenges due to globalization, there are equally collaboration opportunities
- Collaborate with university partner networks
  - Leverage incoming exchange students to create mixed student groups for assignments, e.g., UA-JMU
  - Leverage exchange of lecturers to establish mixed virtual groups for such assignments, e.g., UA-CTU
  - Develop and establish common courses with partner universities

The Architecture of Collaboration

- Collaborate with private industry partners
  - Internships, master theses
  - Summer schools, bootcamps
  - Usage of tools from spin-off companies
  - Run integration projects co-supervised by companies
    - Multinationals, SME's, NPO's
- Use and embed publicly available content
  - Embed external content in learning channel. E.g.,
    - Khan Academy
    - PatrickJMT
    - EdTech



Reach Out and Leverage Alumni



- Use of video tutorials for different target groups
- Own ECLIPS studio for recording
- Opportunities for co-creation
- Interactive link with the outside world

Examples of pre-students channels

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Faculty of Business and Economics

Reach Out and Leverage Alumni

EVOLVABLE MODULAR CONTENT

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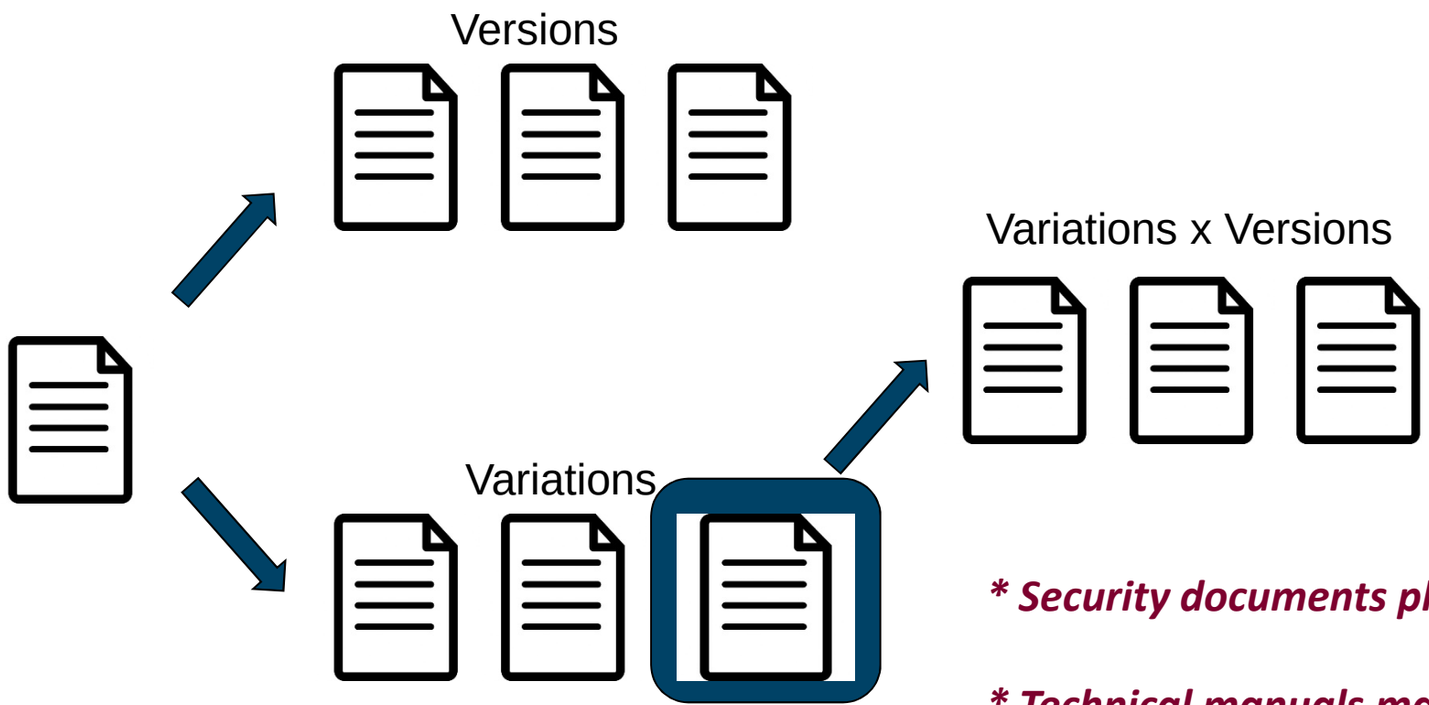
What About the Future of Documents ?

What About Re-Use and Evolvability ?



**** Security documents plants***

**** Technical manuals machines***

**** Accreditation body reports***

What About Re-Use and Evolvability ?

- Look at software …

"expect families of routines to be constructed on *rational principles* so that families fit together as **building blocks**"

from: Doug McIlroy, *Mass Produced Software Components*,
1968 NATO Conference on Software Engineering, Garmisch, Germany.

What About Re-Use and Evolvability ?

- Look at software …

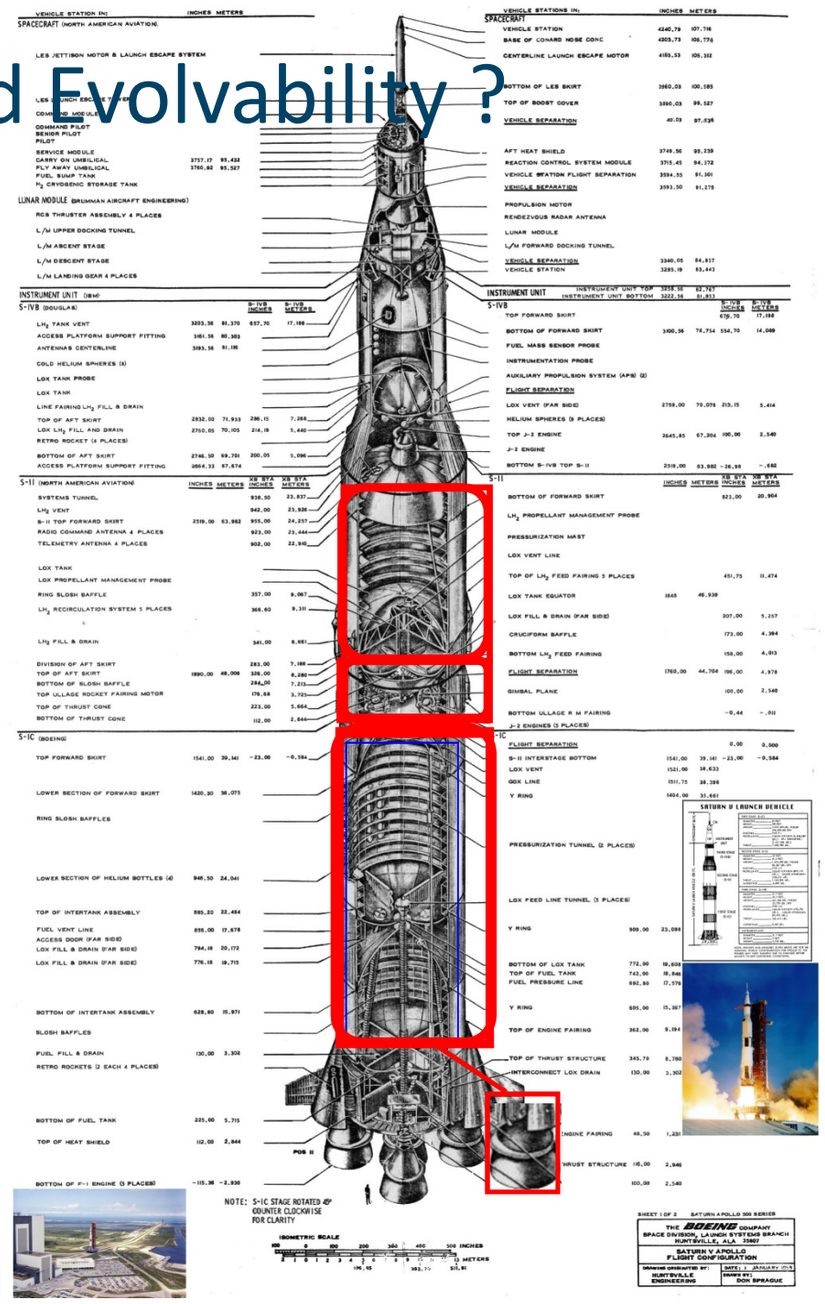
The Law of Increasing Complexity
Manny Lehman

"As an evolving program is continually changed, its complexity, reflecting deteriorating structure, increases unless work is done to maintain or reduce it."

Proceedings of the IEEE, vol. 68, nr. 9, september 1980, pp. 1068.

What About Re-Use and Evolvability ?

- Look at rockets …



What About Re-Use and Evolvability ?

- Look at bikes …

What About Re-Use and Evolvability ?

- Look at cars …

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Robots

Mercedes-Benz swaps robots for people on its assembly lines

Car makers switch to smaller and safer robots working alongside humans for greater flexibility

Samuel Gibbs

Friday 26 February 2016 12.05 GMT

Shares 0 | Comments 168

Save for later

Humans are taking the jobs of robots, as car manufacturers adapt to demands of customisation. Photograph: Kai Pfaffenbach/Reuters

Bucking modern manufacturing trends, Mercedes-Benz has been forced to trade in some of its assembly line robots for more capable humans.

The robots cannot handle the pace of change and the complexity of the key customisation options available for the company's S-Class saloon at the 101-year-

Most popular in US

MH17 shot down by missile brought into Ukraine from Russia, says investigation

Trump boasts after first debate against Clinton: 'I didn't want to embarrass her'

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MODERNE TIJDEN - IEDEREEN WIL ZIJN EIGEN AUTO

Weg met de lopende band

Vandaag om 14:22 door Diederik Van Vaerenbergh

G+ | Tweet | Delen | Mail | Print

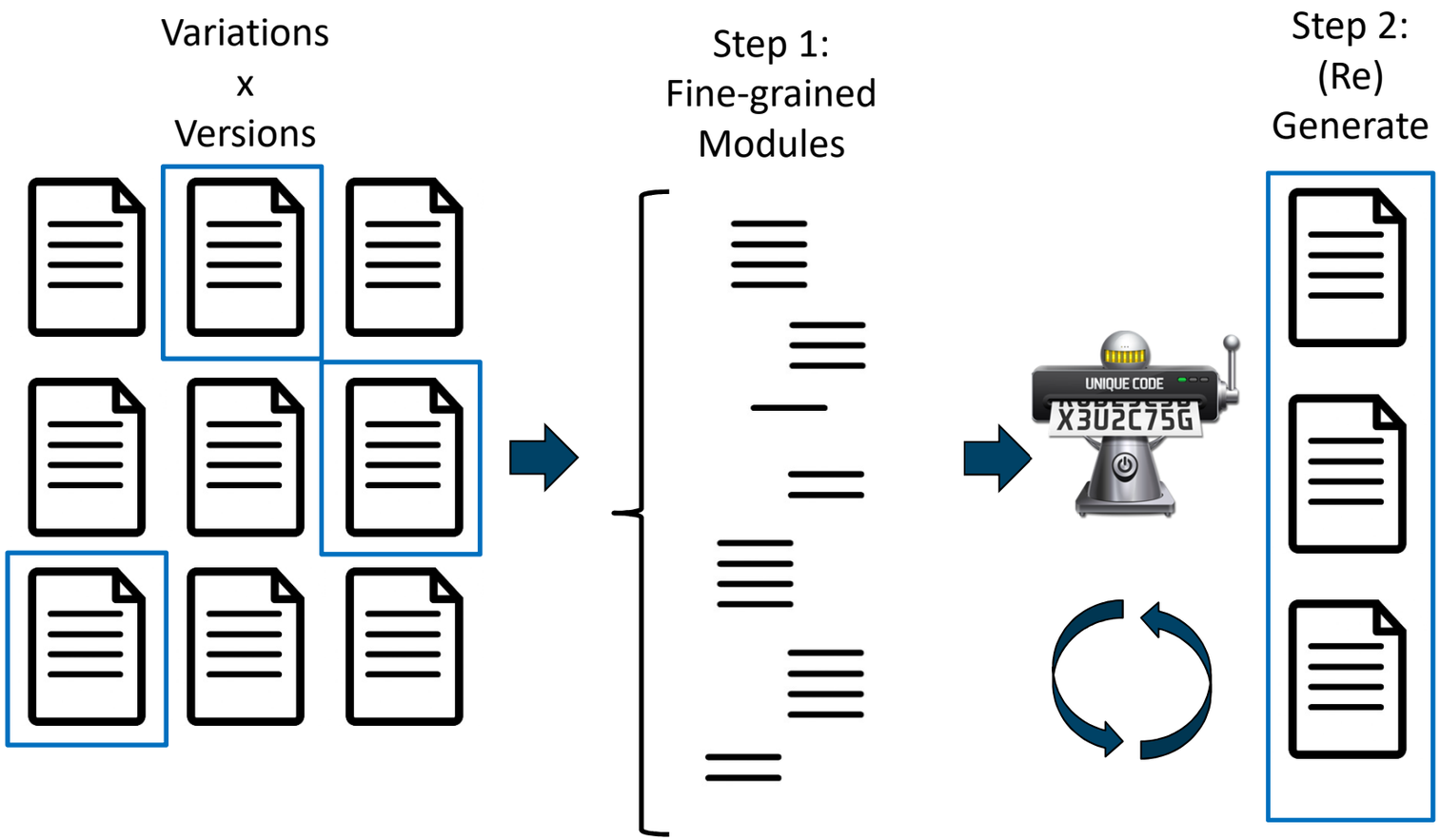
Foto: AP

Honderd jaar geleden werden auto's voor het eerst aan de lopende band gemaakt. Audi wil daar nu vanaf. Want uw auto is niet dezelfde als die van uw buur, toch?

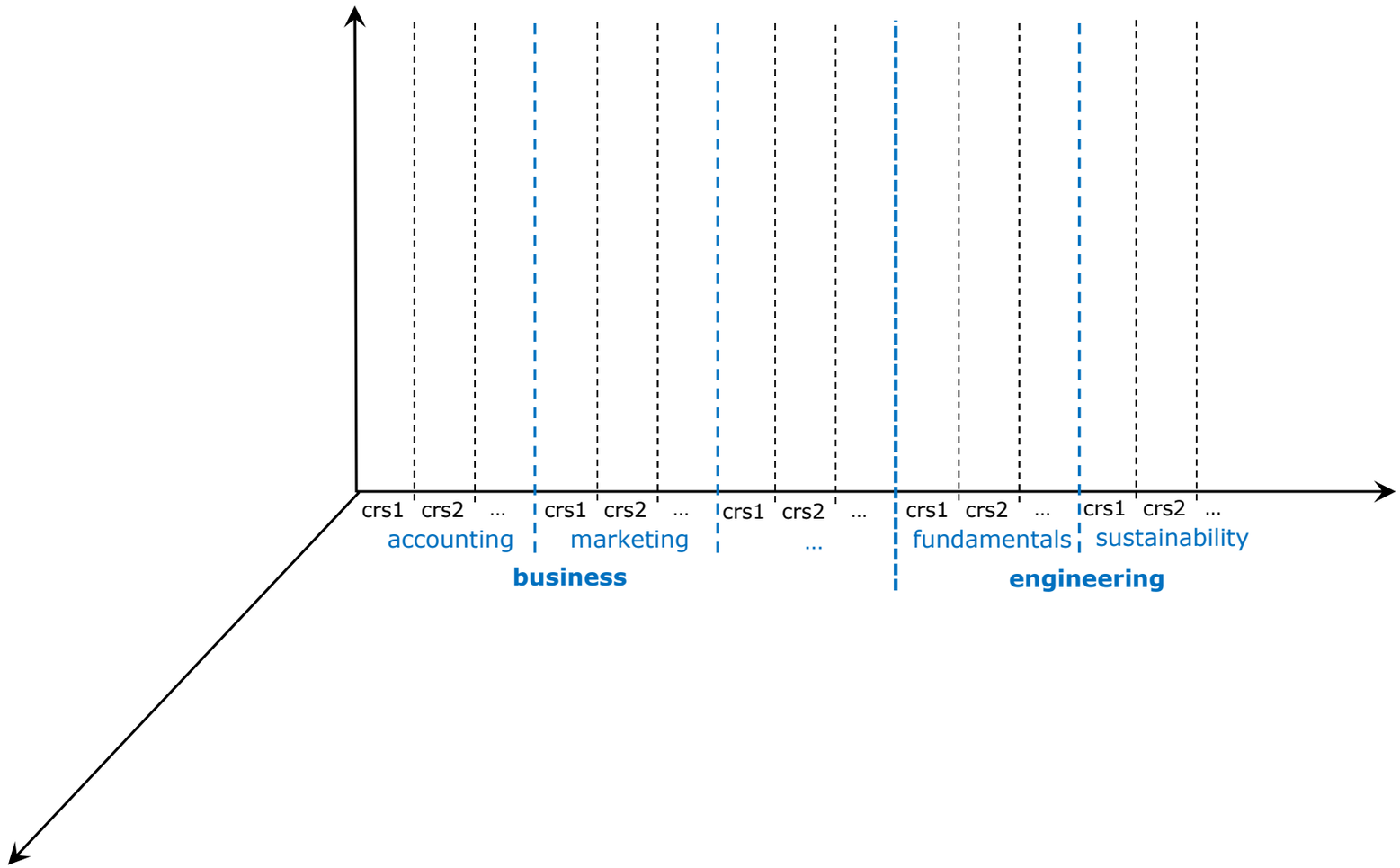
Honderd jaar geleden (103 jaar voor wie het exacte getal wil) voerde Henry Ford in Detroit de lopende band in om zijn wagens, de Model T dus, sneller geproduceerd te krijgen. Nu wil Audi-topman Hubert Waltl daarvan af.

'Honderd jaar geleden had dat zin omdat iedereen hetzelfde product wou', zegt Waltl in de *Frankfurter Allgemeine Zeitung*. 'Nu geldt het tegenovergestelde: elke wagen moet persoonlijk zijn. Het is een maatpak, gemaakt naar de wensen van elke afzonderlijke klant.'

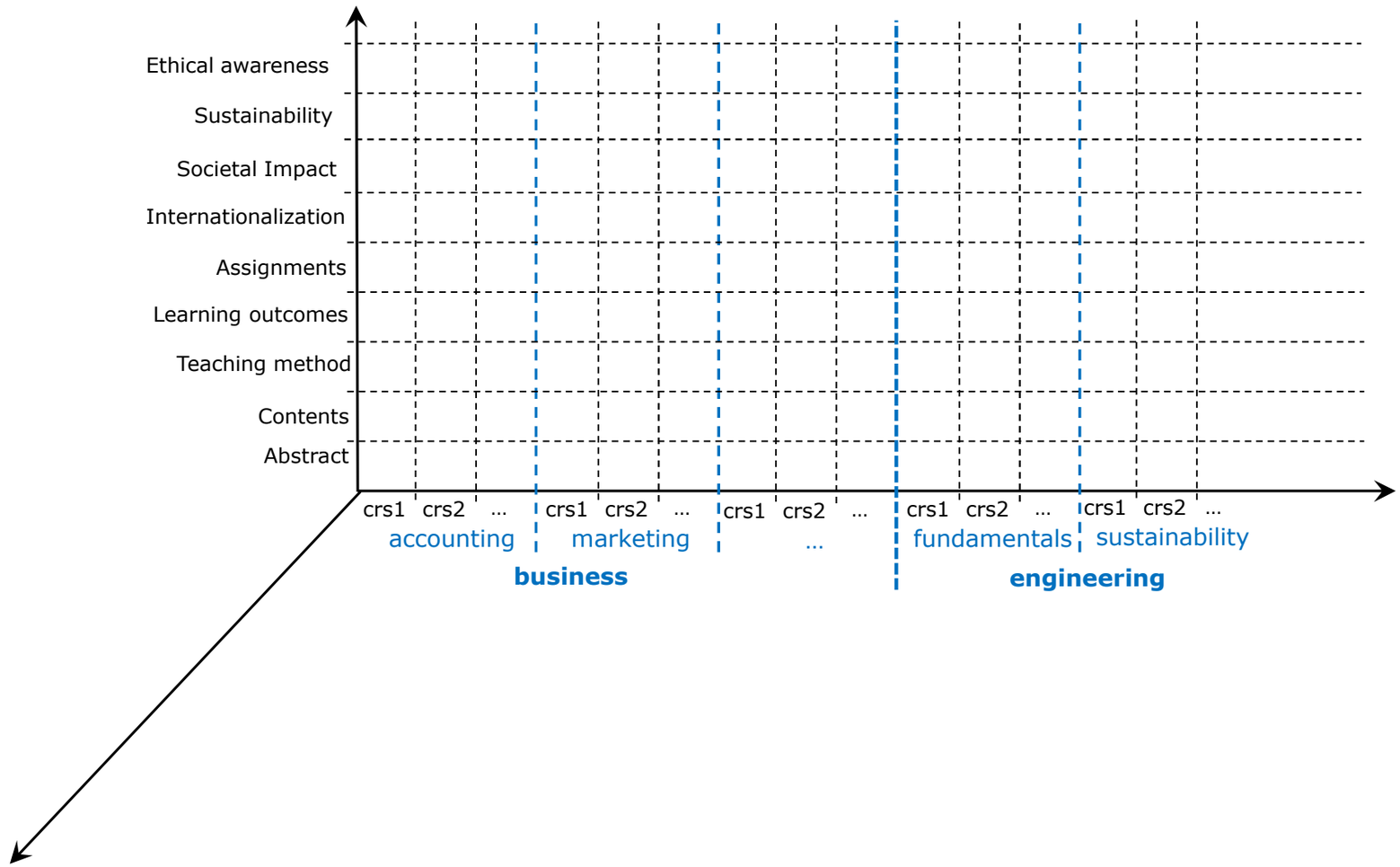
What About Re-Use and Evolvability ?



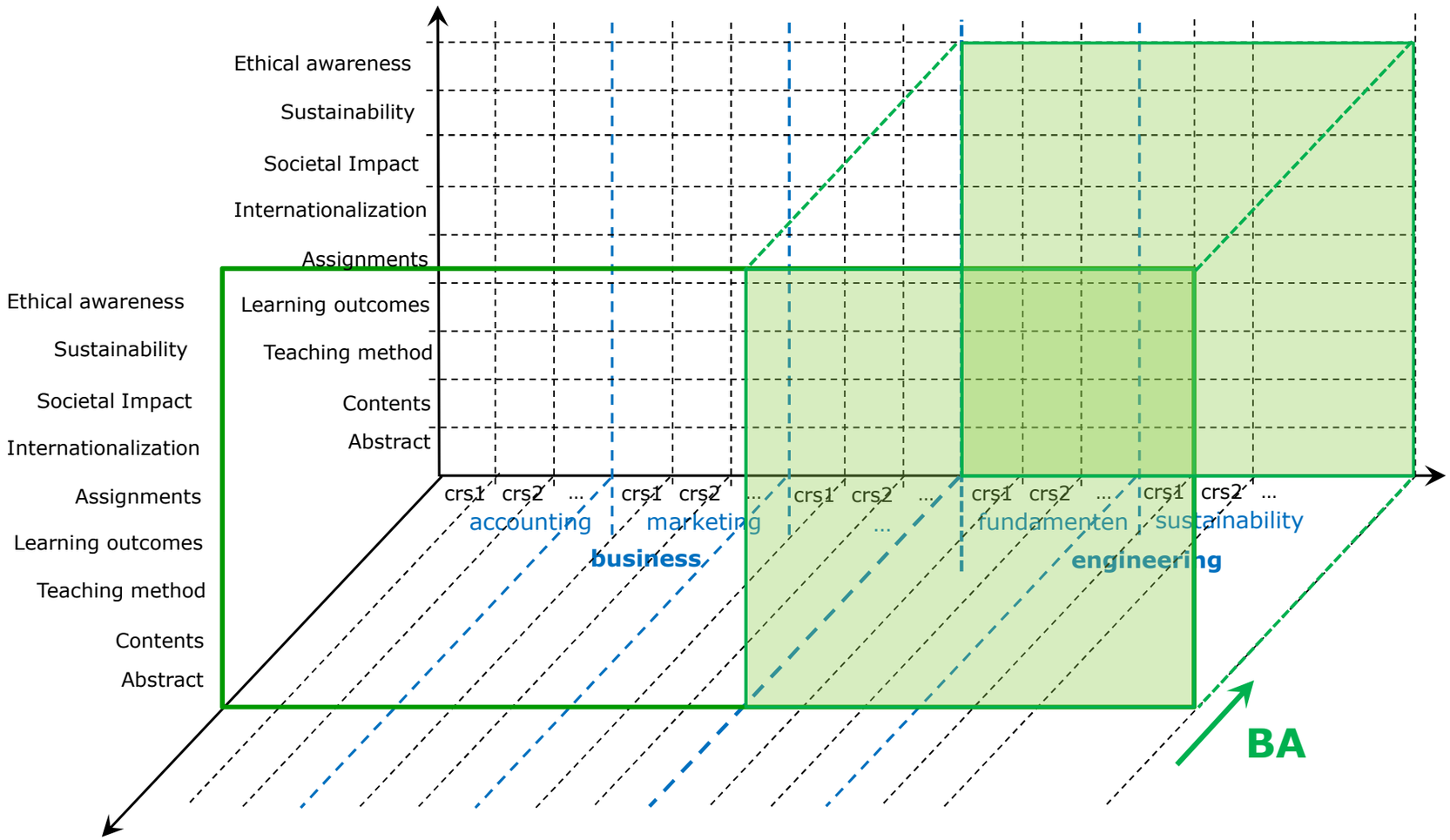
Toward Evolvable Modular Content



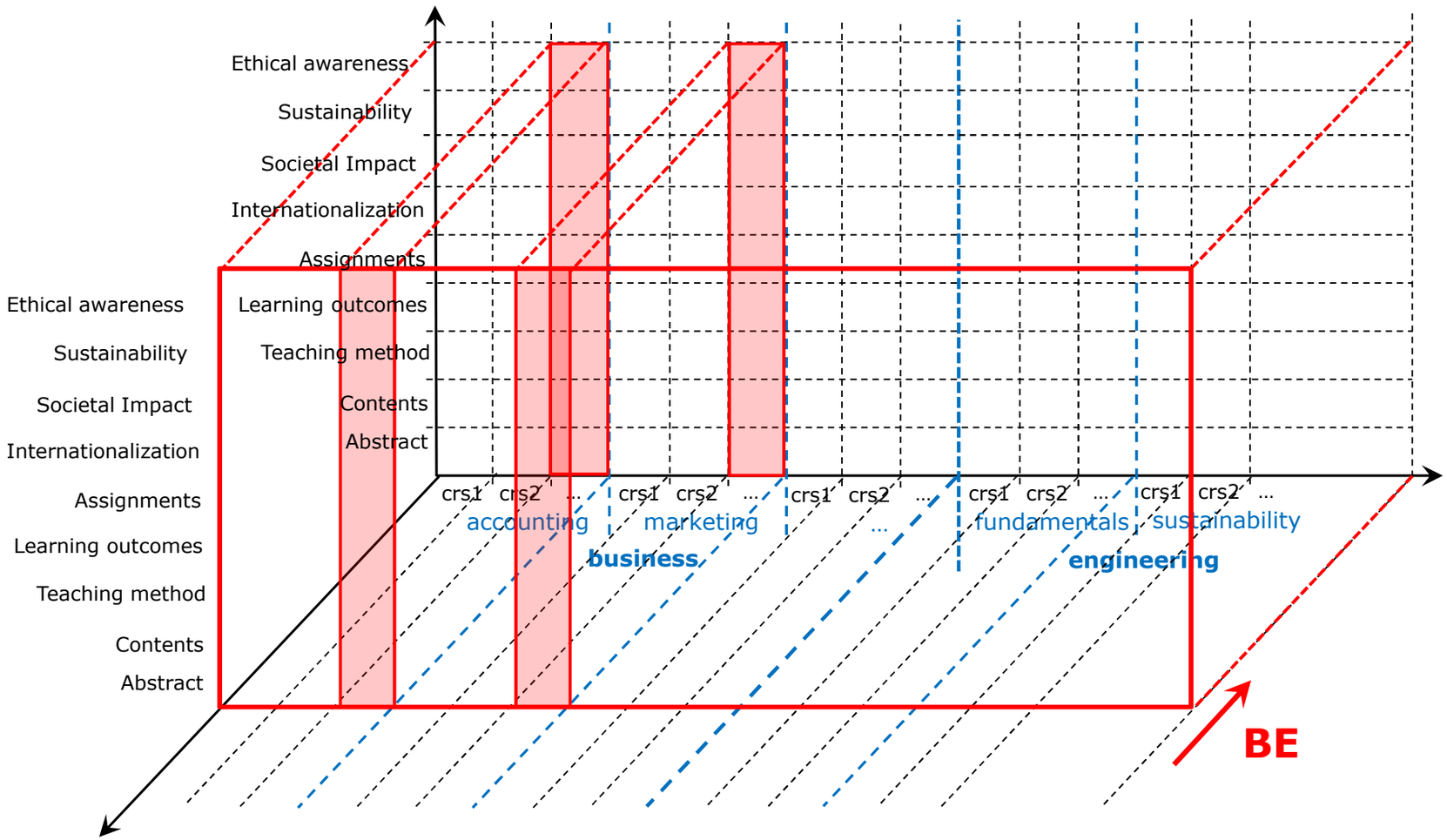
Toward Evolvable Modular Content



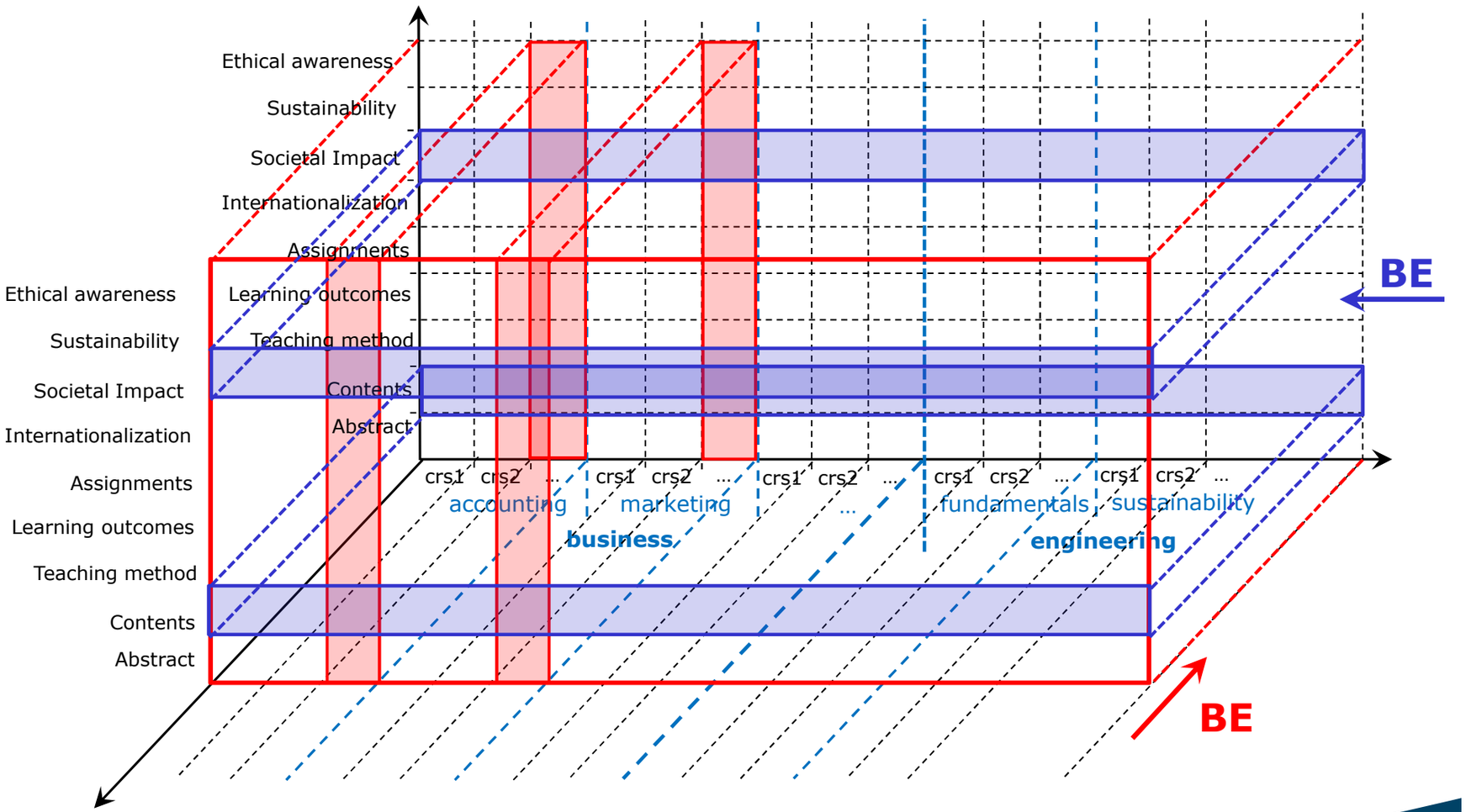
Toward Evolvable Modular Content



Toward Evolvable Modular Content



Toward Evolvable Modular Content



Toward Evolving Modular Content

- Other types of variations exist as well
  - Layout styles
  - Verboseness
  - Languages
- Ordering should be configurable
  - Within an hierarchical level
  - Between hierarchical levels
- Multimedia adds some variations
  - Exchange video without sound
  - Exchange scenario’s without video/sound

CONCLUSION AND DISCUSSION

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Conclusions

- E-learning technologies are in essence disruptive
- Learning disruption is still in a preliminary phase
- It poses or will pose many challenges for educators
  - Prestigious MOOC providers
  - Free content platforms
- Nevertheless, educators have ample opportunities
  - Creating specialized interactive content
  - Creating new collaborative architectures
- One should be well aware of modularity issues
  - Hampering future re-use and evolvability

Questions/Remarks

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