Challenges to the Adoption of BIM in Europe

prof.dr. Žiga Turk
Univerisity of Ljubljana, Slovenia

6th International BIM Technical Symposium on the Application of Digital Construction in Real Estate, Design and Construction & International Forum on BIM Development
Shanghai, China, Sept 24-26, 2019.

Speaker with three hats: Univesity, FIEC, collaboration

University *of Ljubljana*
Faculty of *Civil and Geodetic Engineering*

FIEC

清華大學
Tsinghua University

Summary

- we want to build better, more efficient
  - specialization is key to better productivity
- specialization enabled by communication
  - two communication revolutions - paper, and now digital
- BIM improves design communication
  - but there are challenges to adopt it
  - how is Europe doing it
- future trends in BIM in Europe
  - BIM as part of Industry 4.0 and the platform strategy
- conclusions

Talk map


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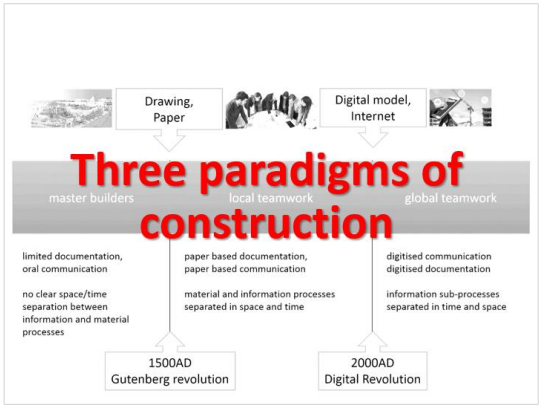
Communication Revolutions


Drawing, Paper
Digital model, Internet
Three paradigms of construction
master builders
local teamwork
global teamwork
limited documentation, oral communication
no clear space/time separation between information and material processes
paper based documentation, paper based communication
material and information processes separated in space and time
digitised communication digitised documentation
information sub-processes separated in time and space
1500AD Gutenberg revolution
2000AD Digital Revolution


DESIGN
BUILD
BIM
OPERATE


Beyond BIM: Construction Industry 4.0


Summary and Conclusions


Communication
Revolutions

Specialization

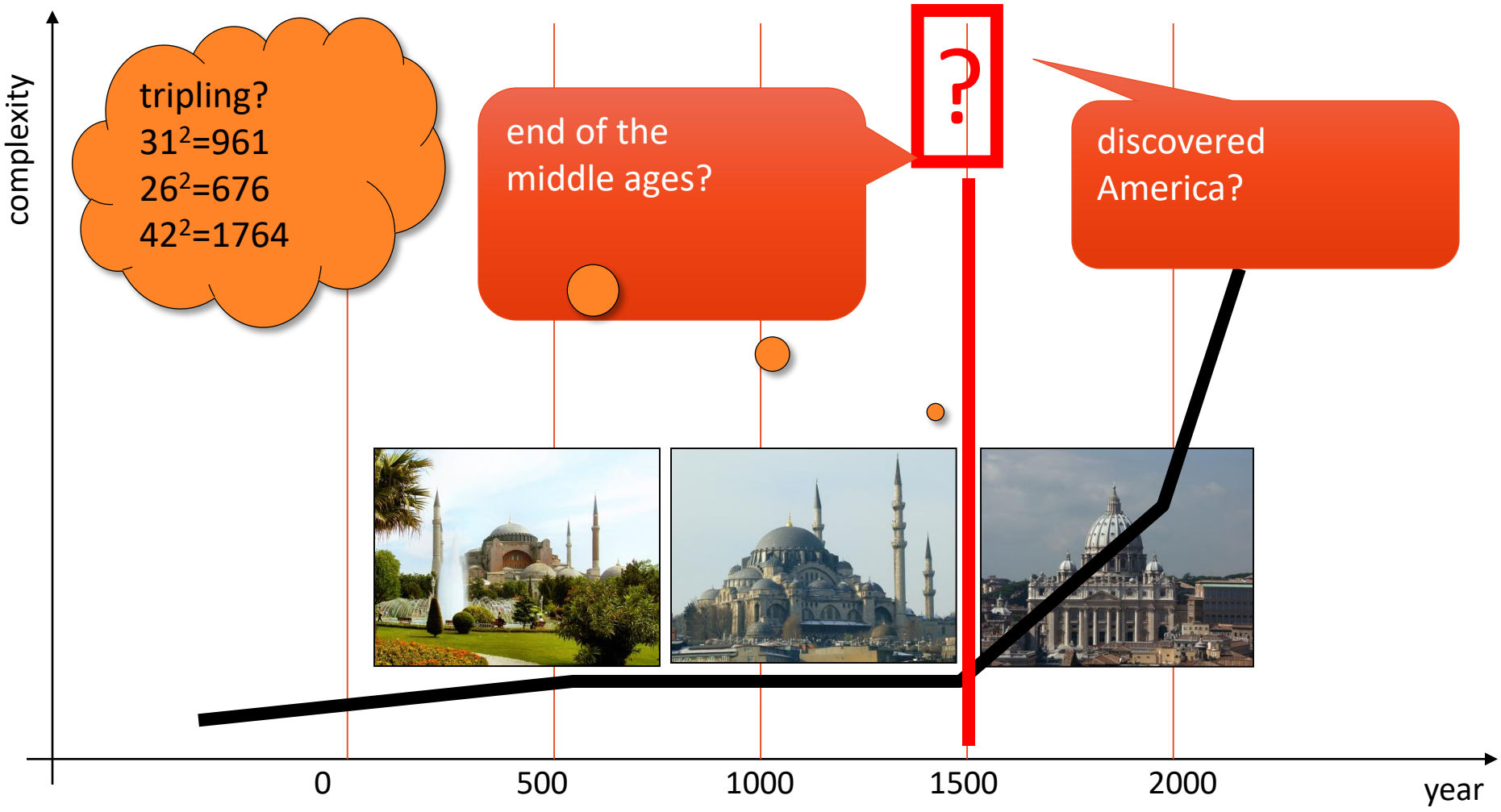
- Progress of mankind is progress in how many people can work together
  - more people, more knowledge
- Progress in construction is enabled by more knowledge by more people
  - not different
- Working together requires communication
  - it was dramatically improved by technology twice

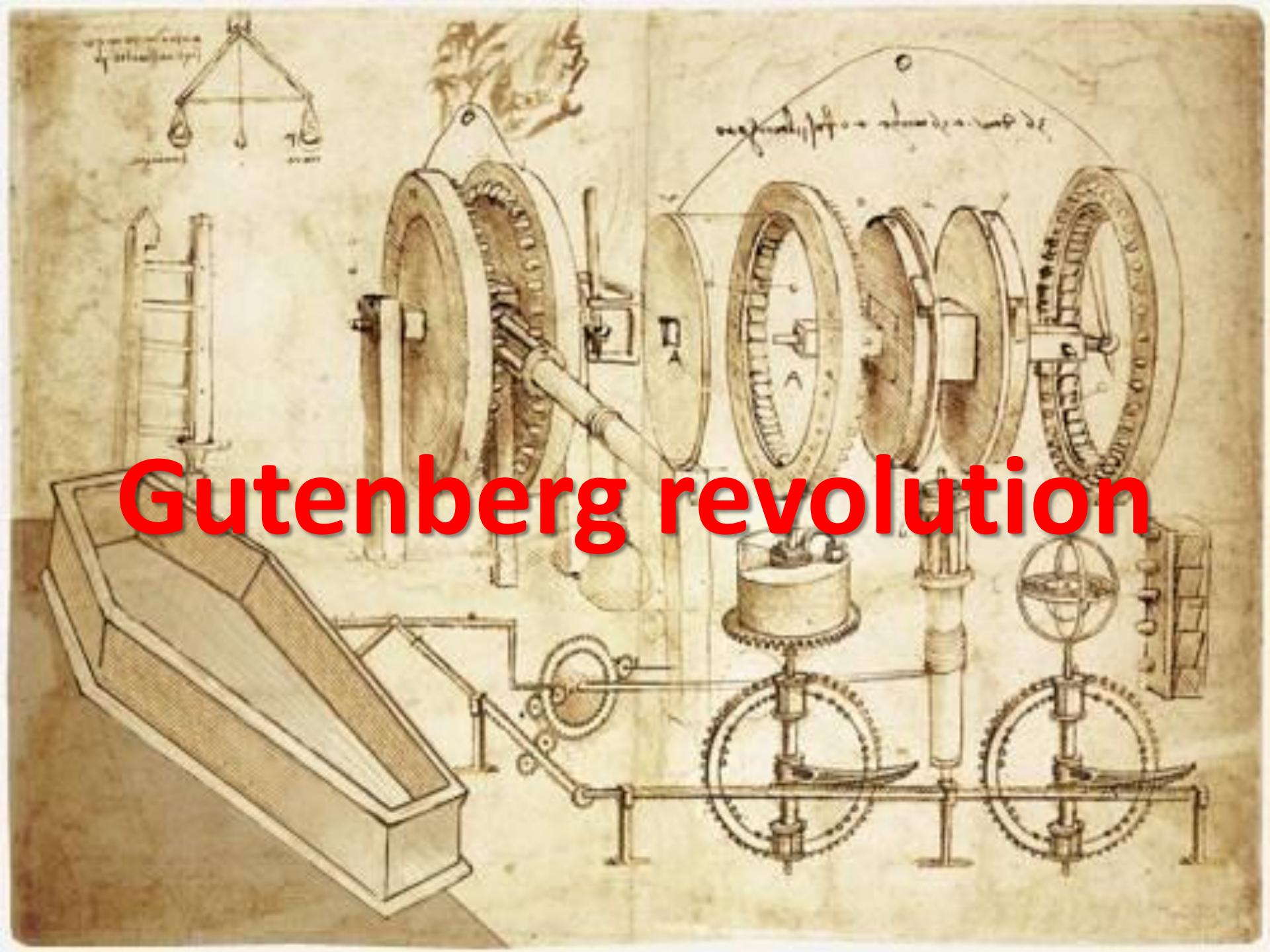
AD500, Istanbul: Hagia Sophia

AD 1500, Istanbul: Süleymaniye Mosque

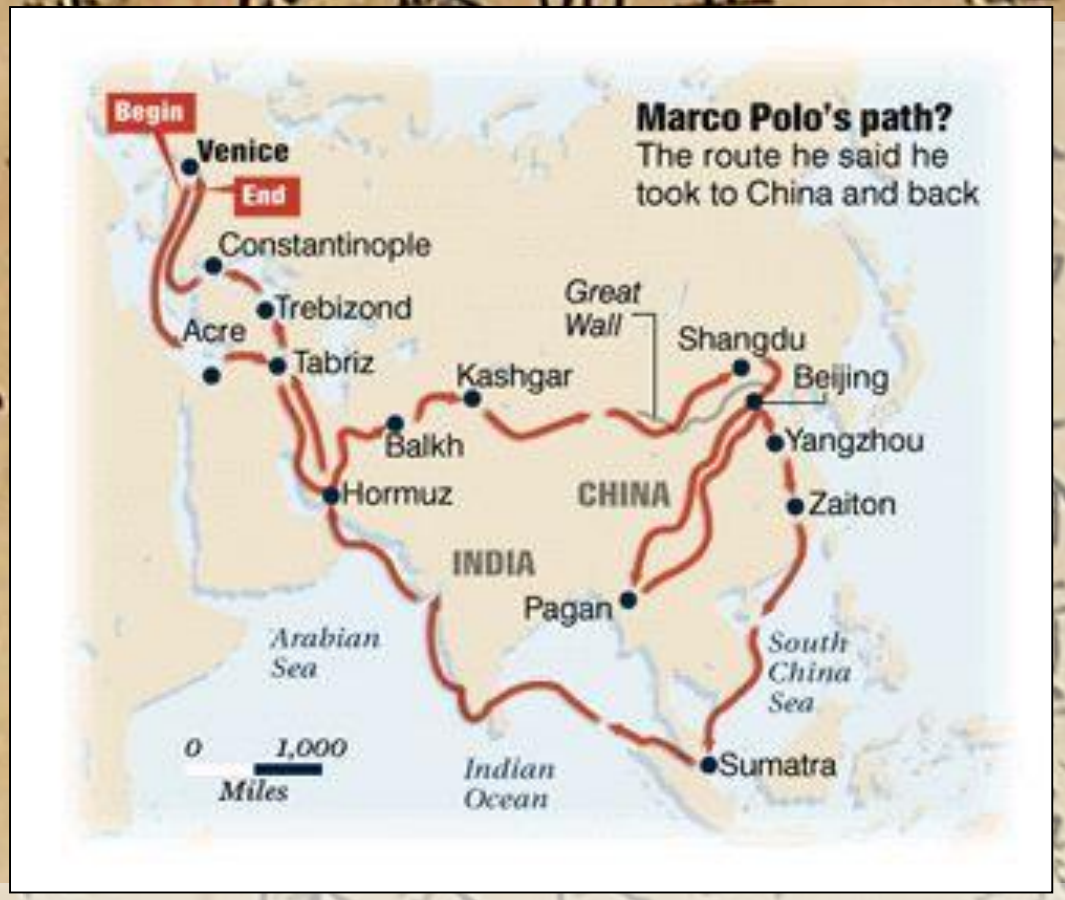
AD1600: St. Peters in Rome

1000 years: nothing
100 years: tripling in size




Gutenberg revolution

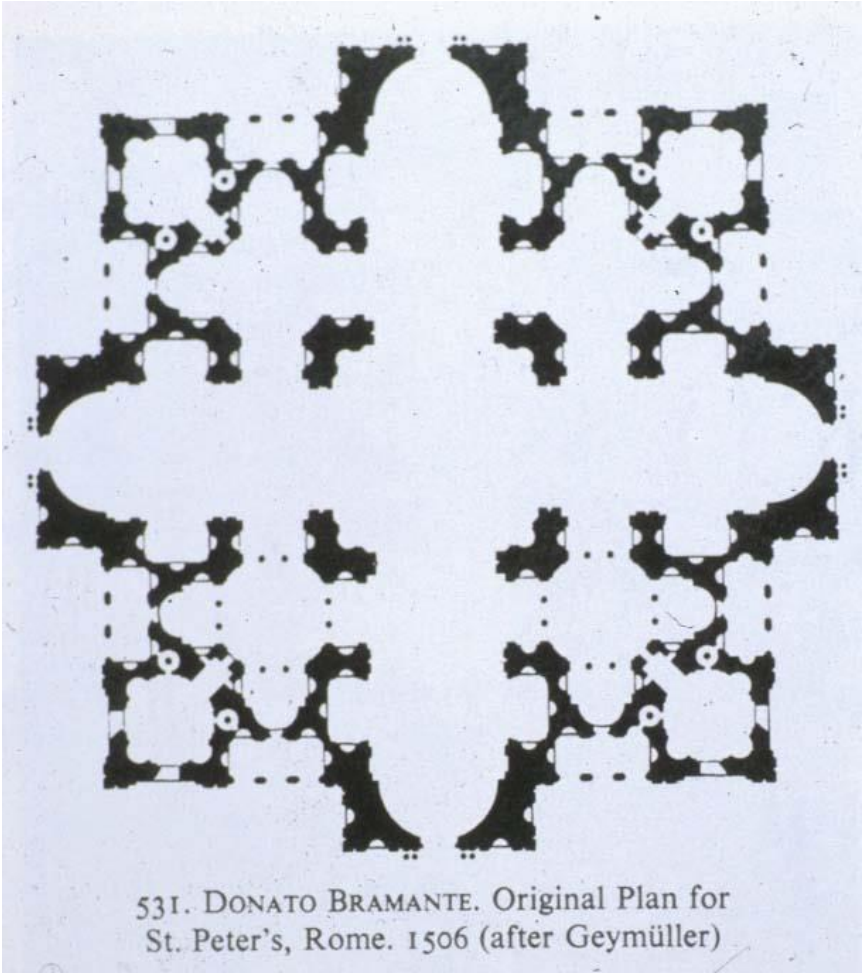
expensive paper



cheap paper making technology from China reaches Europe

paper, available for anything …

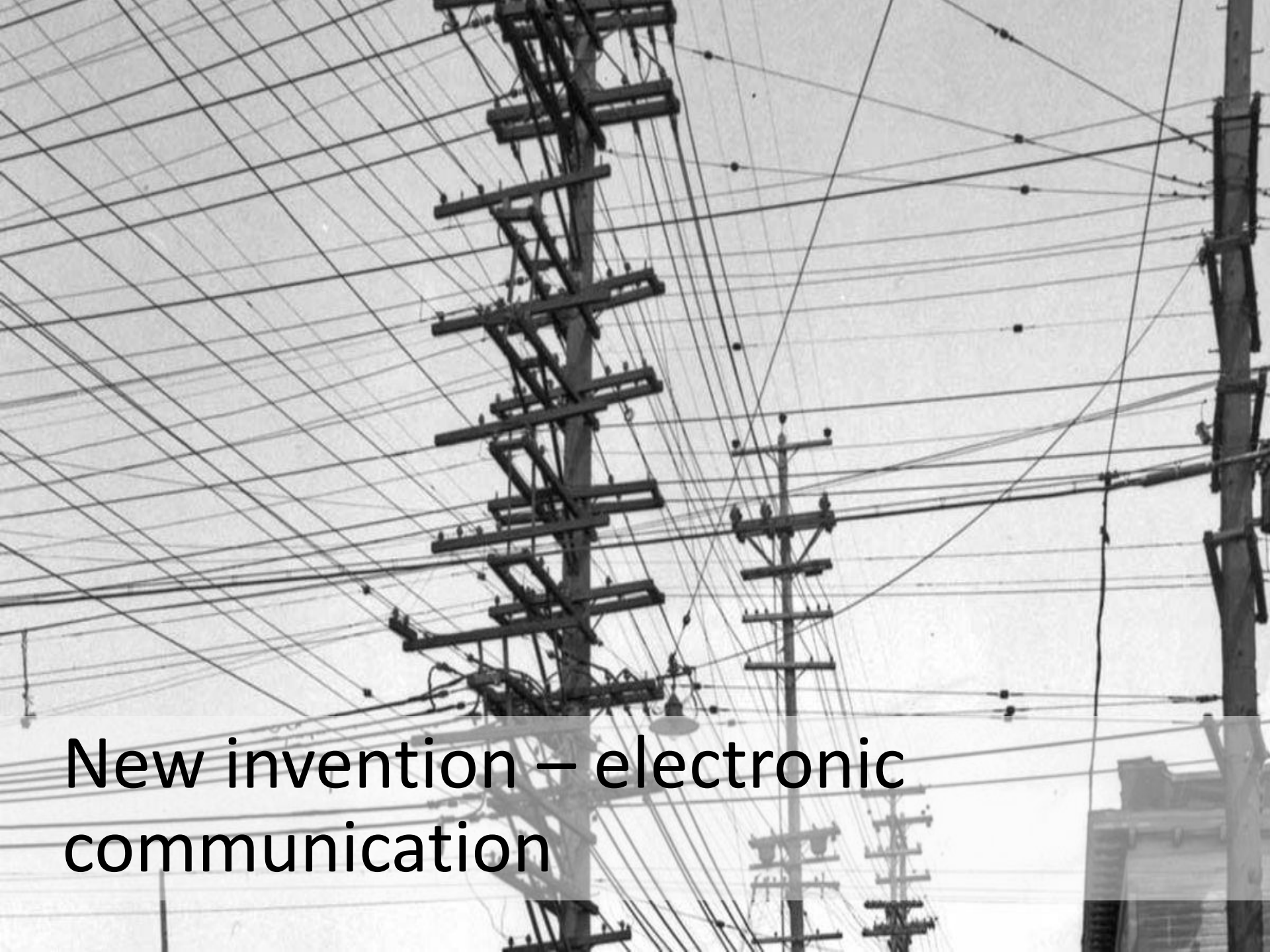
… including engineering drawings !



531. DONATO BRAMANTE. Original Plan for St. Peter's, Rome. 1506 (after Geymüller)

Printing gets enough raw material

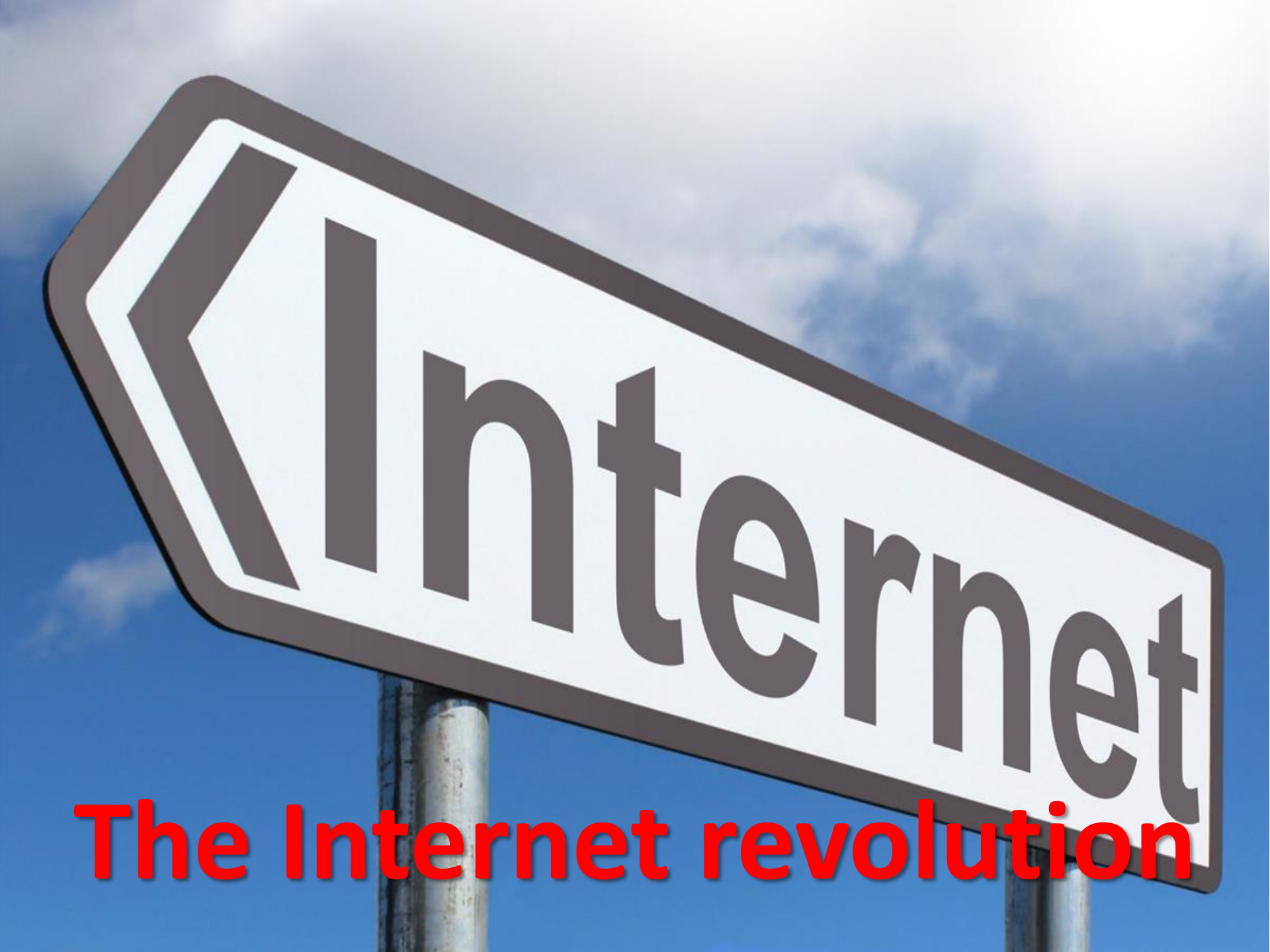
The Renaissance, Enlightenment, scientific revolution follow.



New invention – electronic communication

… at first available for very special purposes …

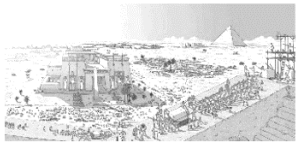
… well, not quite so special, but not to each and everyone



The Internet revolution

and e-communication is available to everyone for anything


Including engineers



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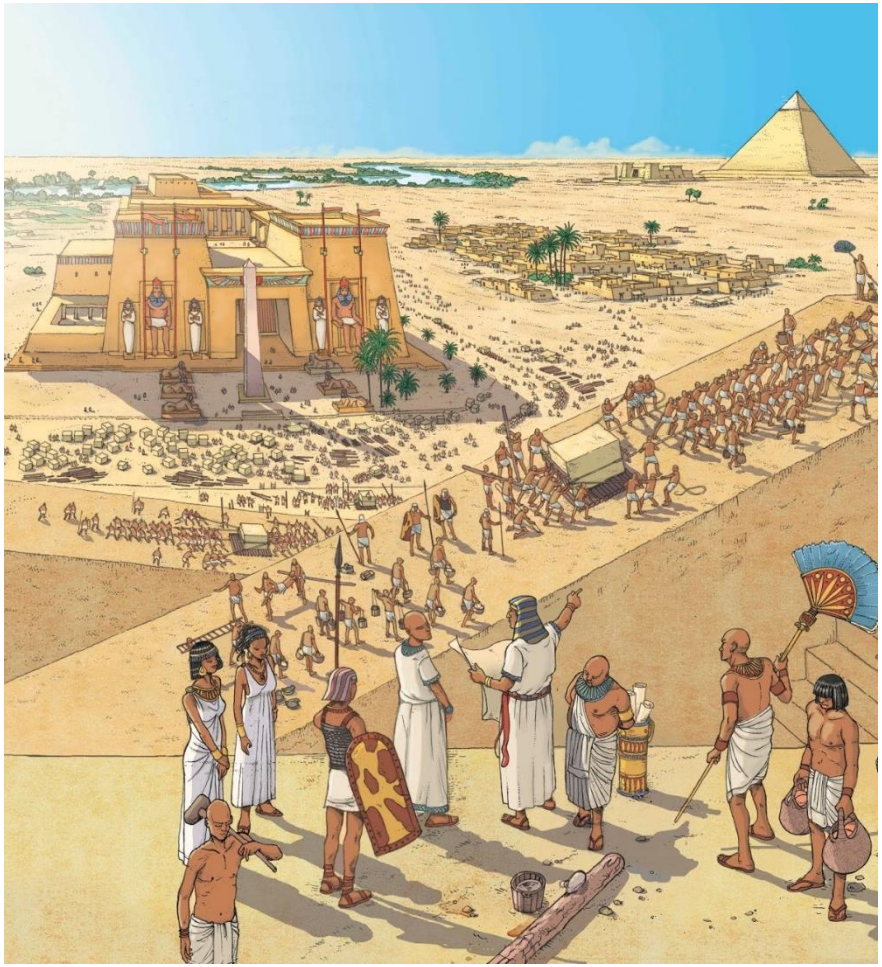
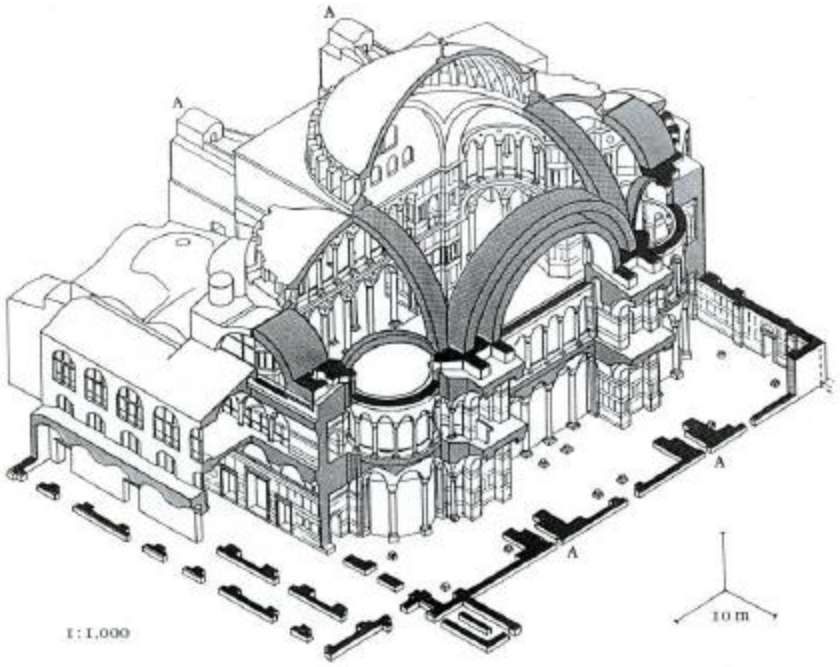
Gutenberg revolution

2000AD
Digital Revolution

Construction before drawing

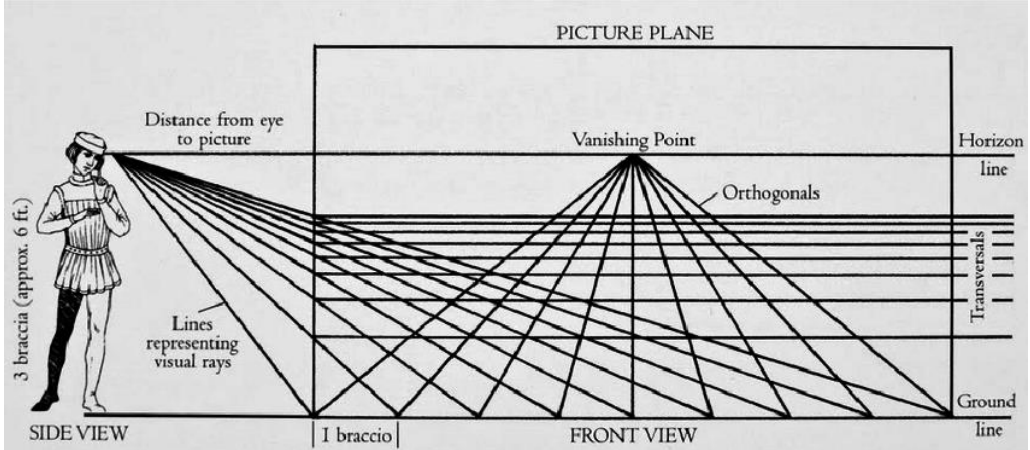


Spoken word is the main information carrier



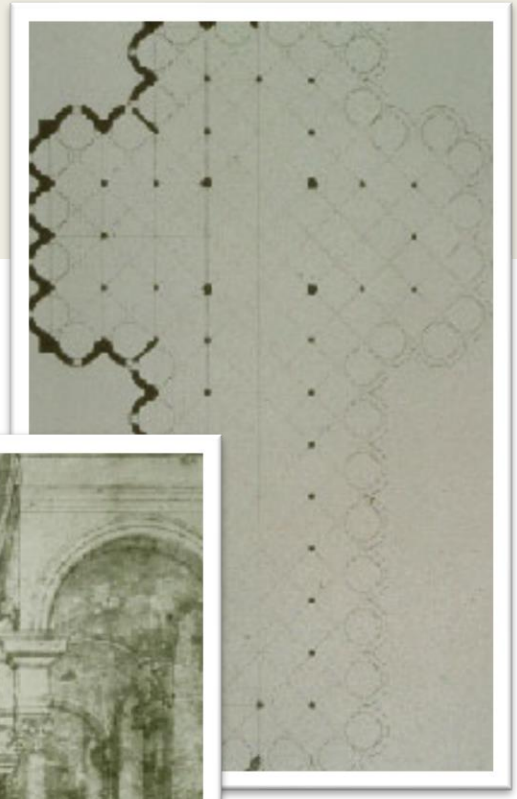
The Gutenburg revolution

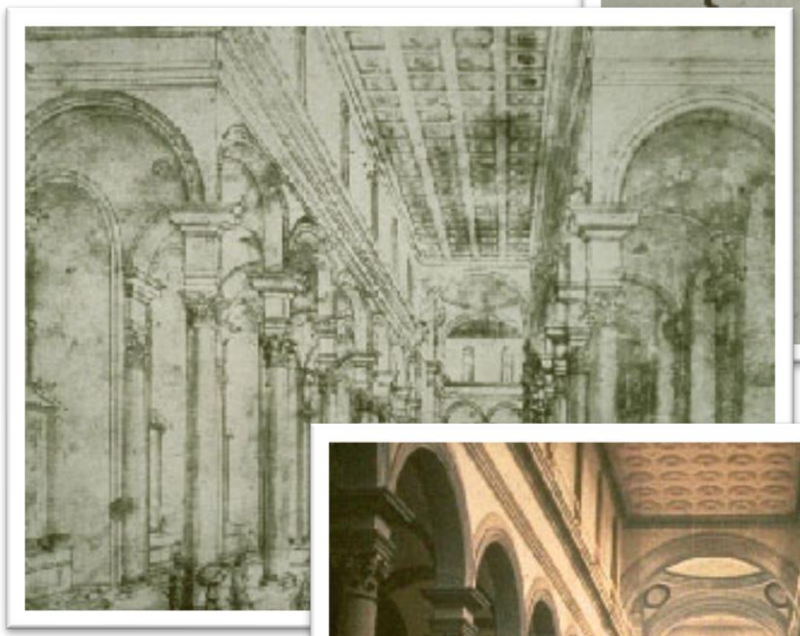
- gunpowder, cannons, ice cream, spagetti
  - China before <1300
  - Ottoman empire (15th,16th century)
  - siege of Vienna
- information technology (printing)
  - China <1300
  - Europe (15th century)
  - Islamic world (18th century)
- related ideas
  - scaled drawing … Bruneleschi (1420)
  - perspective drawing … Alberti (1435)
  - scaled mechanical model … Galilei (1500+)

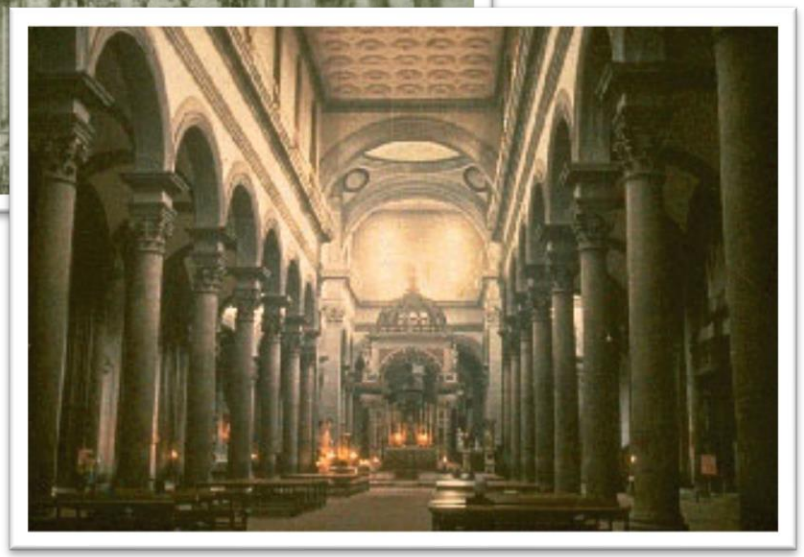


Filippo Brunelleschi (1377-1446)

- Devised a method of perspective for architectural purposes
- he is said by Manetti to have made a ground plan for the Church of Santo Spirito in Florence on the basis of which he produced a perspective drawing to show his clients how it would look after it was built.







Source: Dan Collins

Lines on paper are main information carrier

Construction in the industrial age

- masters replaced by teams of specialists
- teams enabled by technology
  - technical documentation, mostly drawings, modern IT

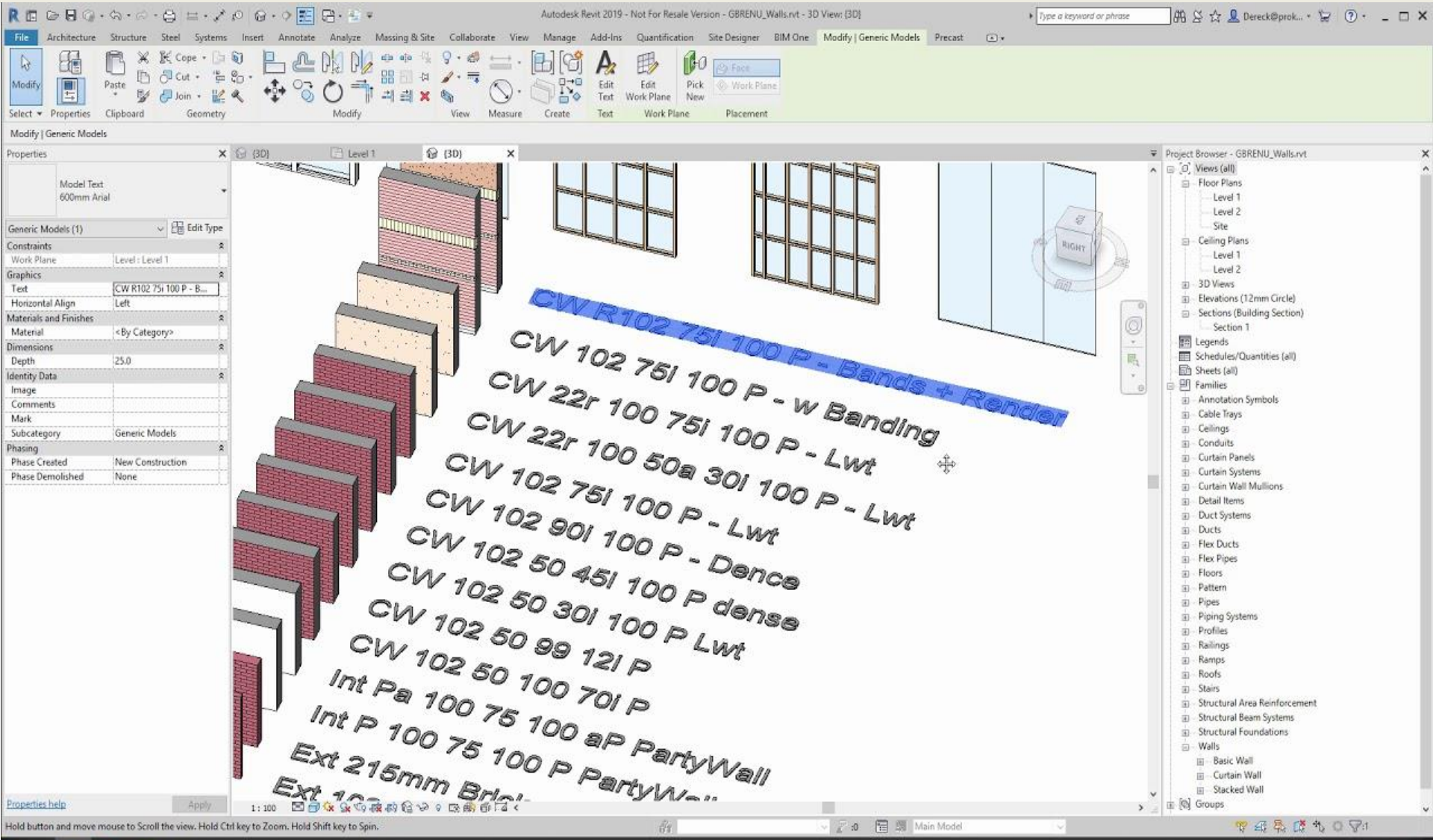
Enters electronic communication

- wired:
  - telegraph, telephone, fax
- wireless
  - radio, TV
- limited support/impact for the construction

Then the Digital Revolution

Digital information, digital communication

Digital Objects are main information carrier



Communication revolutions and construction

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?

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Digital Revolution

The holly grail of computer integrated construction

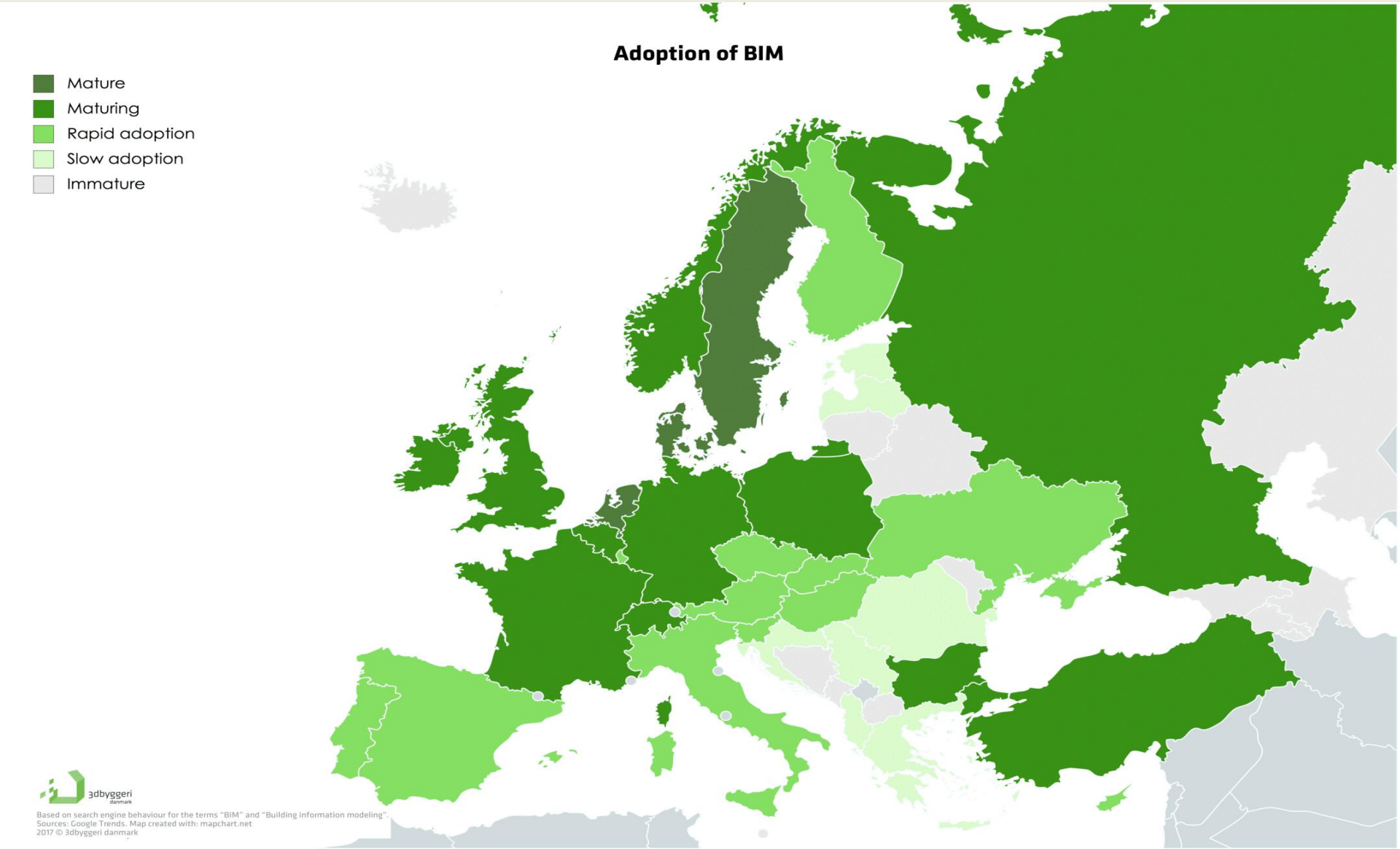
- Agree on the symbols
- Create „one-language“ again
- Not easy!

- BIM!


DESIGN
BIM
BUILD
OPERATE

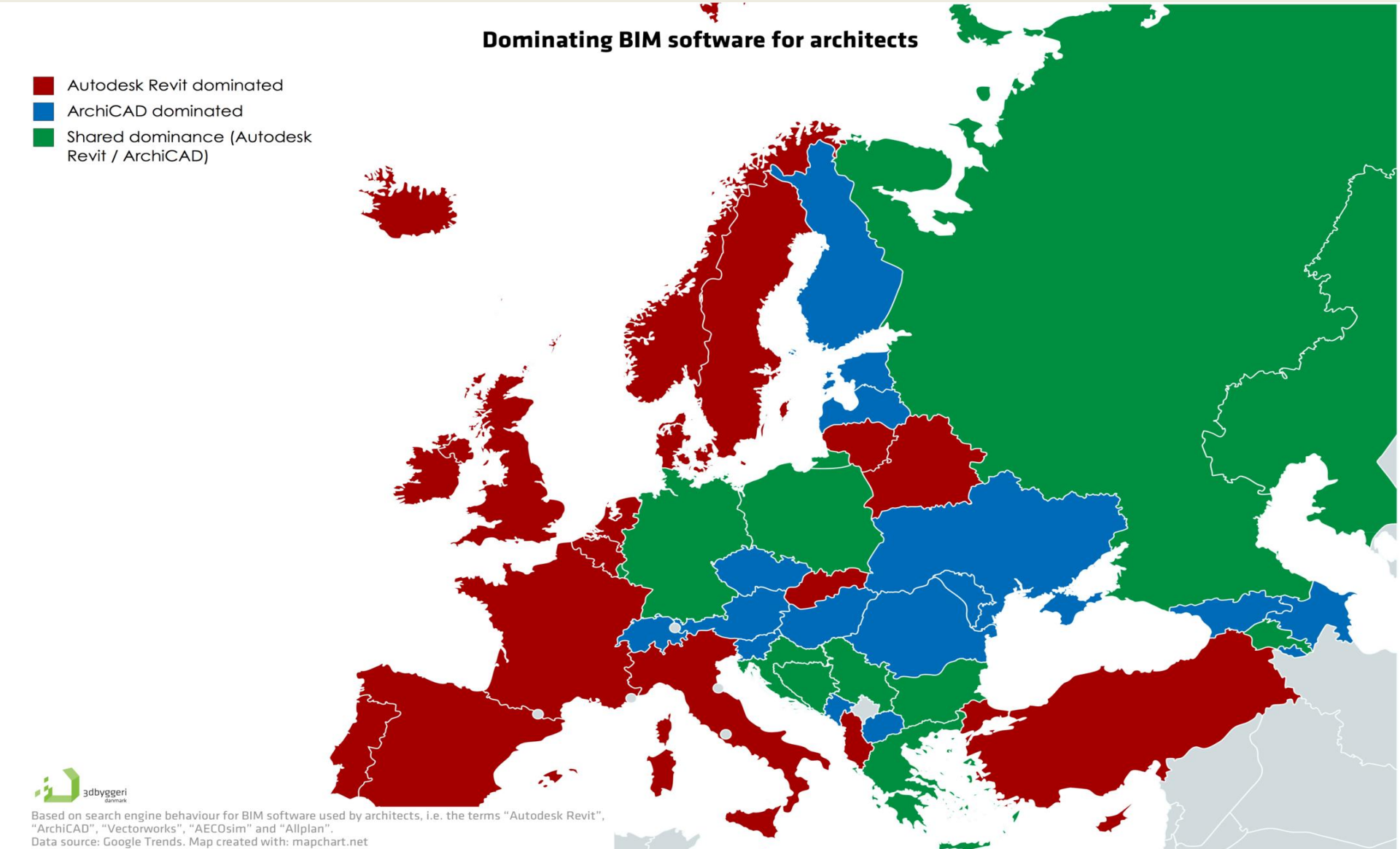
Adoption of BIM in Europe

3dbyggeri via Google Trends



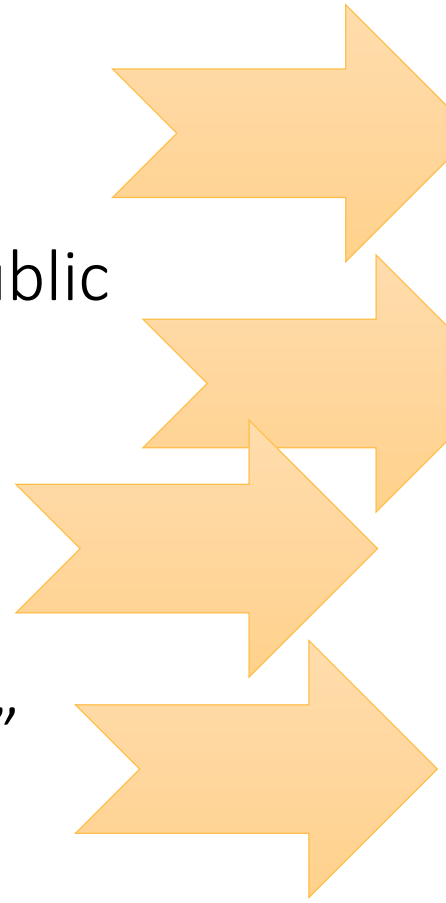
BIM vs. BIM in Europe

3dbyggeri via Google Trends



Overview

stakeholders	motives
construction businesses	higher productivity through specialization
private and public investors	fewer surprises in costs and time
users of the facility	better quality of the facility
“BIM industry”	growth, share of the pie



Models of BIM expansion

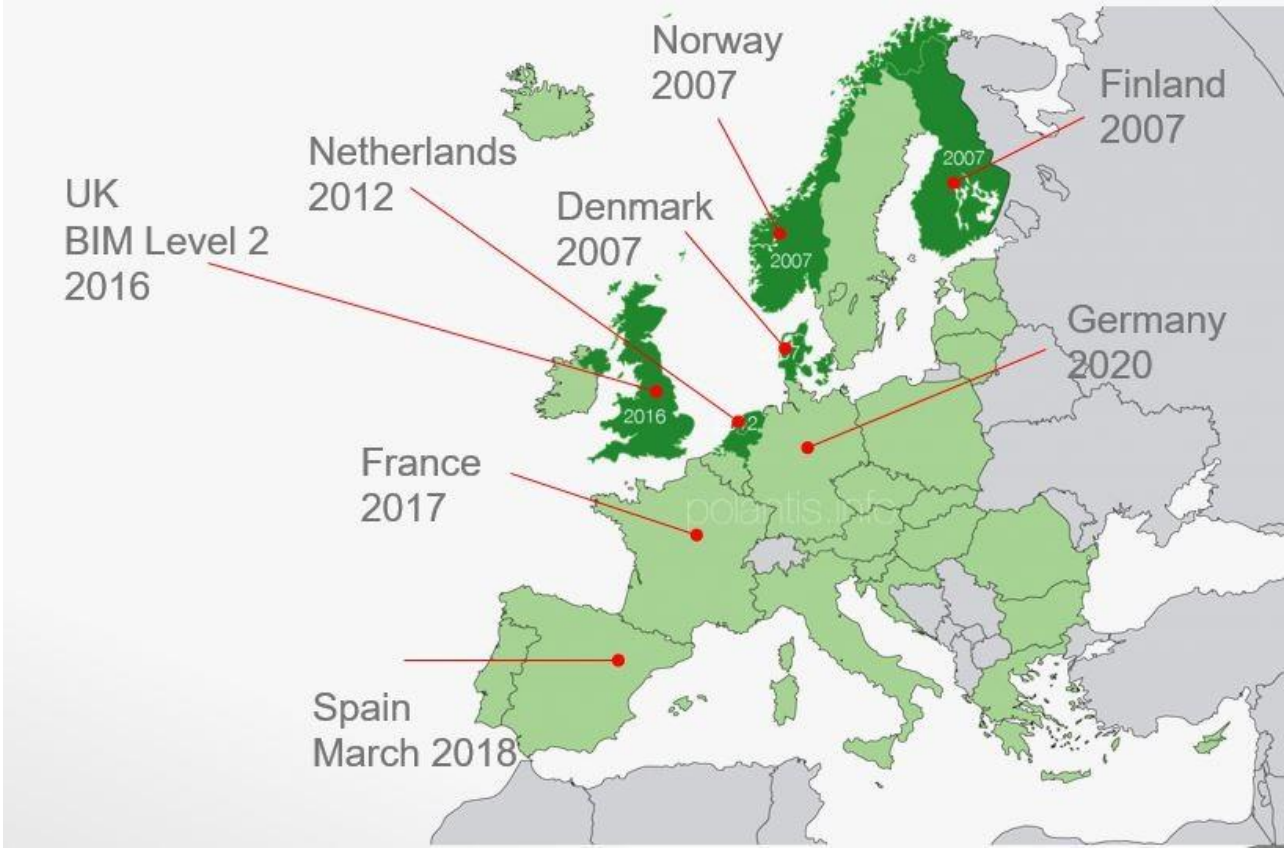
- government driven
  - EU directive … *can* require BIM
- investor driven
  - motivated by predictability, quality, savings in time and money
- AEC industry driven
  - design driven – motivated by bigger share of the pie
  - construction driven – motivated by efficiency gains
- BIM industry driven
  - motivated by sales and services offer
  - BIM as a service – getting part of the savings pie

Government driven

European Union - EU Directive 2014/24/UE (source)

“For public works contracts and design contests, Member States may require the use of specific electronic tools, such as of building information electronic modelling tools or similar. In such cases the contracting authorities shall offer alternative means of access, as provided for in paragraph 5, until such time as those tools become generally available within the meaning of the second sentence of the first subparagraph of paragraph 1”.

Public procurement *may* require BIM and does require BIM



"the UK has mandated BIM for national government procurement in 2016(level 2);

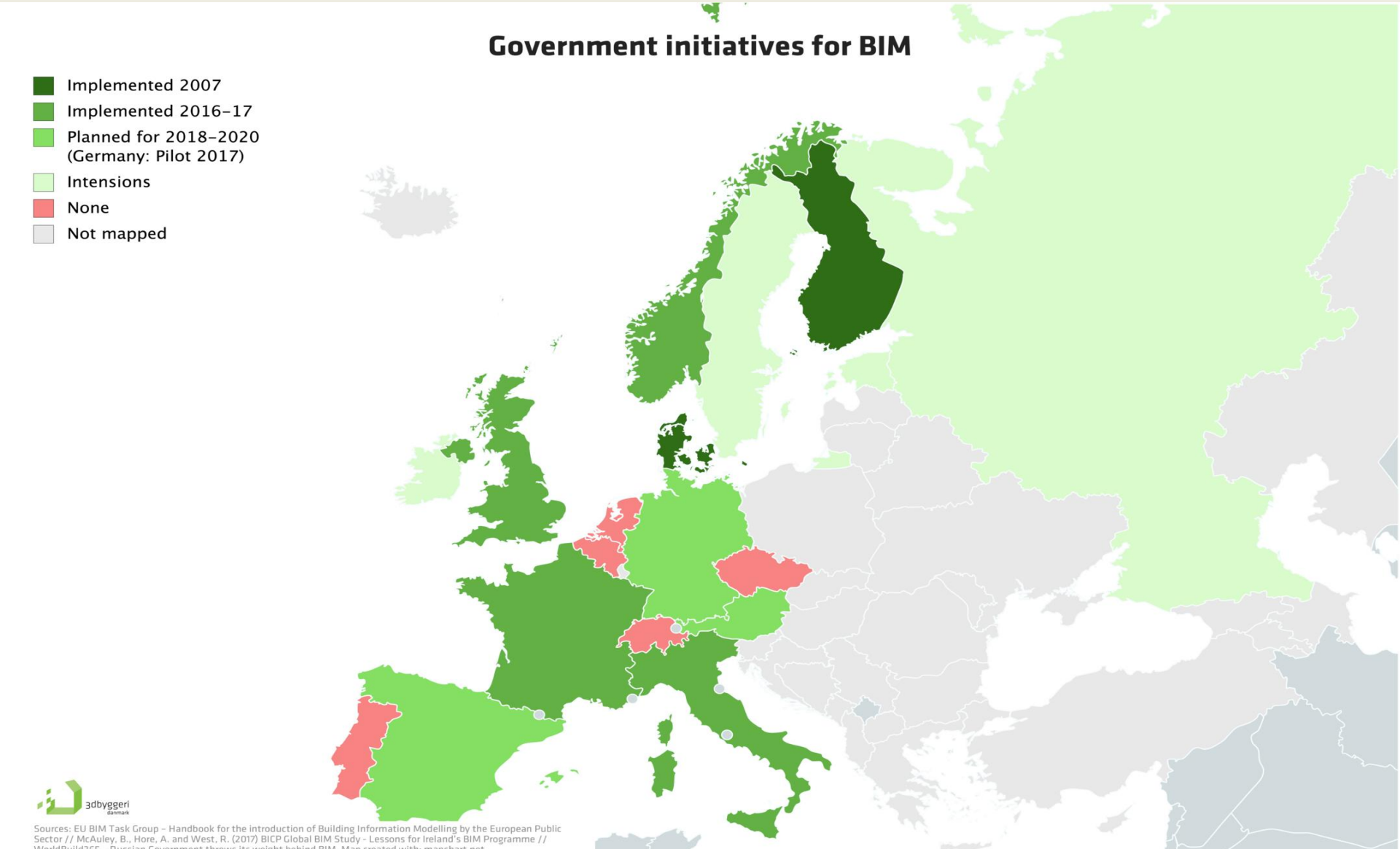
France will mandate BIM for public procurement in 2017 and announced €20 million in three years for the digitalization of the Industry;

Germany is to allocate €2.7 billion up to 2020 to undertake major pilot projects using BIM methodology.

Nordic countries including Norway (2007), Finland (2007), and Denmark (2007) and the Netherlands (2012) have already implemented BIM strategies for public procurement" (source).

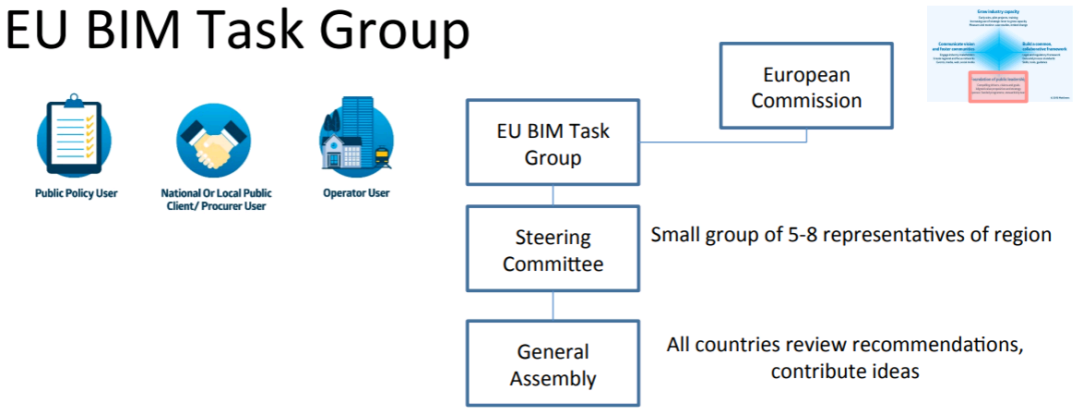
Government Initiatives on BIM

3dbyggeri via EU BIM Task Group 2017



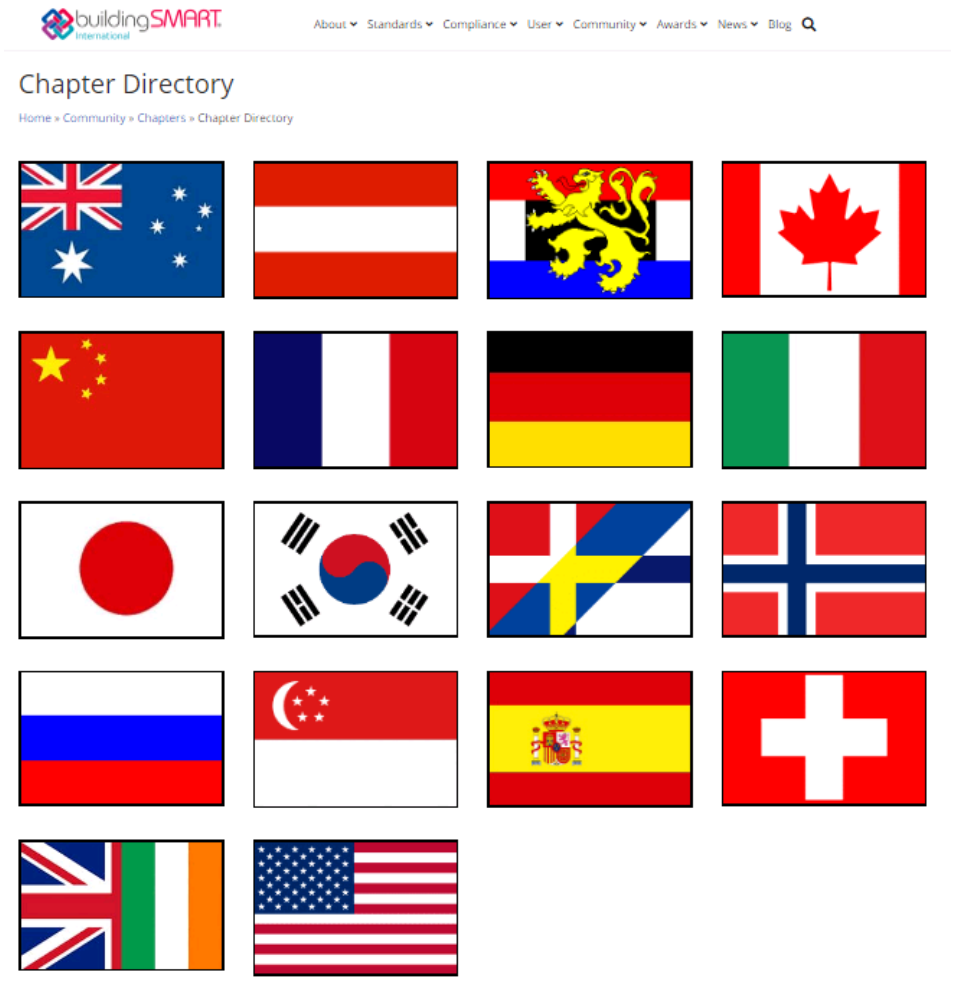
EU BIM Task Group is Main Policy Driver

- "The Task Group's vision is to encourage the common use of BIM, as 'digital construction', in public works with the common aim of improving value for public money, quality of the public estate and for the sustainable competitiveness of industry"
- "The EU BIM Task Group represents the public stakeholder interests relating to BIM and public estate to national and international standards bodies, such as ISO, CEN and buildingSmart." (source).



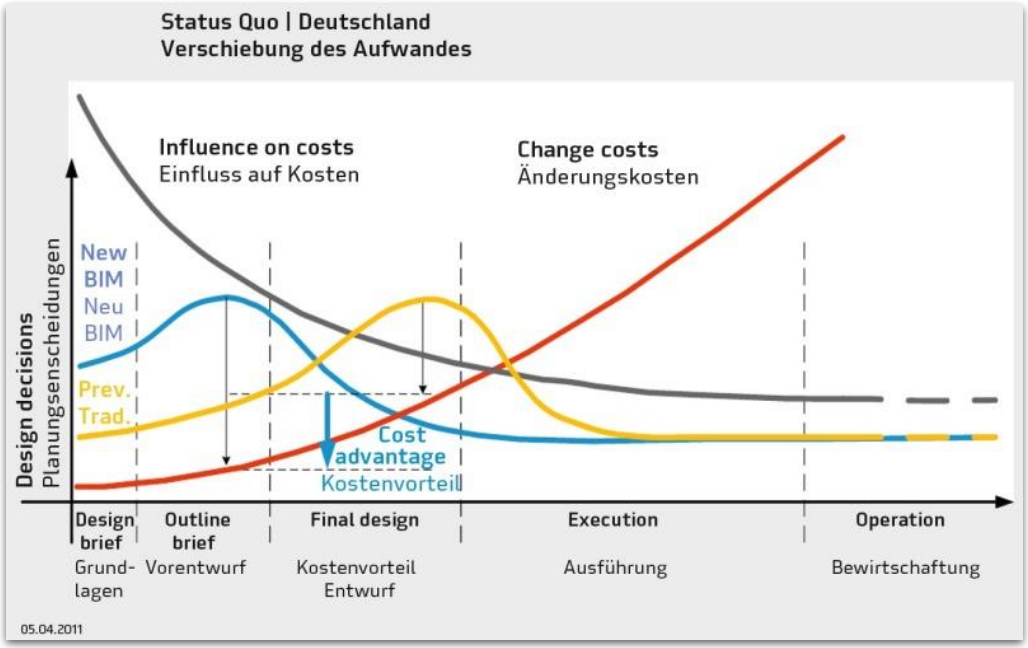
Buildingsmart is main standardization driver

- “**the worldwide industry body** driving the digital transformation of the built asset industry.
- **committed** to delivering improvement by the creation and adoption of open, international standards and solutions for infrastructure and buildings.
- **community** for visionaries working to transform the design, construction, operation and maintenance of built assets.
- **open, neutral** and international **not-for-profit** organization.”



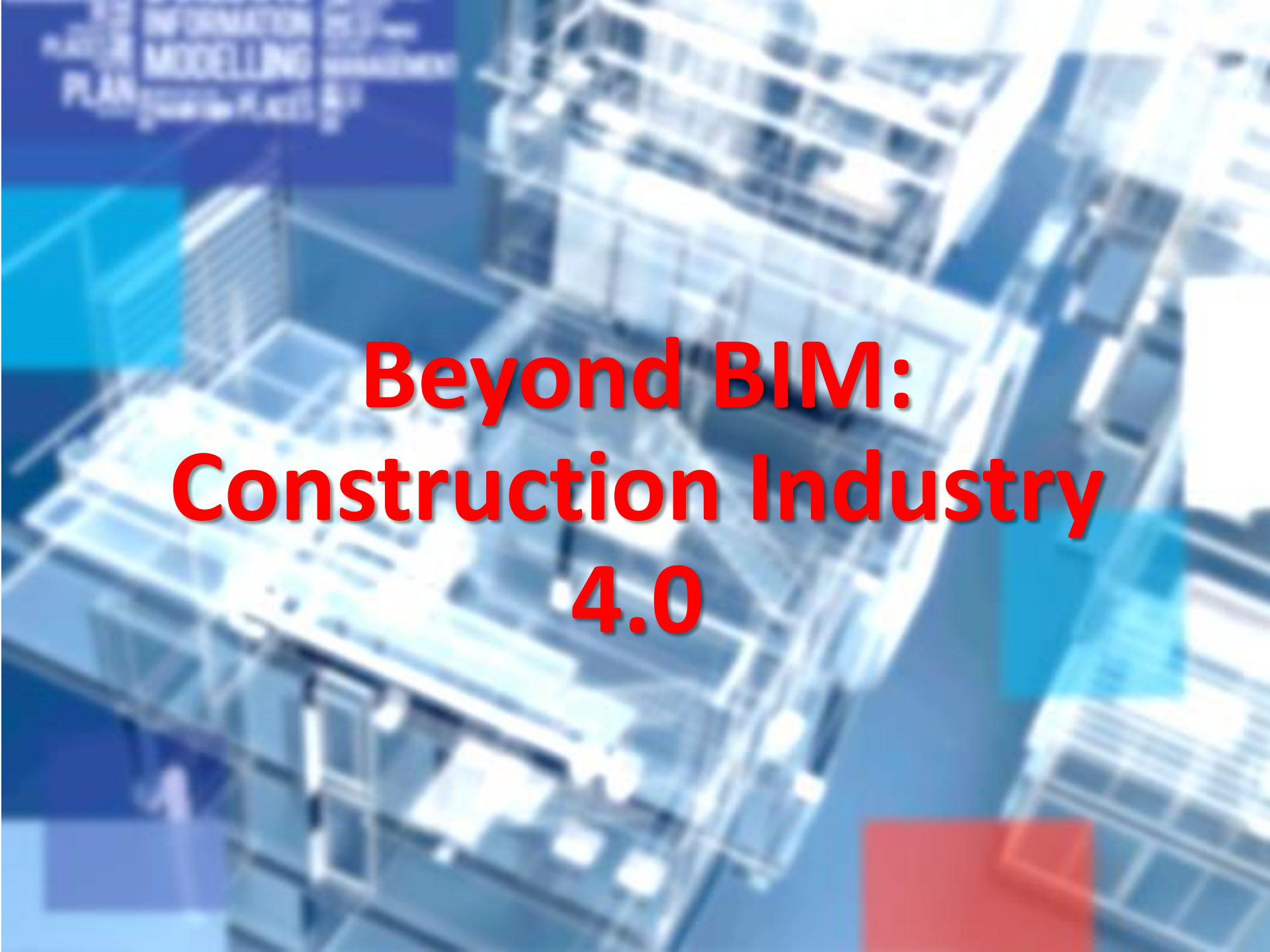
Industry has their own interests

- investments in design phase, savings in construction phase
- mandate BIM design for overall project savings
- design-build-(operate) in-house for savings in one business



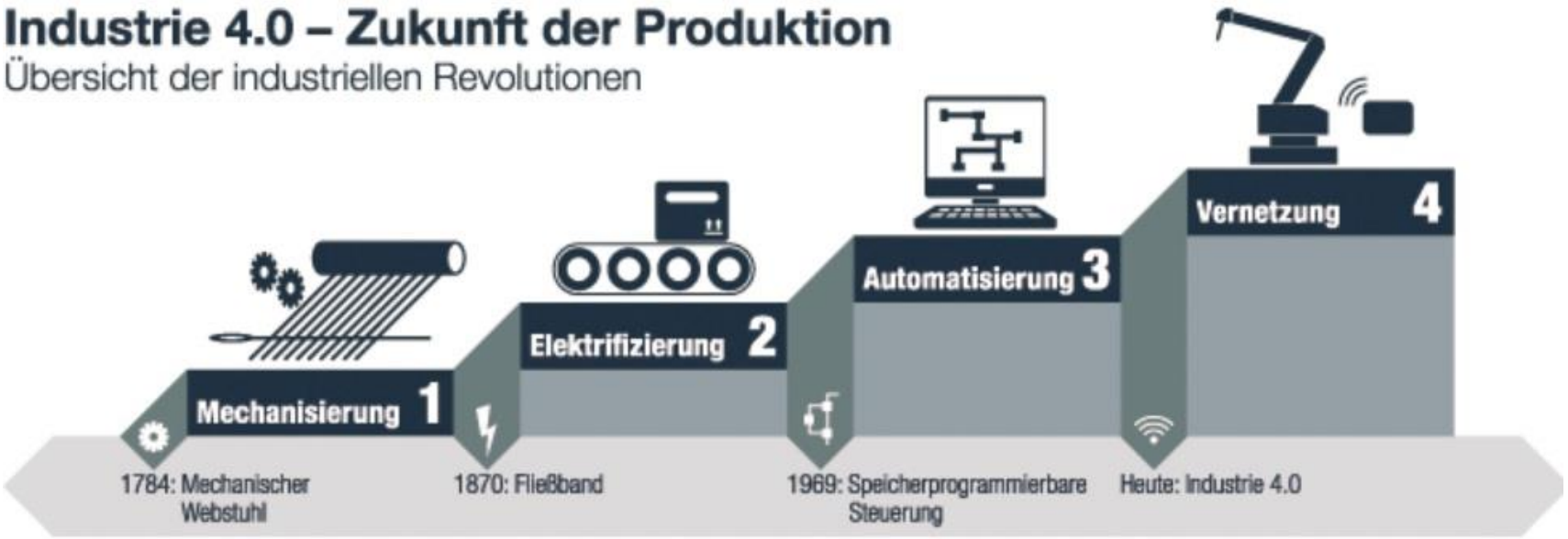
Construction Industry Driven – i.e. FIEC

- "Construction 4.0” is our "branch" of Industry 4.0. We use this term to refer to the digitalisation of the construction industry“
- “BIM is central to Construction 4.0 but it is not the only element”.



Beyond BIM: Construction Industry 4.0

4.0 - The Fourth Industrial Revolution

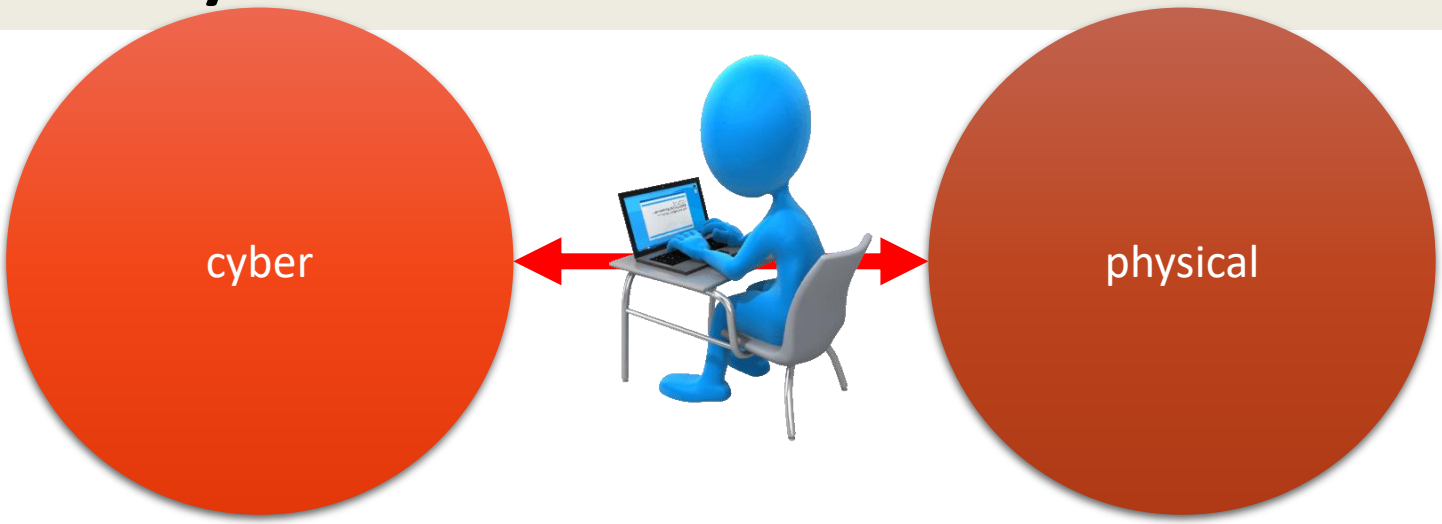


mechanization electrification automation networking

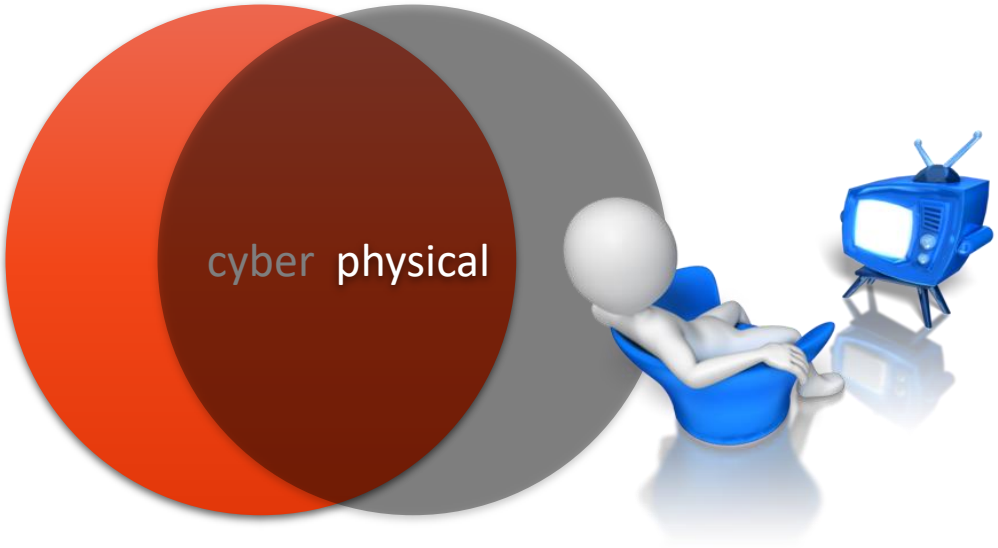
4.0 – merging of the cyber and the physical

Cyber and Physical not connected by humans only

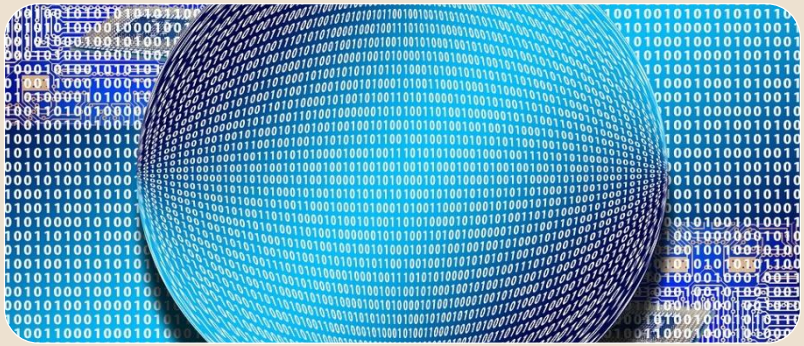
industry 3.0



industry 4.0



Industry 4.0 is digitized and digitally integrated



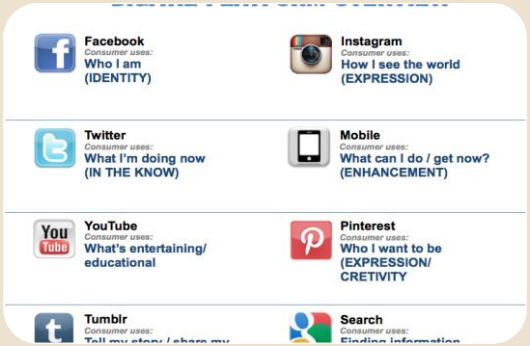
digitized

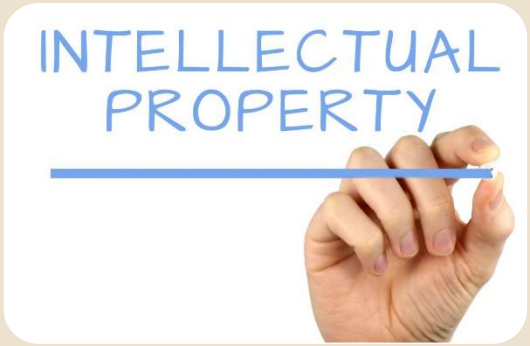
- digital design
- digital manufacturing
- digital operation

integrated

- integrated information
- integrated processes
- integrated knowledge
- integrated people

There are new ways to do business in Industry 4.0





product as a service

- capex becomes opex
- excavating not excavator

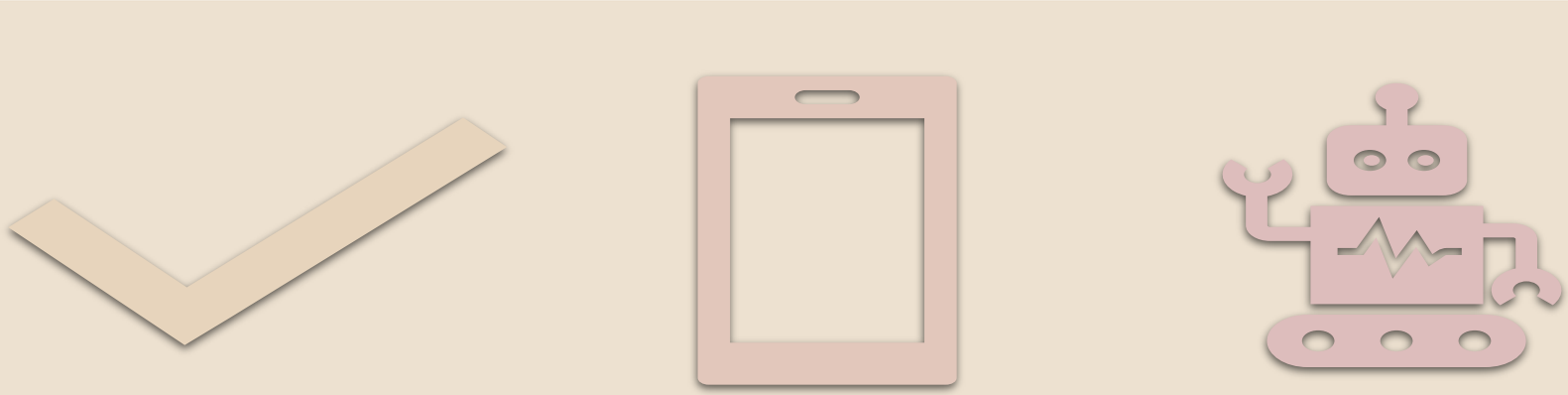
platforms

- Uber/AirBNB/Facebook are B2C and C2C platforms
- Hollywood “B2B” economy, B2B platforms
- Uber for small construction works
- B2B platforms

data & IPR business models

- data is the new oil,
- monetization of data, analysis, experience, knowledge, intelligence
- energy management in buildings
- BIM components, AI trained in one building used to steer another

Construction 4.0 will be delivered through platforms



networking platform

- as old as WWW
- European Platform of National Construction Initiatives

business platform

- matchmaking customers and performers
- examples: Amazon, Uber, Apple
- new business models

technology platform

- provide technological/ developer environment
- Microsoft, Android, Autodesk A360, Nemetscheck Bimplus

commercially successful are combinations of last two

Platform Business Models

- “most groundbreaking innovations are *not* products or services
- they are the
  - platforms on which these products and services are built, and
  - business models that these platforms enable.”
  - think Android, Amazon, Uber
  - think Weibo for business

- goal:
  - platforms to enable digital construction
  - infrastructure on top of which apps and services could be built by others

In conclusion:
Construction must make Construction 4.0

- 4.0 = cyber physical = interplay of physical and digital
- Construction 4.0
  - can't get more physical than construction
  - many opportunities to go cyber
  - knowledge and information products, services, business models
- Will be delivered through platforms
  - H2020 DigiPlace project to define framework
  - Sept 2019 – March 2021

Summary and Conclusions

Conclusions

- the goal is specialization
  - more people working together, managing complexity
  - paper and digital changed collaboration dramatically
- speaking a common language helps
  - BIM technology is providing such common languages to describe buildings and building processes
- buildings are similar across the world
  - to have global benefits we need globally compatible solutions
  - we need a common space for ideas
  - we need a common market for solutions
  - open is better than closed, connected is better than separated
  - Europe, China and the US should compete and collaborate together

The End

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