Transition to Sustainability: Human and Technological Systems

Dr. Ioan M. Ciumasu
ioan.ciumasu@gmail.com

The mark

- No formal exam. The mark will be given on an individual PowerPoint presentation where each of you will present a project on a topic that is important for you, and where you will show several slides with Knowledge maps that you draw yourself as tool for managing and communicating the project. It can be anything, a business idea-project, an association, a technology, etc. Preferably something related, at least indirectly to climate changes and adaptation. However, I am more interested in knowledge maps per se, as a method and skill that you develop so that you can use it later in the projects of your processional life. The important thing is that you are motivated to solve it because it affect you and your people. In addition, this presentation is something that you will be able to show as example of your work – when you will be asked by a potential employer in the future. You can change the topic if you need too (we'll decide together), later, but in any case you must finish the work within the same deadlines as everybody.
- Use this presentation here and the video lessons as inspiration.
- Do the work in English, but you can mix English and French if necessary. English is the international work in Science and in Business, so this is an opportunity for you to do the practical training in English too.

- You need two brainstorming,
  - the first to decide on the idea you want to work (the Question you want to ask when using the DIKAR process framework; consult with me by email, so that I advise you and we decide together whether you pursue a certain idea or not; it needs to be an idea that is important – meaning a problem that affects more people that just yourself.
  - The second when you need to identify/create some solutions for that problem. The problem must be one for which there is no satisfactory solution yet.

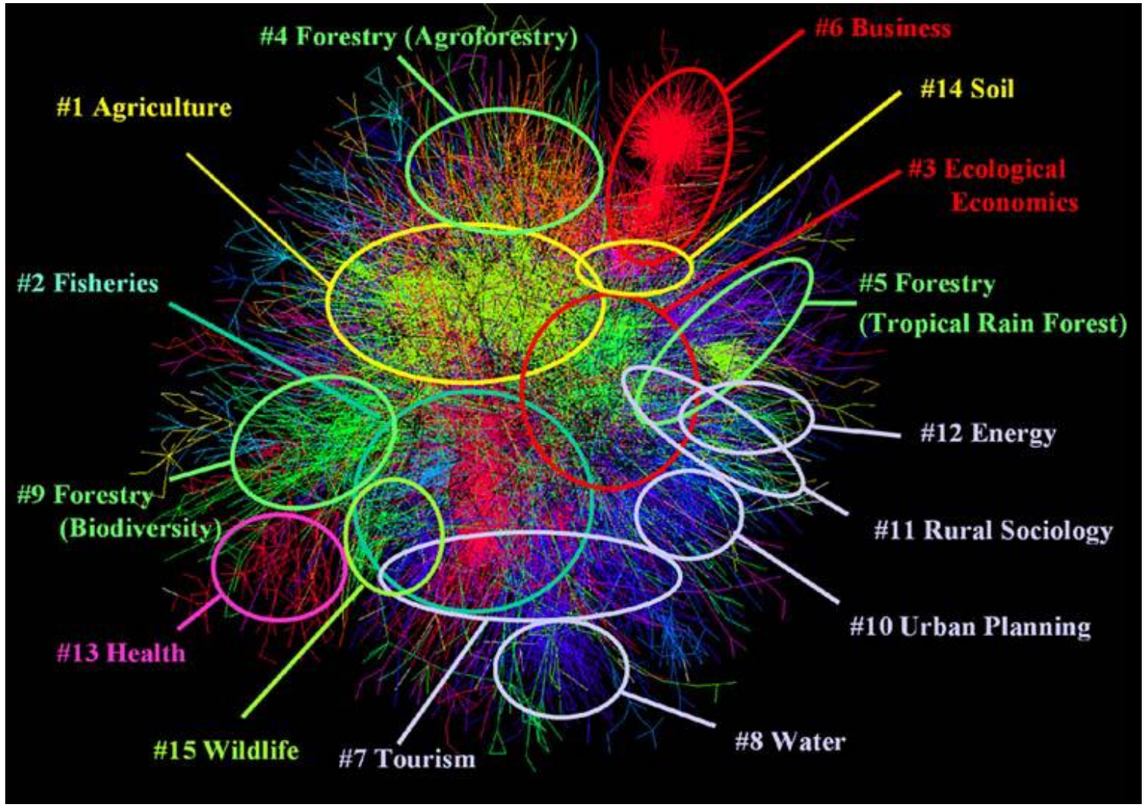
Deadlines:

- In January, at our TDs you need to have a presentation Draft to present (each of you will present in 10 min or so, then I will give you feed-backs for another 20 min or so). After that we continue by email. You send me un updated draft, I give feedback again by email, you improve it again etc. … until you tell me "this one is the final version".
- In March, you should email me you final draft, because after that you will have internships, jobs, etc. In theory you can still send me updated versions until June, but in practice, you will probably be busy with internships and jobs.
- In June I will be asked to give the final marks. So I will give my notes on what I have as final from you at that moment.

The link to the Science-Business conference video (recorded) I shown you in Brussels:

https://sciencebusiness.net/events/open

SUSTAINABILITY SCIENCE & PEOPLE



Example of representation of cluster analysis of relation (citations) between domains in sustainability studies as it was in 2007. The numbers and the circles give the order of importance (volume of work) of each domain. The distance and overlaps show how close they are to each other.

Source: Kajikawa et al 2007, Sustainability Science 2: 221–231
http://link.springer.com/article/10.1007/s11625-007-0027-8#page-1

The so-called Blue Marble
The 1st image of Earth from space; the Apollo 17 mission in 1972.
https://en.wikipedia.org/wiki/The_Blue_Marble

Noos, ancient representation as a sphere …
https://en.m.wikipedia.org/wiki/Nous

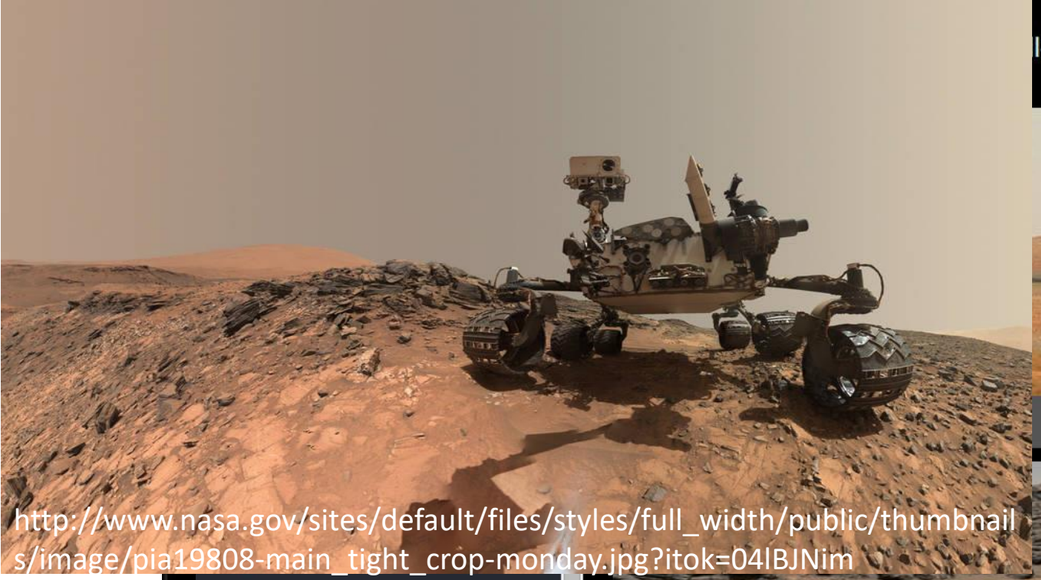
NASA/GSFC/Visualization Analysis Laboratory

Figure 1. *The distribution and density of lights at night indicate the pervasive presence of the technosphere.*

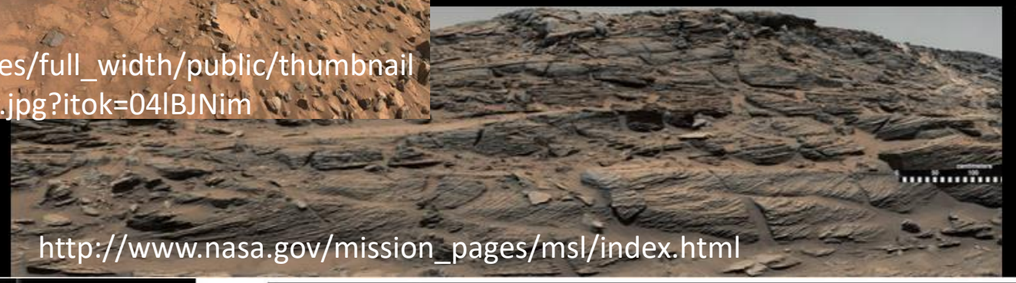
Technobiosphere, a contemporary fusion of biosphere and the technosphere, here shown by the human-generated lights at night, Earth scale:

http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/15445/turner_frontiers_2010.pdf?sequence=3

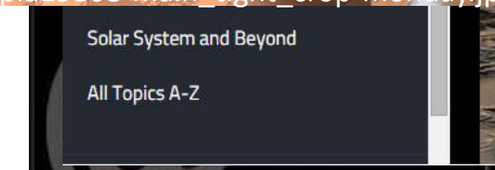
But mental representations as forms of advancing the understanding of the world has begun with the cave art as mental / abstract representation of the world:
https://en.wikipedia.org/wiki/Cave_painting

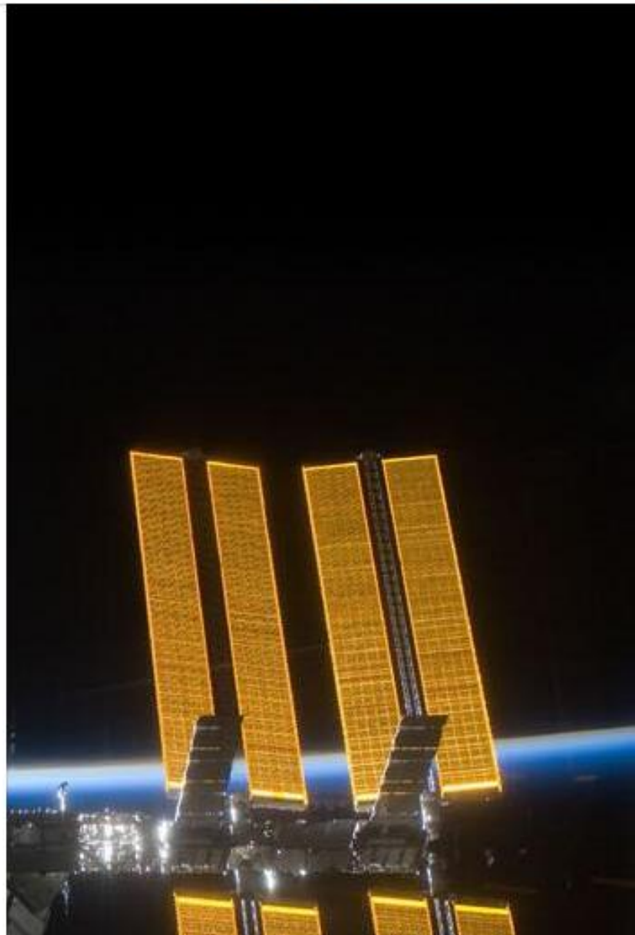


http://www.nasa.gov/sites/default/files/styles/full_width/public/thumbnails/image/pia19808-main_tight_crop-monday.jpg?itok=04lBJNim



http://www.nasa.gov/mission_pages/msl/index.html

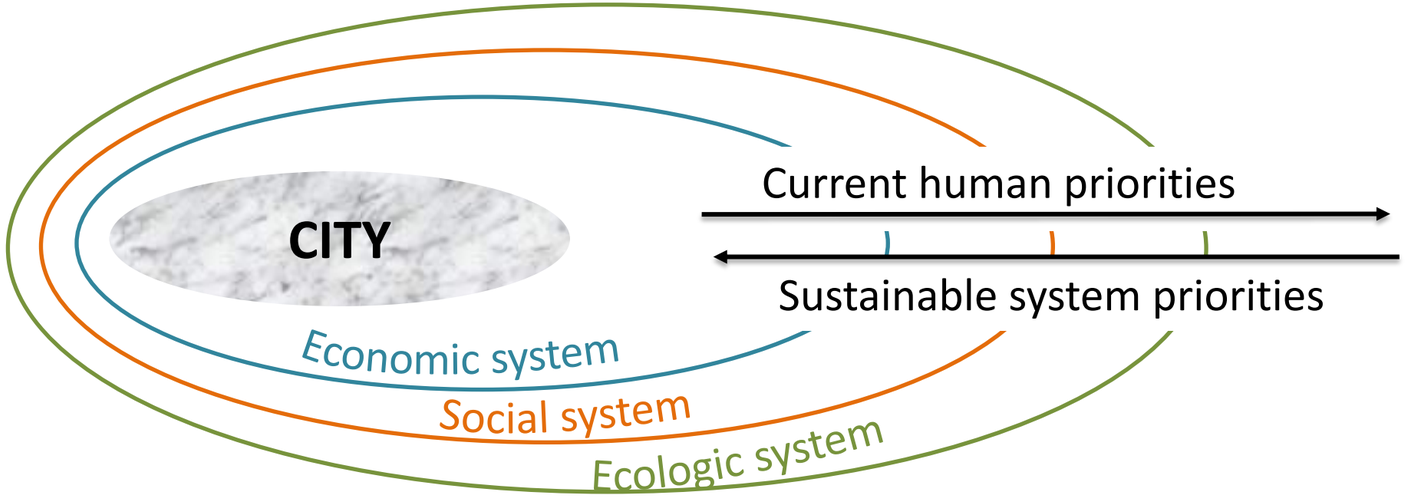


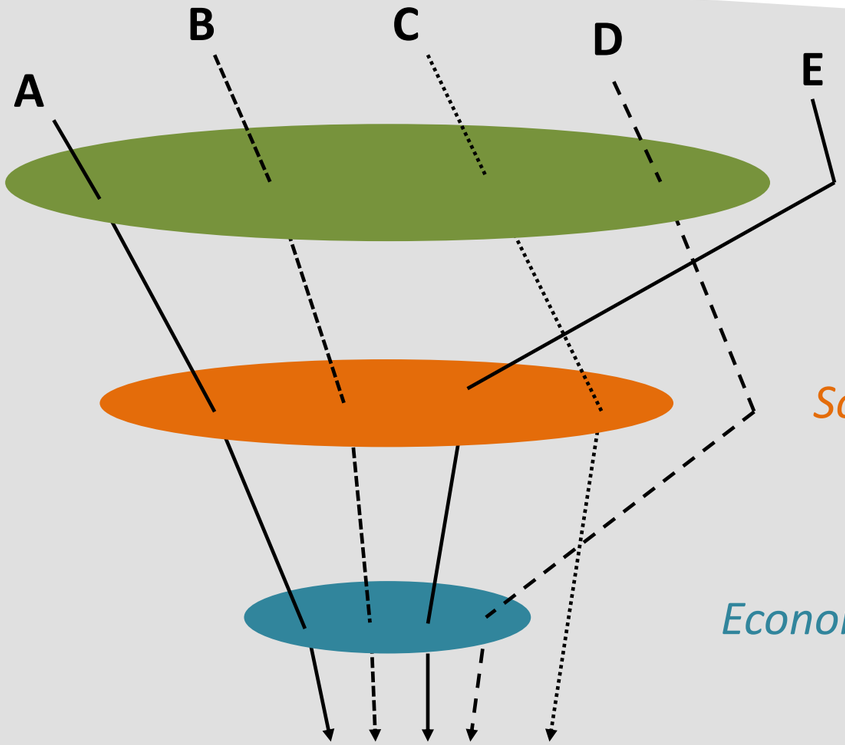


CONFLICTING PRIORITIES IN HUMAN COMMUNITIES

The city – as embedded in a nested inclusion relation between economic, social & ecologic systems – experiences conflicting priorities between sustainability (science) and public.

Adapted after Giddings et al., 2002; Gowding 2005; Ciumasu et al., 2008; Ntanou et al., 2014.





Ecologic sustainability filter

Social sustainability filter

Economic sustainability filter

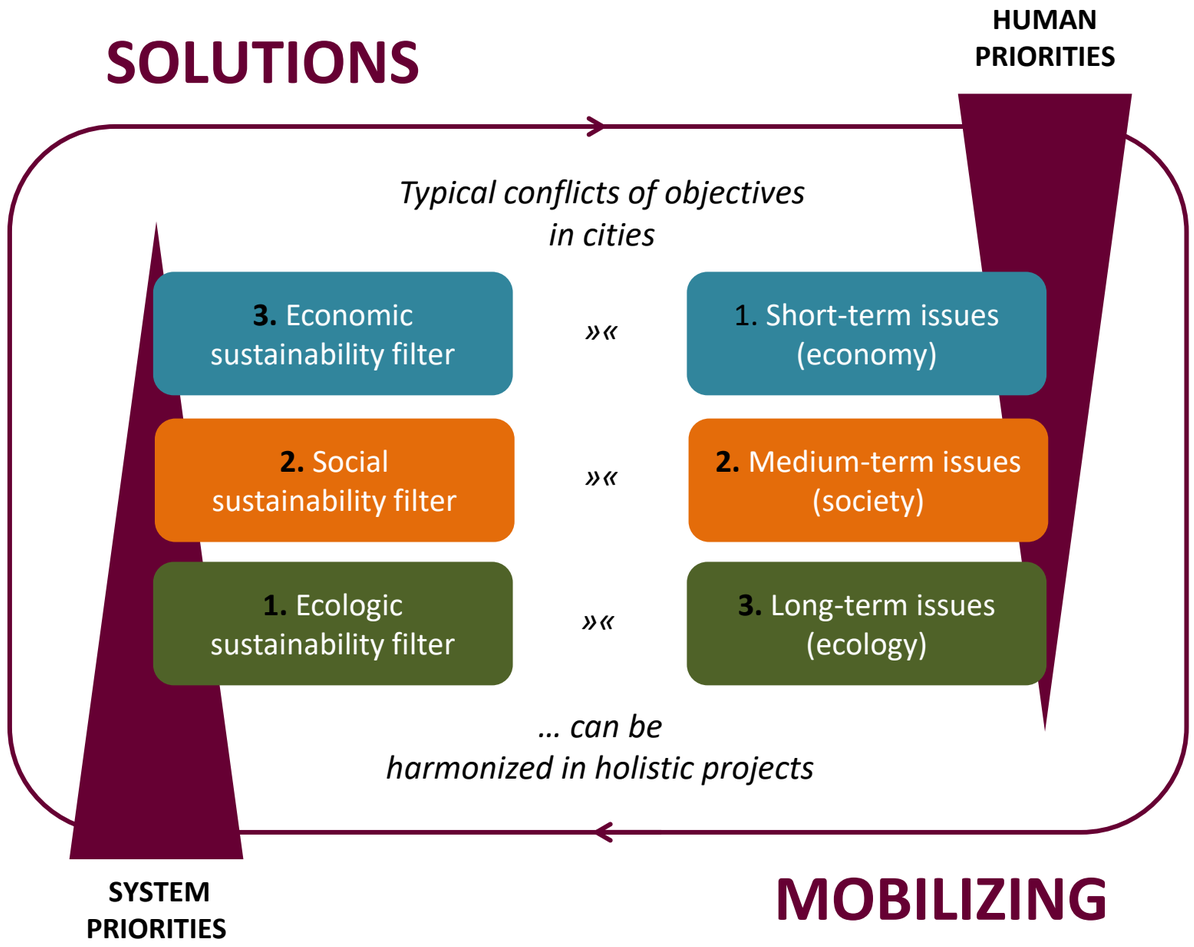
Urban projects assessment scenarios, based on sustainability filters derived from the nested inclusion relation between economic, social and ecologic systems.

Adapted after Ciumasu et al., 2008; 2012.

Legend: A, B are sustainable situations (or projects/scenarios of development in a city). C, D, E are unsustainable because at least one sustainability filter is missed.

RECONCILING PRIORITIES IN HUMAN COMMUNITIES

The fundamental conflict between public & sustainability agendas remains unresolved because of **(1) opposing priorities ; (2) system complexities**



BASIC RESOLUTION PRINCIPLES:

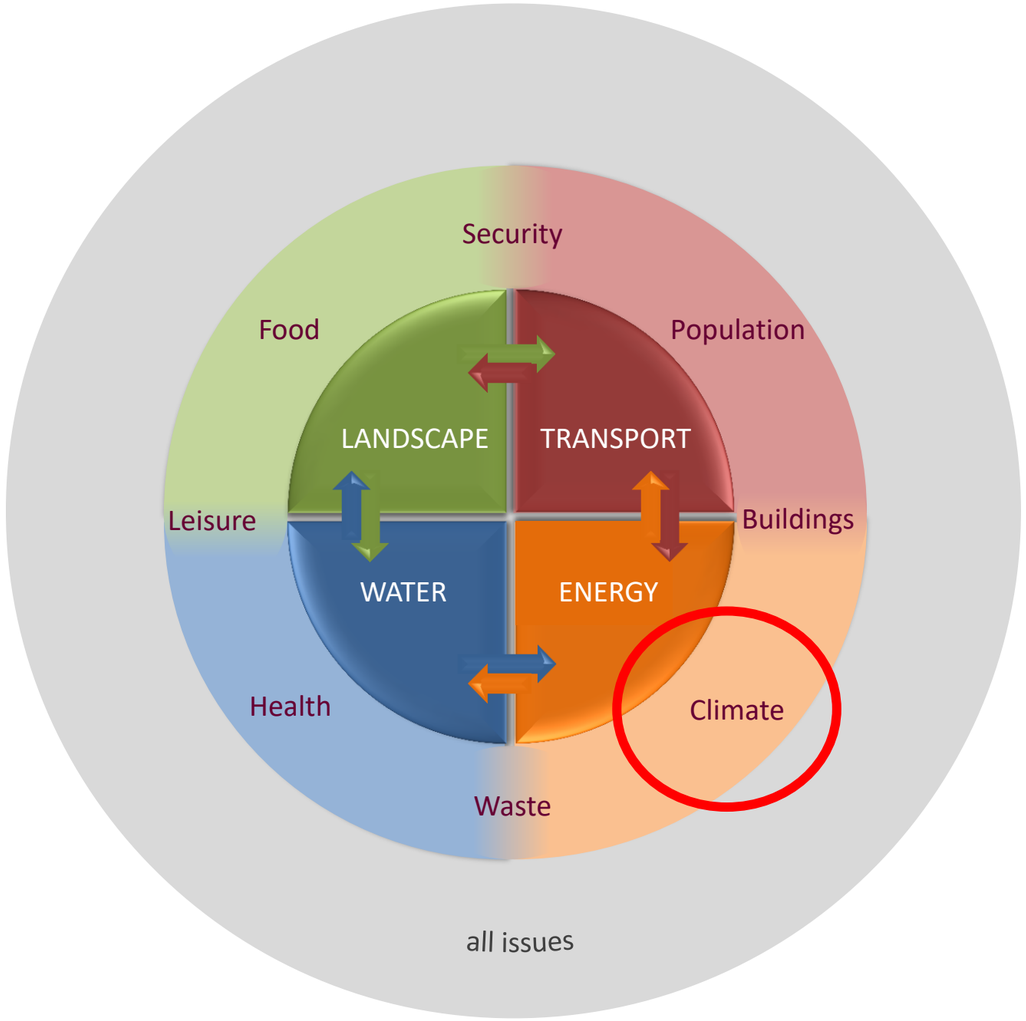
- ***Short-term economic incentives do determine the human priorities and the public business agendas.***
- ***Longer-term prosperity & business competitiveness do depend specifically on those solutions which increase system sustainability.***
- ***Holistic approaches enable new action models.*** *Thus, short-term/economic priorities of people must be recognized as top incentives to act. This provides the necessary public basis for mobilizing professional networks and projects. Once the ball is rolling a system approach must be adopted in the definition of the problems and their potential solutions, so that those problems will not return. This requires a good balance between short- and long-term gains.*

DOMAINS OF INTERACTION BETWEEN PHYSICAL AND HUMAN SYSTEMS.

Both categories are ordered in a nested inclusion relation, the ecologic and the value systems having the highest order. Thus, any technology system is a subsystem of a knowledge system, which is itself a subsystem of a value system. Any economic system is a subsystem of a social system, which is itself a subsystem of an ecologic system.

		HUMAN SYSTEMS DOMAINS		
		Values	**Knowledge**	**Technology**
PHYSICAL SYSTEMS DOMAINS	**Ecologic**	**Cultural systems** (memory of human-nature relations; worldview)	**Science systems** (discovery & definition of the laws of nature; logos)	**Techno-biosphere system** (coupled human & natural systems at Earth scale)
	Social	**Moral systems** (social evolution driven by human relations; nomos)	**Learning systems** (social evolution driven by knowledge)	**Techno-social system** (social evolution driven by technology)
	Economic	**Political systems** (community rules of access to resources)	**Business systems** (group management and gains of resources)	**Techno-economic systems** (purposeful organization of resource enhancements)

URBAN SUSTAINABILITY NEXUS (USN)



The CORE is determinant for the PRIMARY CROWN and together they drive all other issues inside a city

ISSUES *(Only USN COMPONENTS are listed here. Their environmental, social & economic indicators and parameters are available in separate Excel files)*	**CORE OF 4 INTERDEPENDENT FACTORS**	**COMPONENTS [POLYGONS]**		**PROCESSES [ELIPSES]**
		primary crown of 8 issues	all boxes describing core factors	
LANDSCAPE	*			
WATER	*			
ENERGY	*			
TRANSPORT	*			
Population		*		
Security		*		
Food		*		
Leisure		*		
Health		*		
Waste		*		
Climate		*		
Buildings		*		
ETC [any, see Excel tables]			*	
Land uses				*
Urban agriculture				*
Water intake				*
Water discharge				*
Water imports/exports				*
Water treatment, recovery & reuse				*
Energy storage				*
New energy solutions				*
New transport solutions				*
All communication initiatives and networks				*

START CONCEPT - details

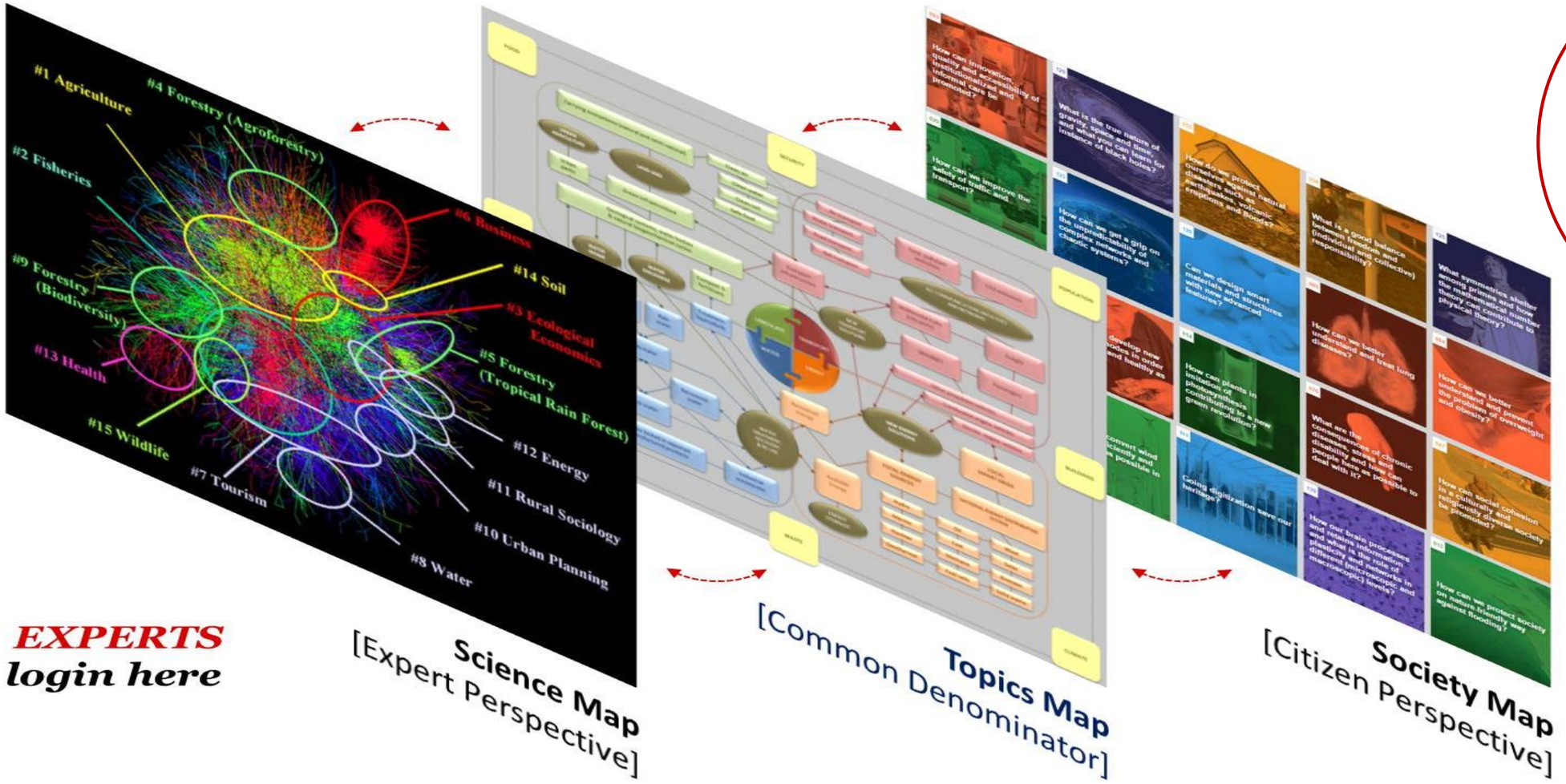
From here on: platform building-testing iteration cycles

A web-based Science-Technology-Business action platform with an international network of experts & business actors

Project example: Interactive Knowledge Maps (IKM)

Both scientific and societal knowledge (expertise) can be mapped; operated through a minimal common denominator, i.e., map of topics of priority interests, completed with practical details; freely accessible online *[Software as a Service]*

Users navigate IKM for orientation; seeing combinations of relevant infos, experts & possibilities



IKM

Going beyond search engines

Contact:
Ioan M. Ciumasu
ioan.ciumasu@gmail.com;
ioan.ciumasu@uvsq.fr

START CONCEPT - details

From here on: platform building-testing iteration cycles

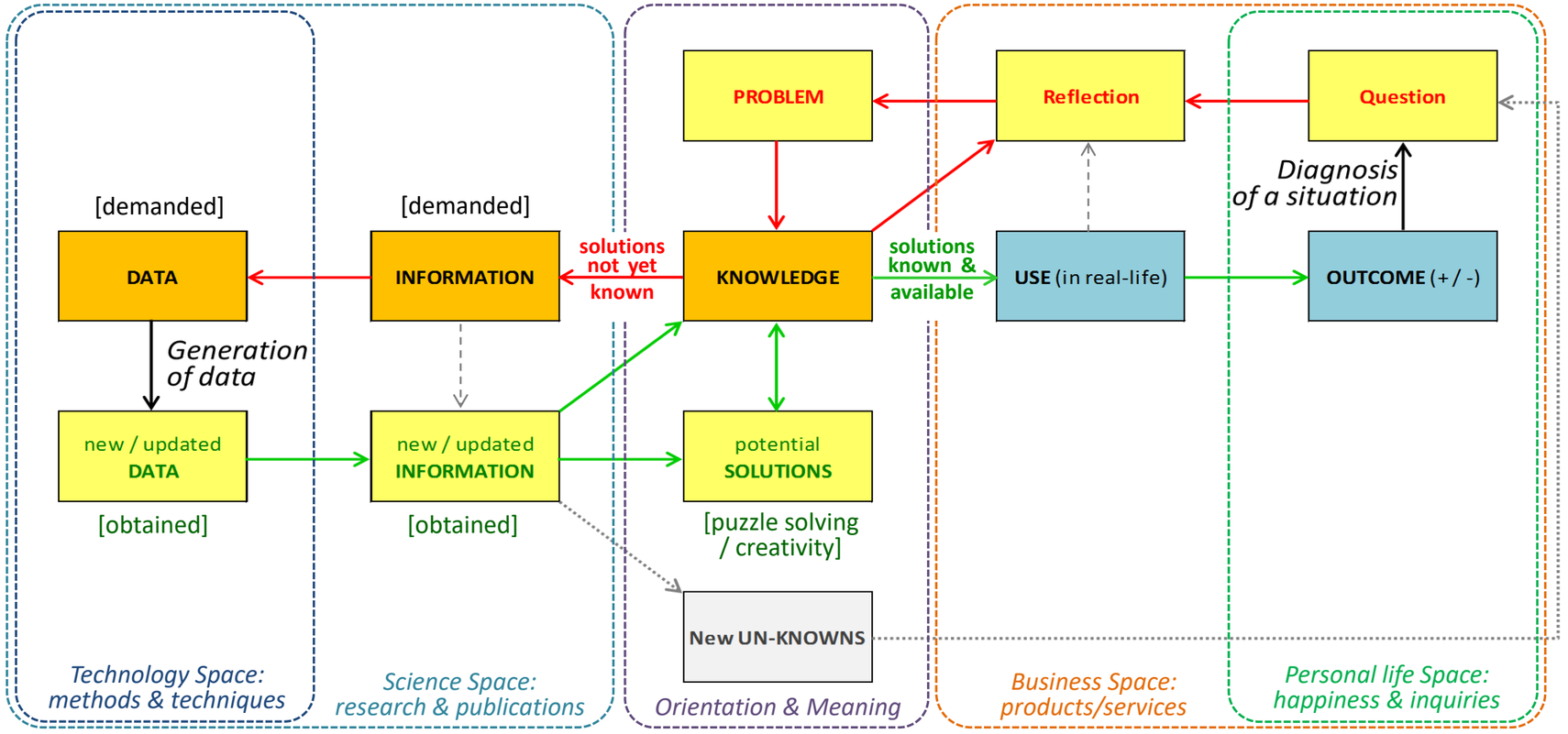
A web-based Science-Technology-Business action platform with an international network of experts & business actors

IKM for stimulating local talent; development

D.I.K.A.R. framework → Data → Information → Knowledge → Action → Result

PROJECT PROCESS ↓

- Formulation of PROBLEM
- Request / Use of SOLUTIONS
- Generation of SOLUTIONS
- Further DISCOVERY



GENERAL LOGIC FRAMEWORK

Every work starts with a QUESTION.

It continues with steps, pathways & cycles iterated as / often as needed.

PRACTICAL DEFINITIONS:

DATA: *measured or estimated value (numbers) of a parameter of interest. Proof of presence of a phenomenon. In informatics: all signs encoding info*

INFORMATION: *the professional interpretation of the data, e.g., whether a pollutant concentration is above /under an admitted threshold.*

KNOWLEDGE: *the capacity to place information into contexts in order to extract meaning and action options. In practice, it means: people*

These three are often confused.

We can <u>only</u> <u>grow</u> Knowledge inside minds, we cannot transmit it. What we transmit is Information & Data. "Acquiring Knowledge" happens via either education-and-experience or recruiting other people.

Types of tools →

Types of users →

TECHNOLOGY maps / SCIENCE maps	TOPICS maps	BUSINESS Maps / CITIZEN INTERESTS maps
DEVELOPMENT ENABLERS	KNOWLEDGE BROKERS	STAKEHOLDERS & ACTORS

Domain of SCIENCE — *Domain of REAL LIFE*

Source: after: Ciumasu IM, 2018. Eco-Cities: Scenarios for Innovation and Sustainability. Book, Springer UK / Switzerland, http://www.springer.com/gp/book/9783319147017

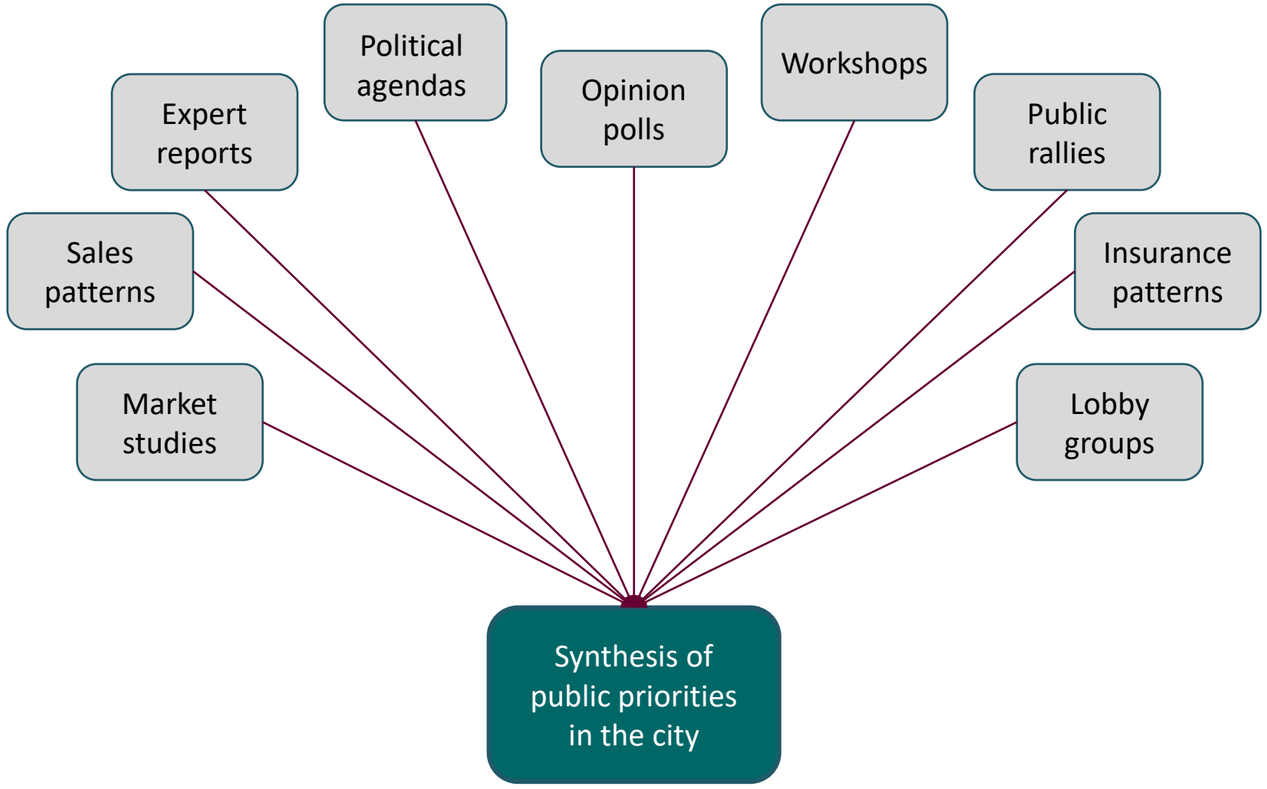
Contact: ioan.ciumasu@gmail.com

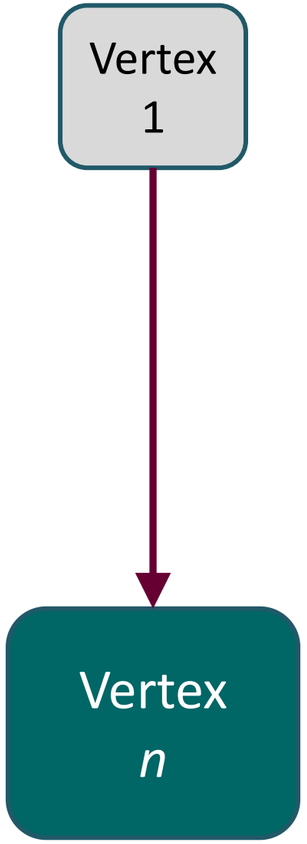
END OF LECTURE

25 September 2018

Examples de Knowledge Maps

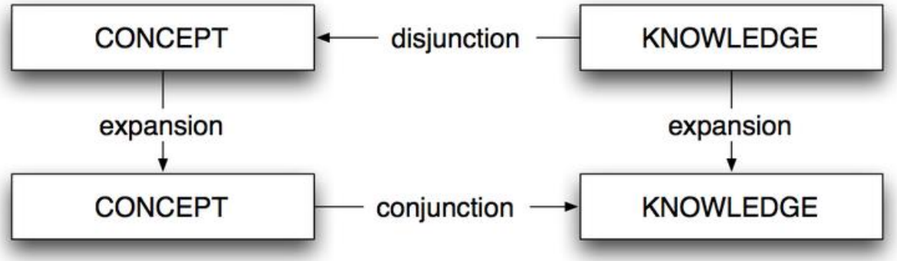
Knowledge Maps are Graphs: visual representations.
They are composed of Objects (entities or situations; represented by vertices)
Connected by Mappings (transformations, or morphisms; represented by arrows)



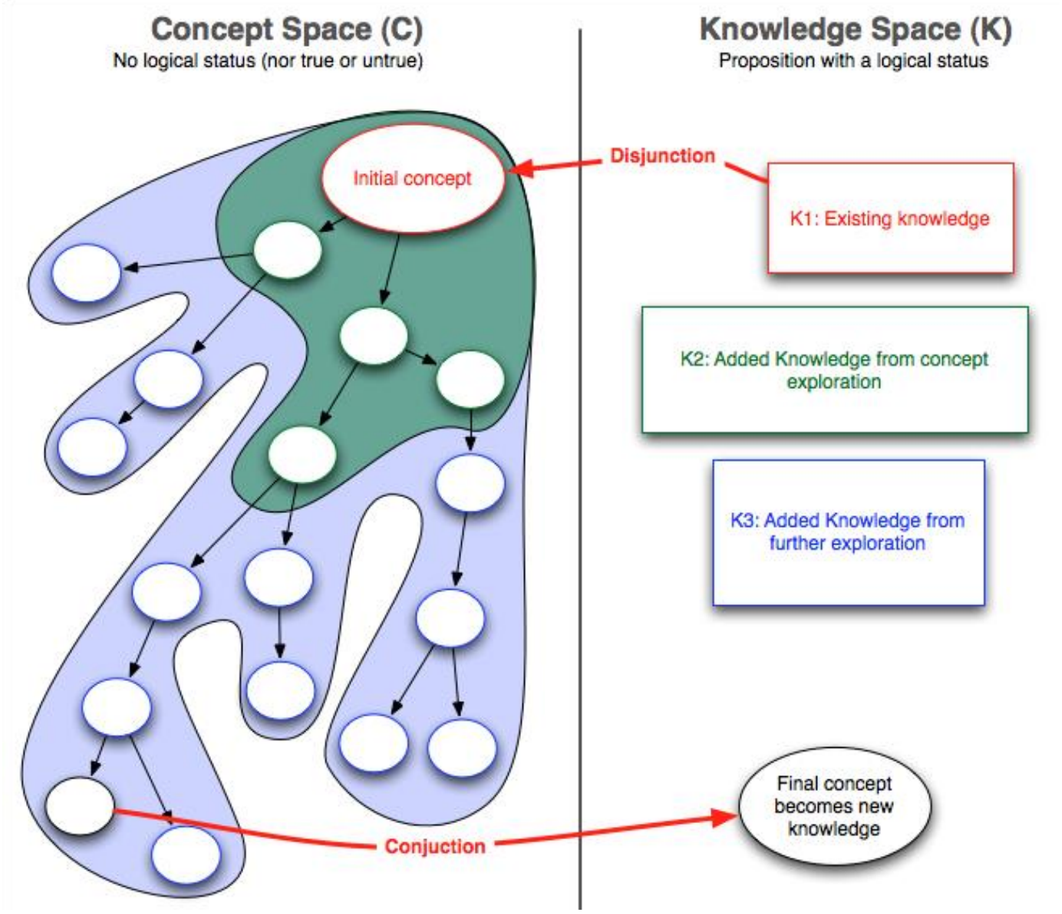


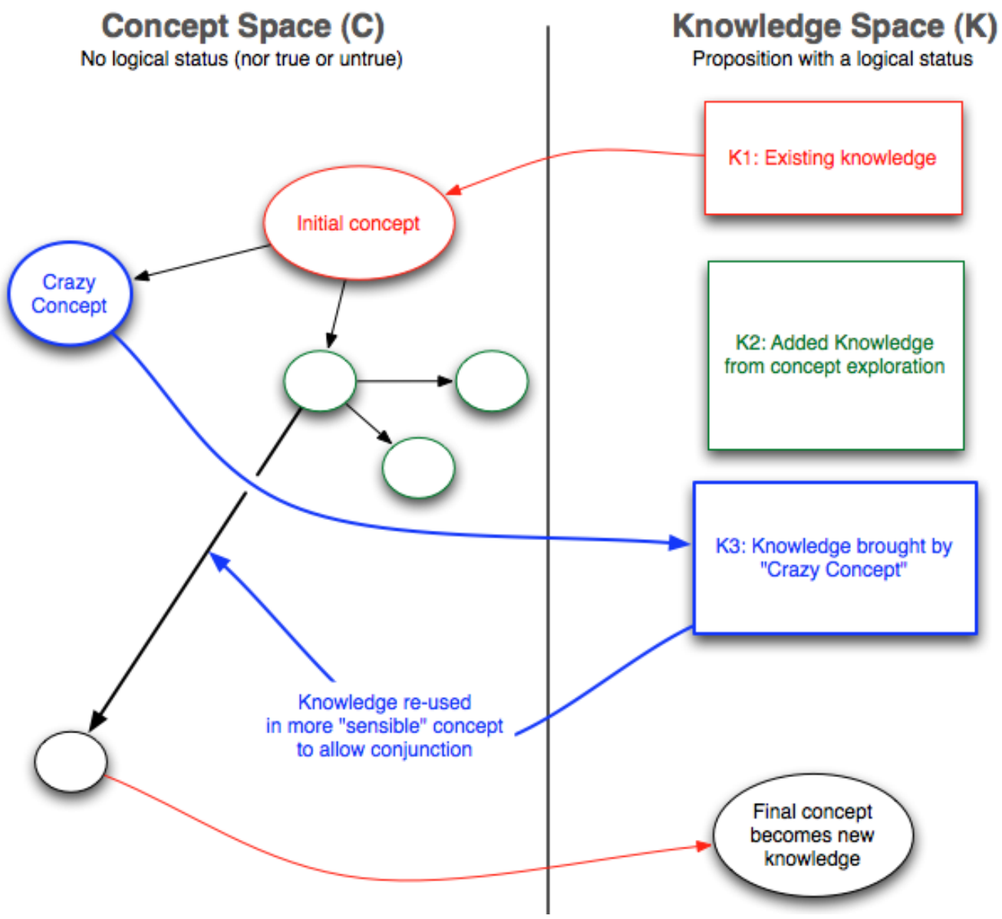
Examples de Knowledge Maps

TOOL MAKING
C-K theory



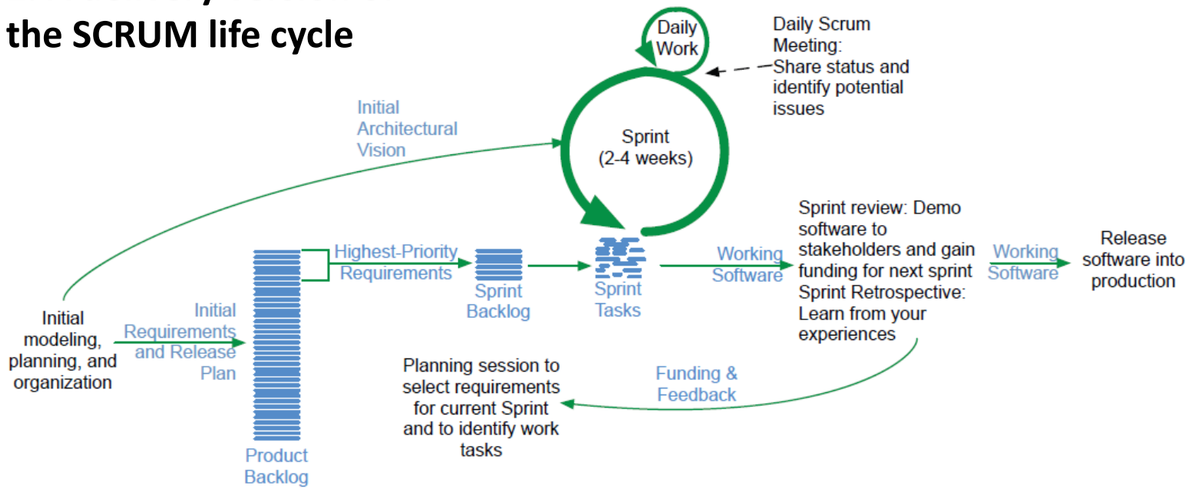
Source: http://en.wikipedia.org/wiki/C-K_theory





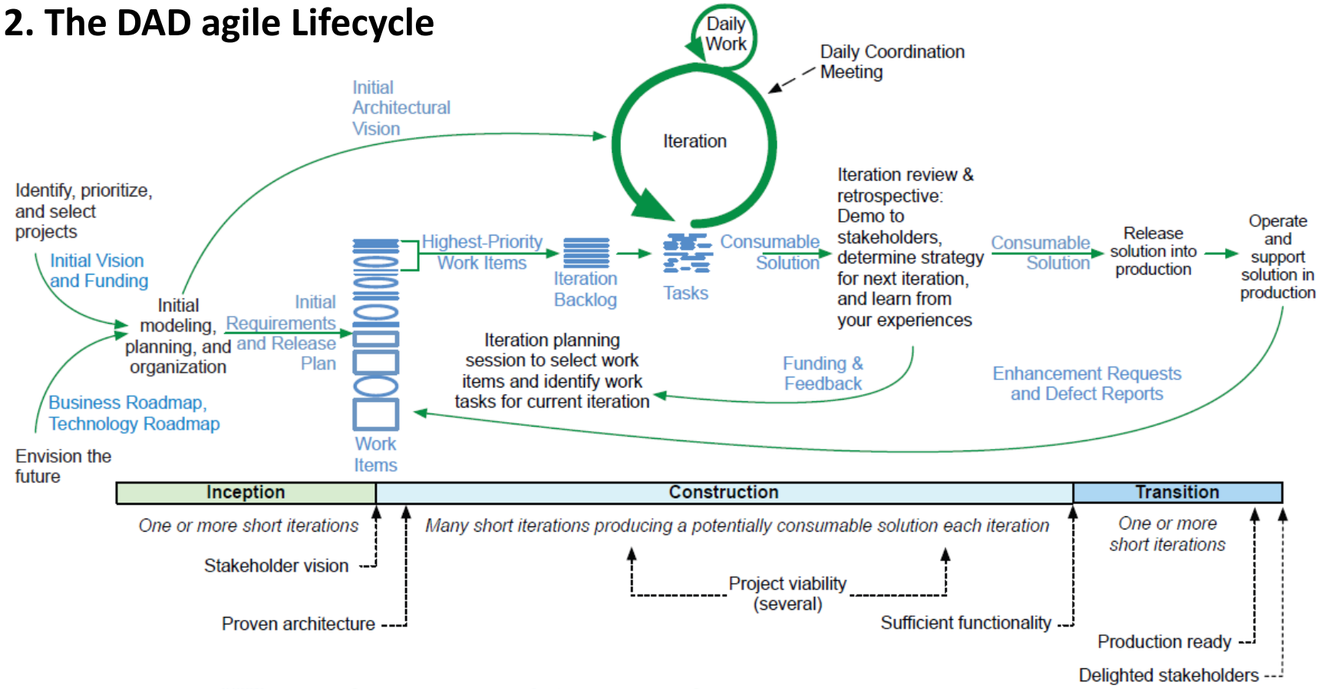
Examples of Knowledge Maps

1. A delivery version of the SCRUM life cycle

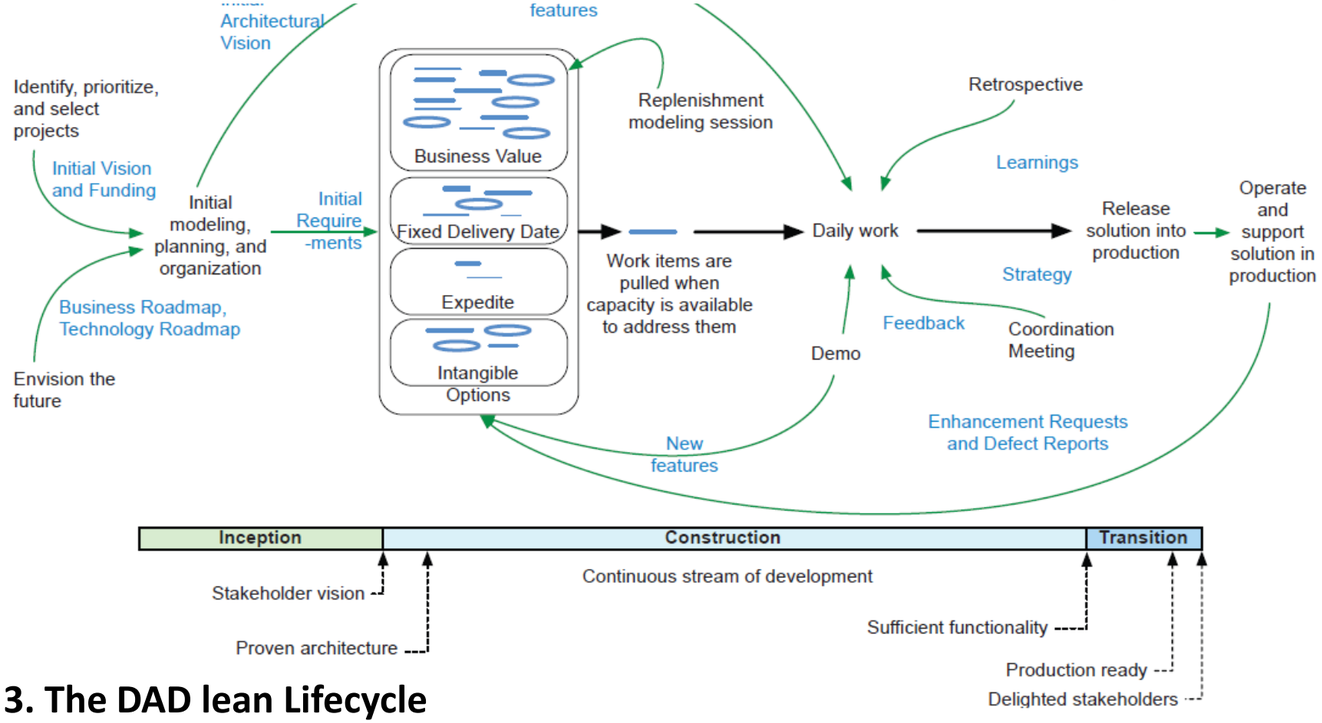


Source: Ambler SW, 2013. Going Beyond Scrum. Disciplined Agile Delivery. Disciplined Agile Consortium White paper, October 2013. http://disciplinedagileconsortium.org/Resources/Documents/BeyondScrum.pdf

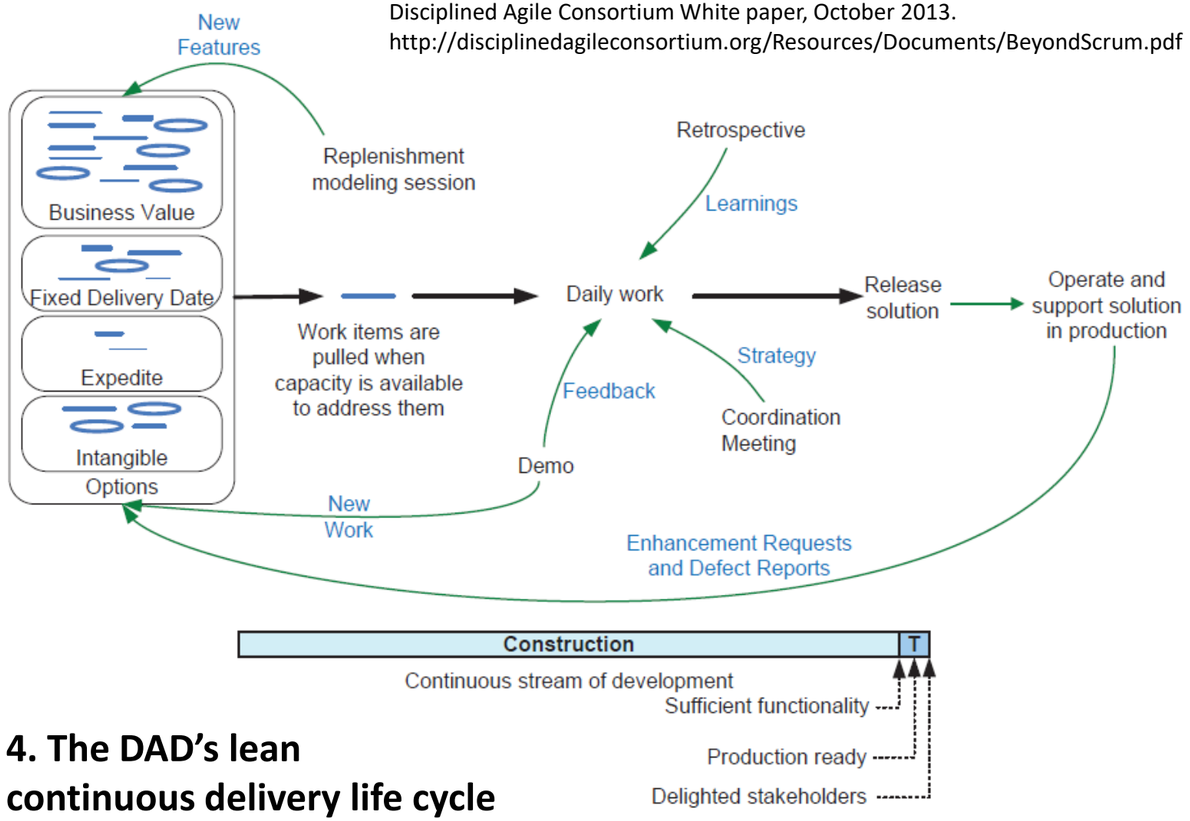
2. The DAD agile Lifecycle



3. The DAD lean Lifecycle

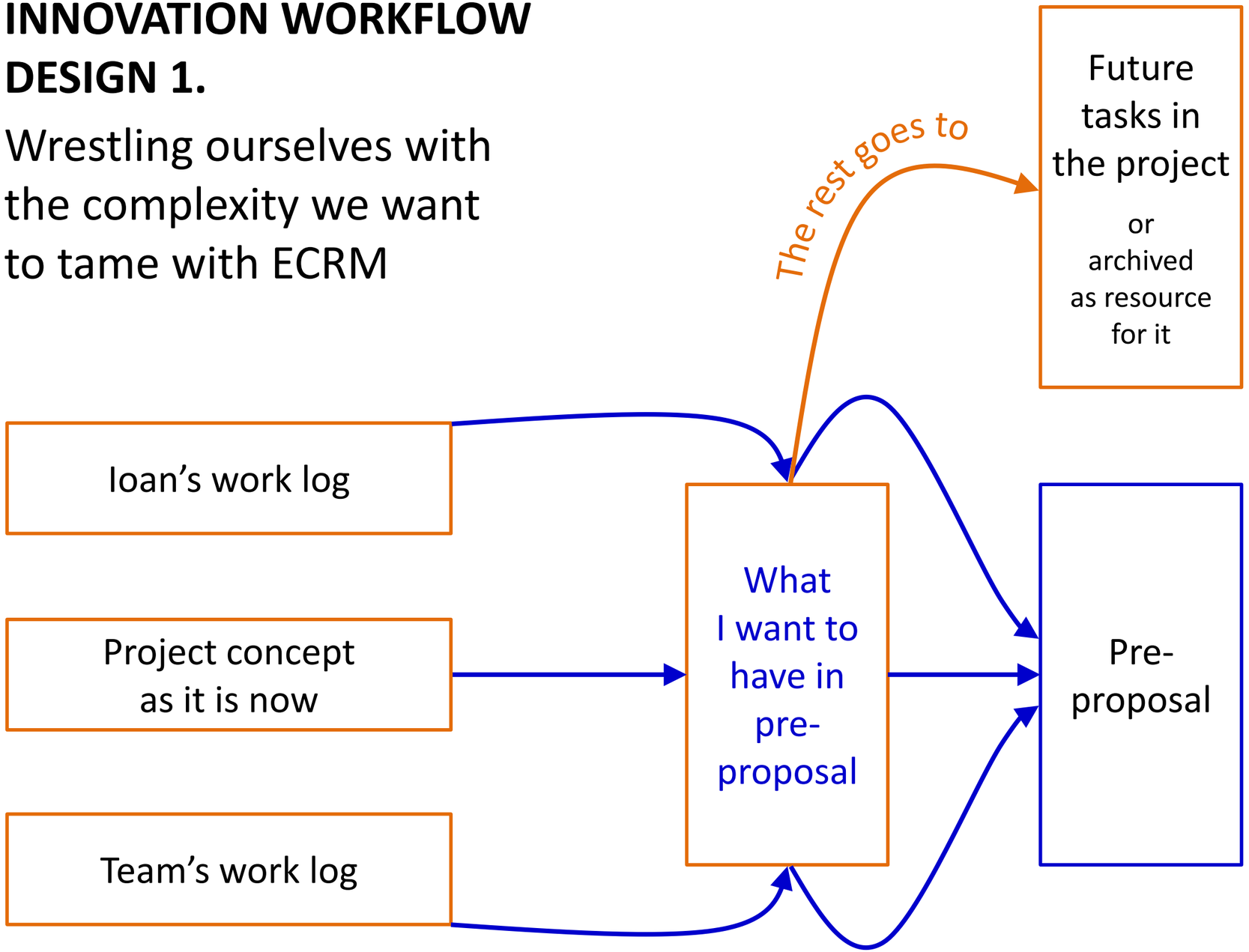


4. The DAD's lean continuous delivery life cycle



INNOVATION WORKFLOW DESIGN 1.

Wrestling ourselves with the complexity we want to tame with ECRM



PRE-PROPOSAL CONTENT

- Executive summary page
- Problem description
- Market situation
- Approach description
- Operational model with: features, requirements, expected benefits (short & long-term) and timeline
- Summary of tests and comparisons with other models, methods and approaches

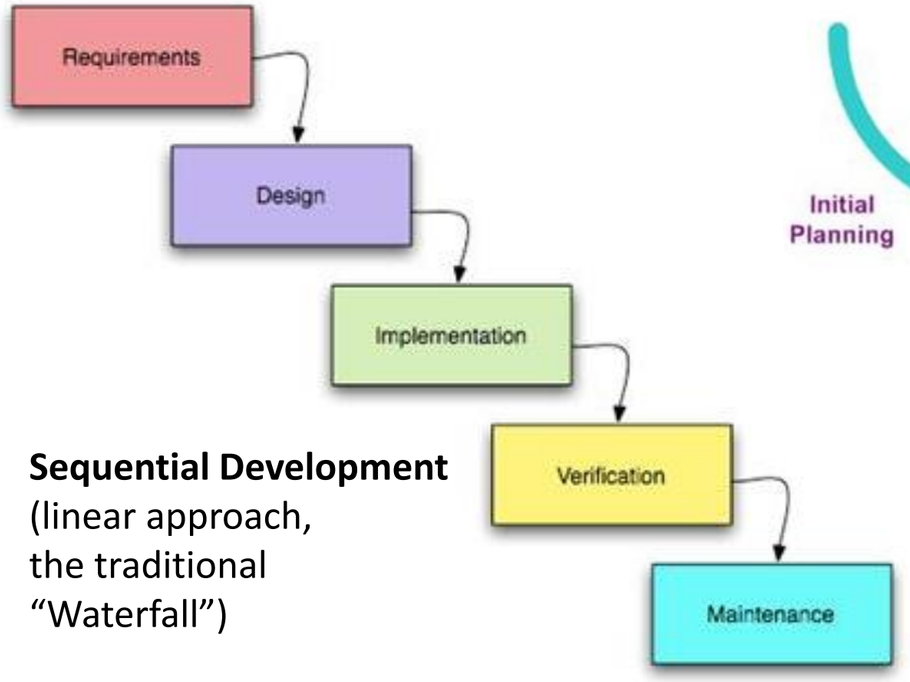
APPENDICES

- List of other projects
- List of people
- List of potential donors
- List of companies

Format: PPT & Word -> PDF

Examples de Knowledge Maps

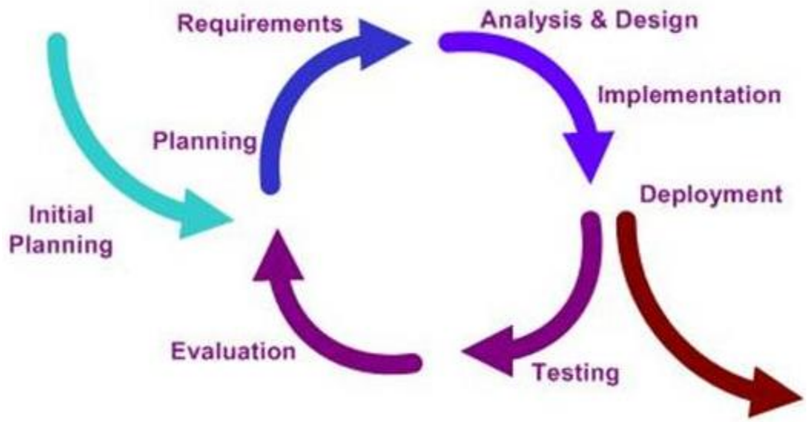
Tool making / product development



Sequential Development
(linear approach,
the traditional
“Waterfall”)

For simple products
eg, a metal piece

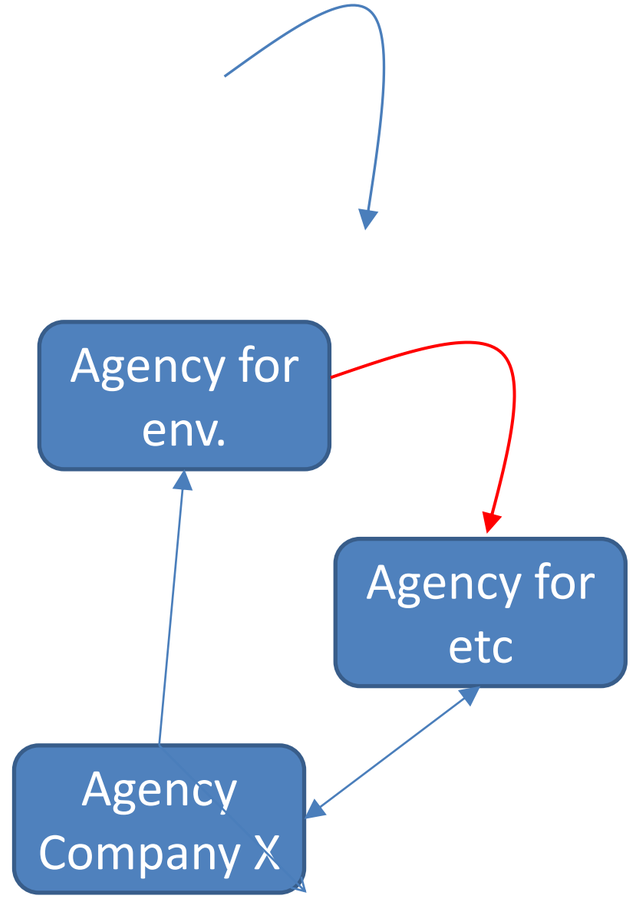
Concurrent design



Iterative Development
(evolutionary approach)

For complex products
eg, a research paper
Dependent on efficient communication

Show how to draw it here:

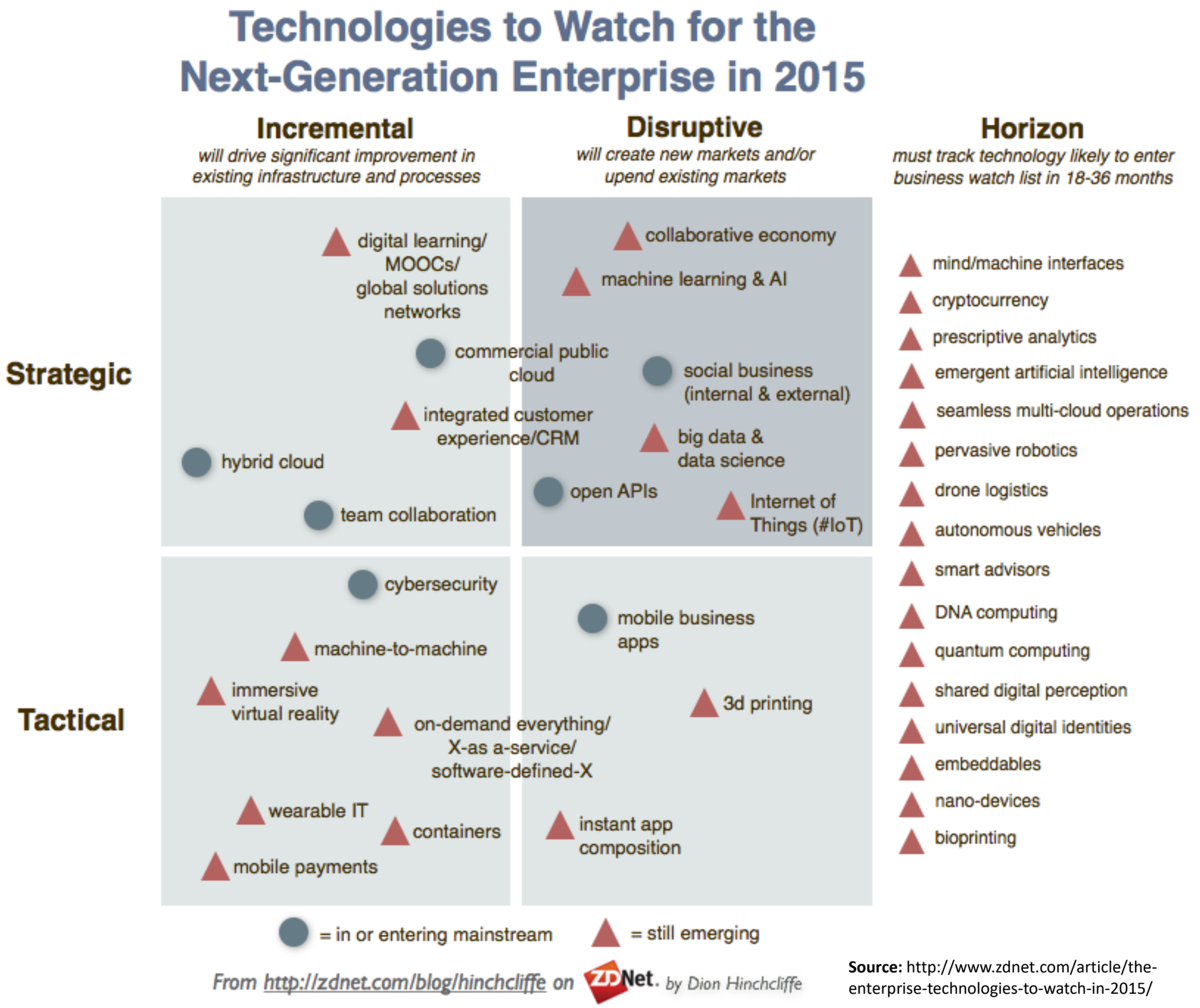


http://en.wikipedia.org/wiki/File:Waterfall_vs_iterative.JPG

Examples de Knowledge Maps

Just another type of diagram that can count as Knowledge map.

In this case, you don't have vertices and arrows, but categories are represented as groups of dots; For example 3D printing (red triangle on the bottom left) is both tactical and disruptive emerging technology (by 2015).
Here, relations are represented by the fact of pertaining to the same category: like the relation between two technologies, for example, 3D printing and immersive virtual reality, is that they both belong to the category called tactical technologies



Source: http://www.zdnet.com/article/the-enterprise-technologies-to-watch-in-2015/

Thank you!

For further questions, email me to:
ioan.ciumasu@gmail.com