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Japan Advanced Institute of Science and Technology

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# Challenges for Standards Development in e-Learning & Knowledge Management

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# Overview

- Context and Questions
  - Standards for What?
  - What is the Problem Space?
  - How do we model it?
- The Challenge of Collaboration
- Issues
- Looking Forward – What Needs to Happen

# Key Context

- e-learning not just a passing fad
  - transforming access & delivery of education and training ... & its traditional resource base
  - spans home, workplace, and institution
- Convergence of e-infrastructure
  - e-learning
  - knowledge management
  - performance support
  - and more ... [**keyword = services**]
- First generation standards are stable
- But standards are still developing
- Growing number & range of players

# Venues for Learning

- Individual
  - home, workplace, leisure, ... socially
- Community of Practice
  - Co-located
  - Geographically distributed, networked, virtual
  - As narrative & discourse
- Organization
  - Physical environment
  - Abstract environment
    - » Strategic
    - » Operational
  - Virtually, in cyberspace



*Lifelong learning for All!*

# Key Visions



“Convenient, effective, affordable, and profitable learning available to every learner and teacher worldwide.”



“Provide access to the highest quality education and training, tailored to individual needs, delivered cost-effectively, anywhere and at any time.”



“(LTSC) is chartered ... to develop accredited technical standards, recommended practices, and guides for learning technology.”



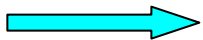
**SC36**

“the pre-eminent international forum for standards development in information technology for learning, education, and training.”

# Key Visions



“The Global Knowledge Economics Council (GKEC) is an organization formed to discuss and select macro-, meso-, micro-, and firm-level plans, policies, and metrics to measure and increase efficiency of knowledge markets and the quality of knowledge at all levels.”



[www.agimo.gov.au/practice/delivery/checklists/knowledge](http://www.agimo.gov.au/practice/delivery/checklists/knowledge)

# Key Visions

"Someday, in the distant future, our grandchildren's grandchildren will develop a new equivalent of our classrooms. They will spend many hours in front of boxes with fires glowing within. May they have the wisdom to know the difference between light and knowledge."

Plato

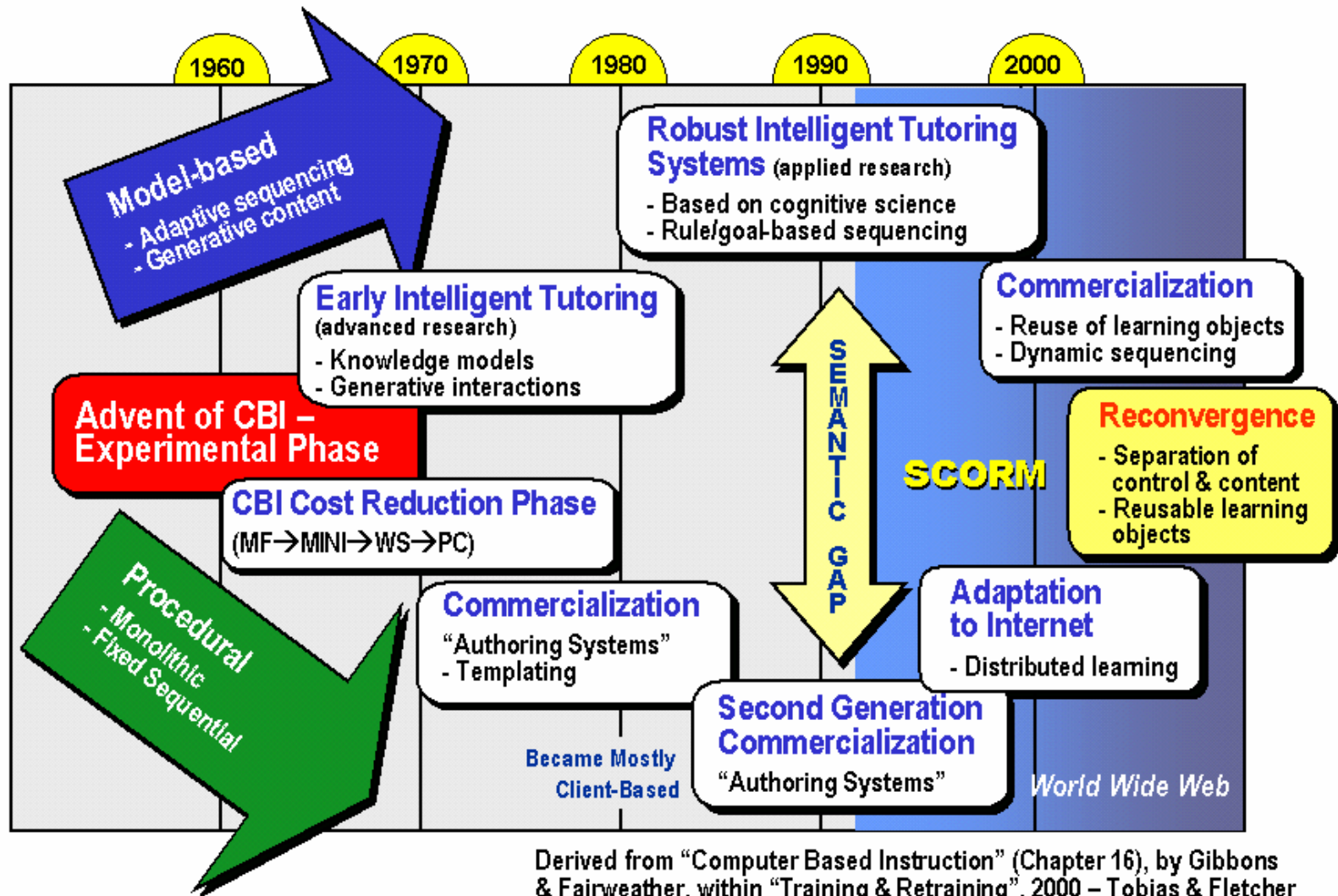
# Key Visions

“An immense and ever-increasing wealth of knowledge is scattered about the world today; knowledge that would probably suffice to solve all the mighty difficulties of our age, but it is dispersed and unorganized. We need a sort of mental clearing house: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified and compared.”

H.G. Wells, *The Brain: Organization of the Modern World*, 1940.



# Historical Perspective



Derived from "Computer Based Instruction" (Chapter 16), by Gibbons & Fairweather, within "Training & Retraining", 2000 – Tobias & Fletcher

# **e = engagement**

**e-learning**

**e-government**

**e-procurement**

**e-business**

**e-commerce**

**e-services**

**e-Europe**

**e-agenda**

**e-content**

**e-mail**

**e-training**

**e-knowledge**

**e-banking**

**e-portfolios**

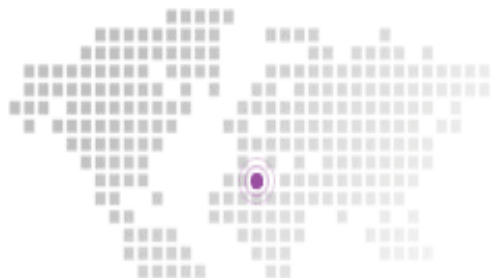
**e-voting**

**e-governance**

**e-skills...**



*Time to redefine a CeO?*



**eDay2** -1 February 2005 - **all Danish citizens** now have a legal right to communicate electronically with central government bodies

**1 February 2005 - French Ministry of the Interior** launched an online debate over the proposed national electronic ID card

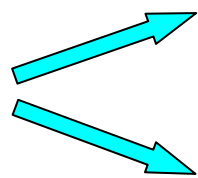
**ALIC**

Advanced Learning Infrastructure Consortium / 先進學習基礎協議會



# Key Question

*What standards are needed in order to build a sustainable and supportive **infrastructure** for learning, education, and training?*



*Technical (ICT) infrastructure*

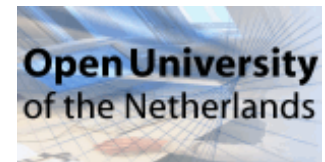
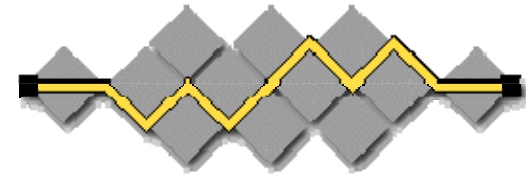
*Organizational infrastructure*

## ... Related Question

*Who will (or should) develop them?*



# Who





# Who Else?



United Nations Educational, Scientific and Cultural Organization

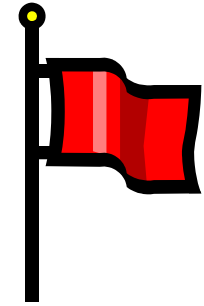


## Education for All

EFA Home



# What Standards?



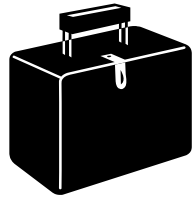
Three broad kinds:

- Standards **specifically purposed** to support learning, education, and training (&/or KM)
- Standards not specifically purposed to support learning, education, and training but are still **essential in enabling** it (&/or KM)
- More widely deployed standards that **may be useful** for learning, education, and training (&/or KM)



# Dualities

## Boundaries



- Packets
- Components
- Content
- Containers
- Collections
- Repositories
- LMS/MLE
- (Intranets)

## Networks

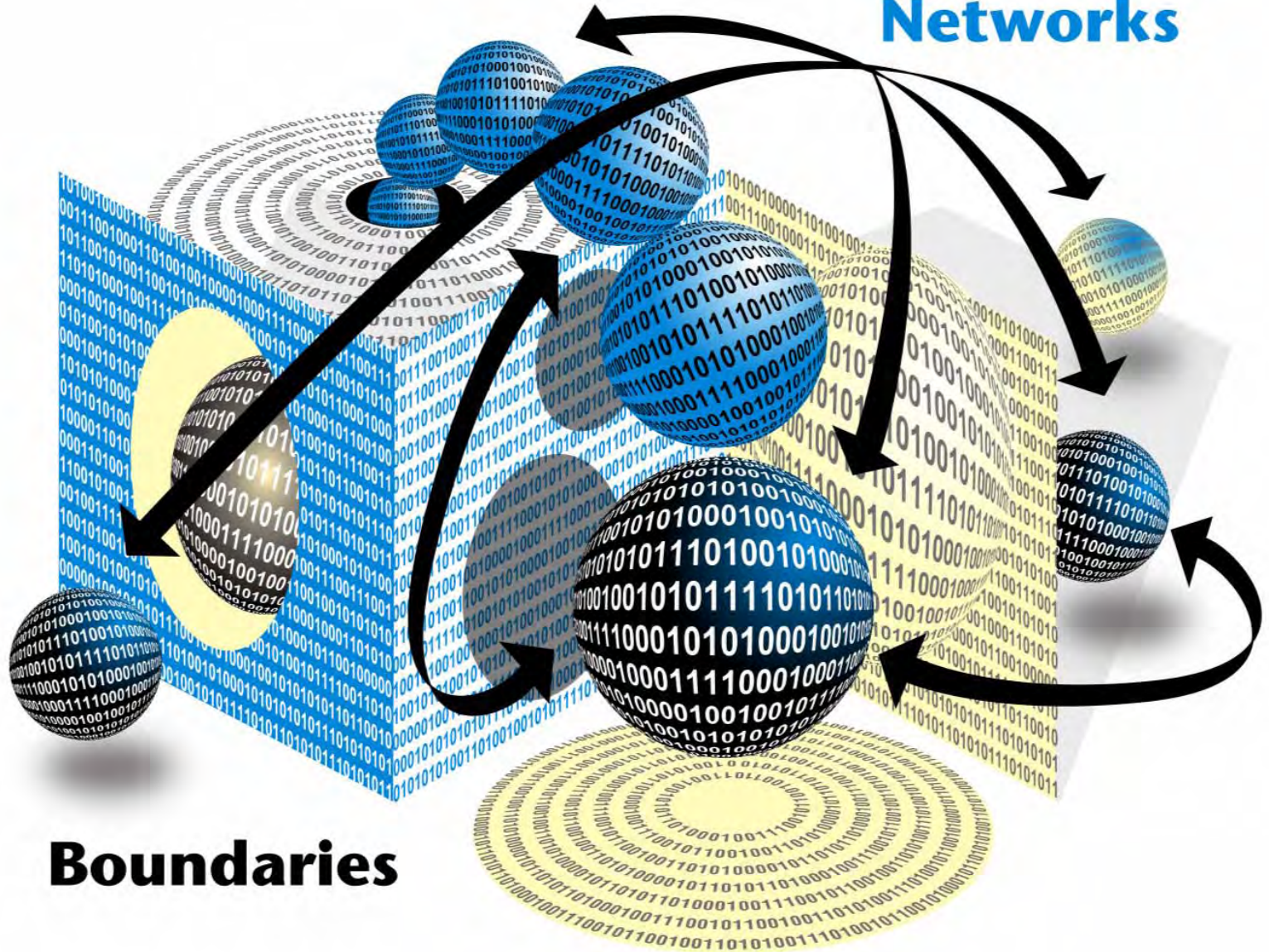
- Connections
- Relationships
- Systems



Defined  Porous

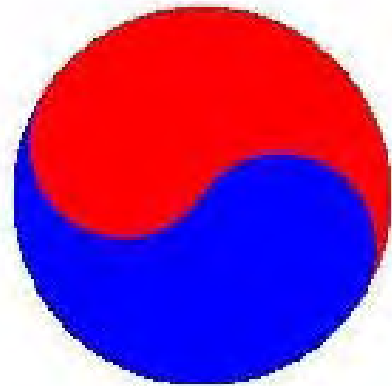
Open  Closed

**Networks**

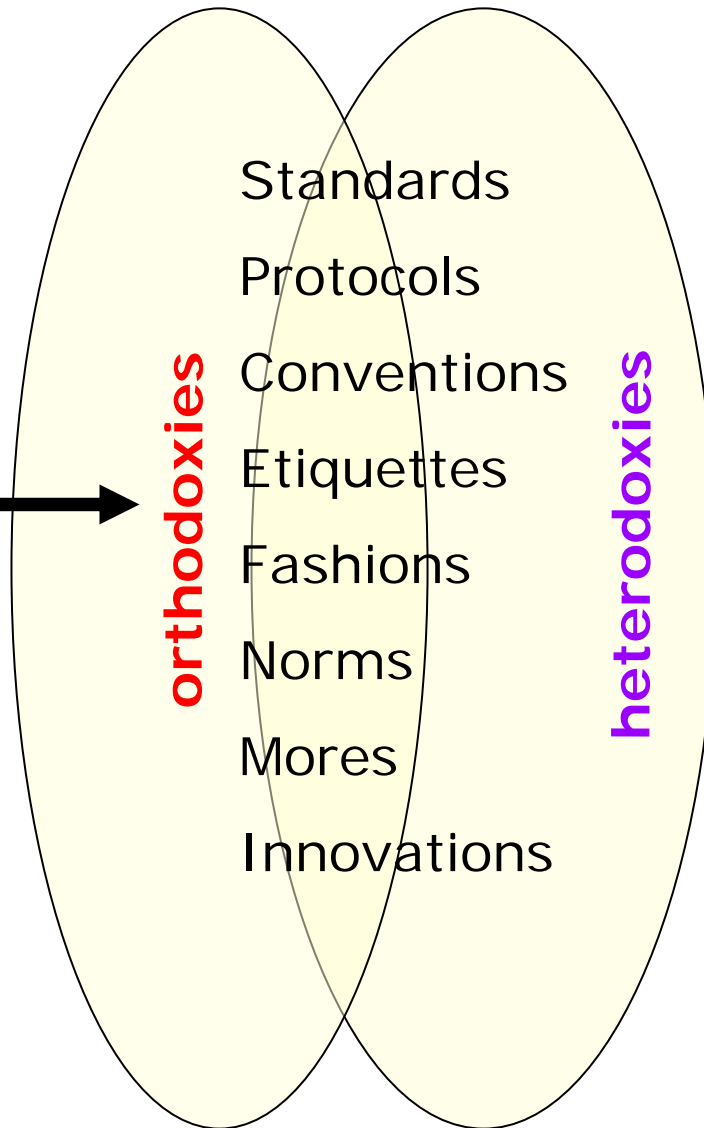


**Boundaries**

# Dualities ... Polarities

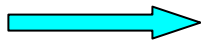


Communities  
of Practice



# Conceptual Challenges

- **What is content?**
  - new data-types & object-types constantly appearing
- **Movable boundaries**
  - Content, context, & learning activities
  - Objects, collections, repositories, ... & federations
  - Data, information, & knowledge
- **Modeling knowledge & learning**
  - Complex Adaptive Systems



*Content is in the eye of the beholder*

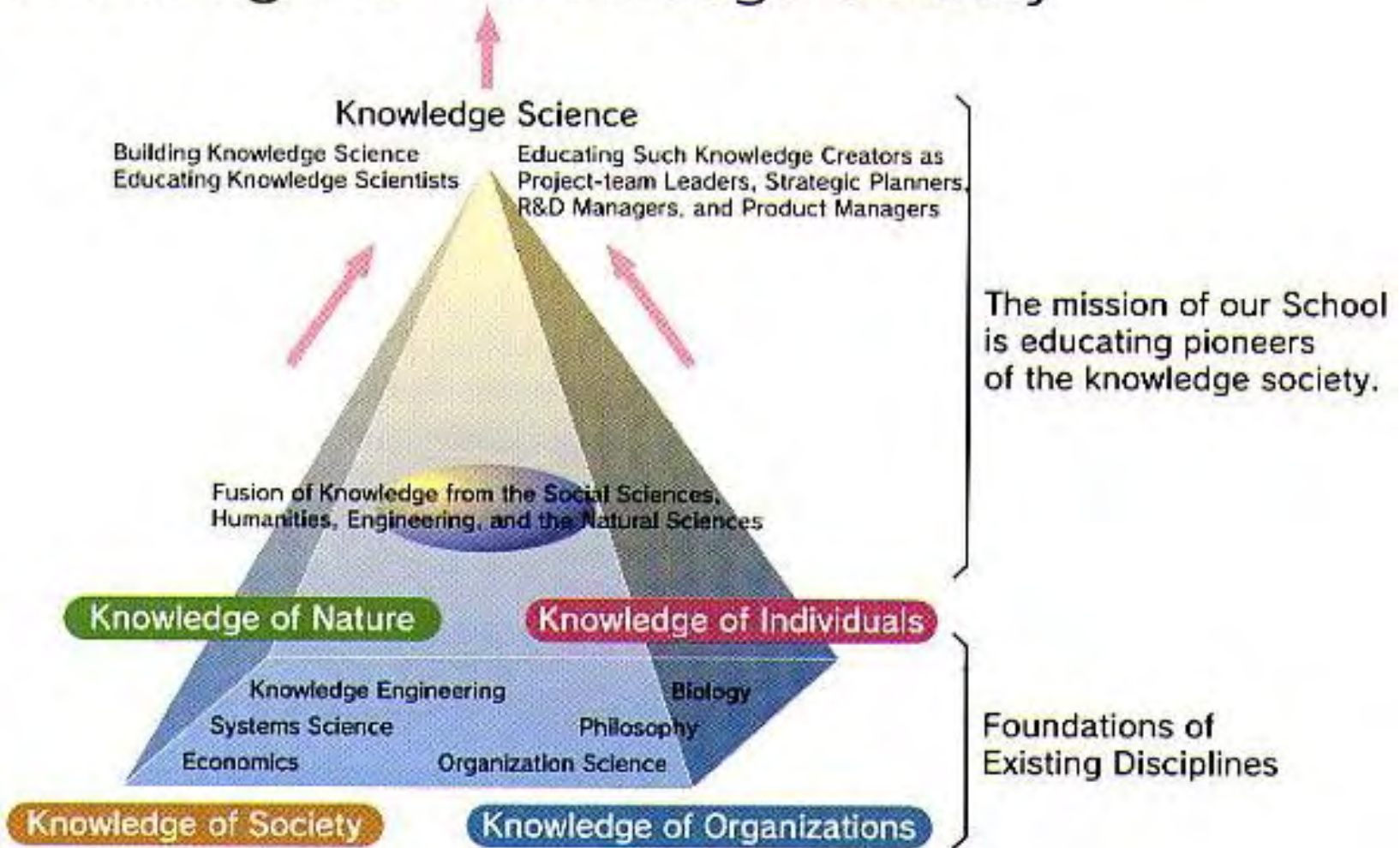


*Learning Technology & Knowledge  
Systems must evolve into supporting  
complex processes*

# Modelling knowledge



## Realizing the “Knowledge Society”





**nouns**

**verbs**

**context**

**Complex Adaptive Systems**

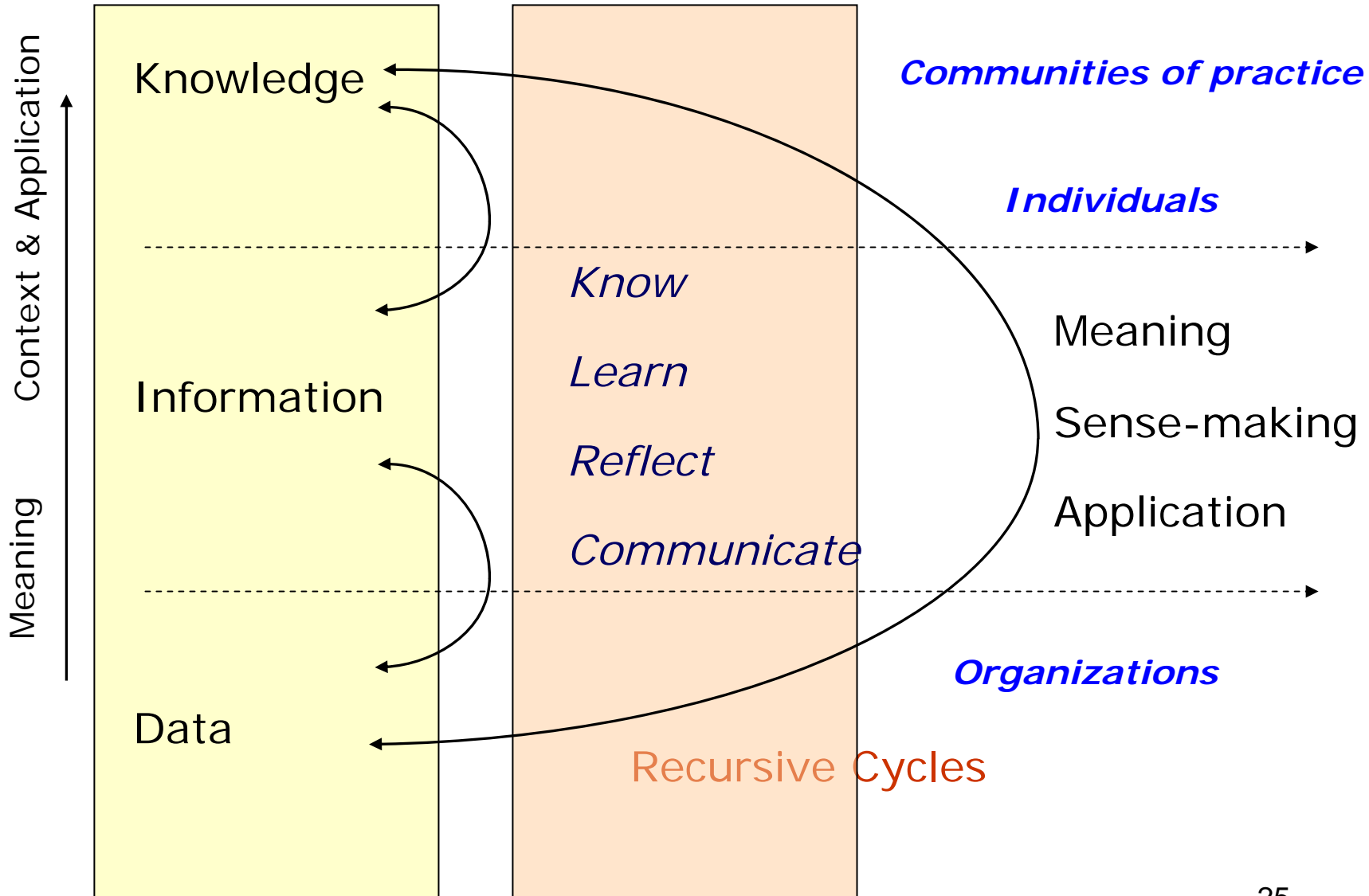
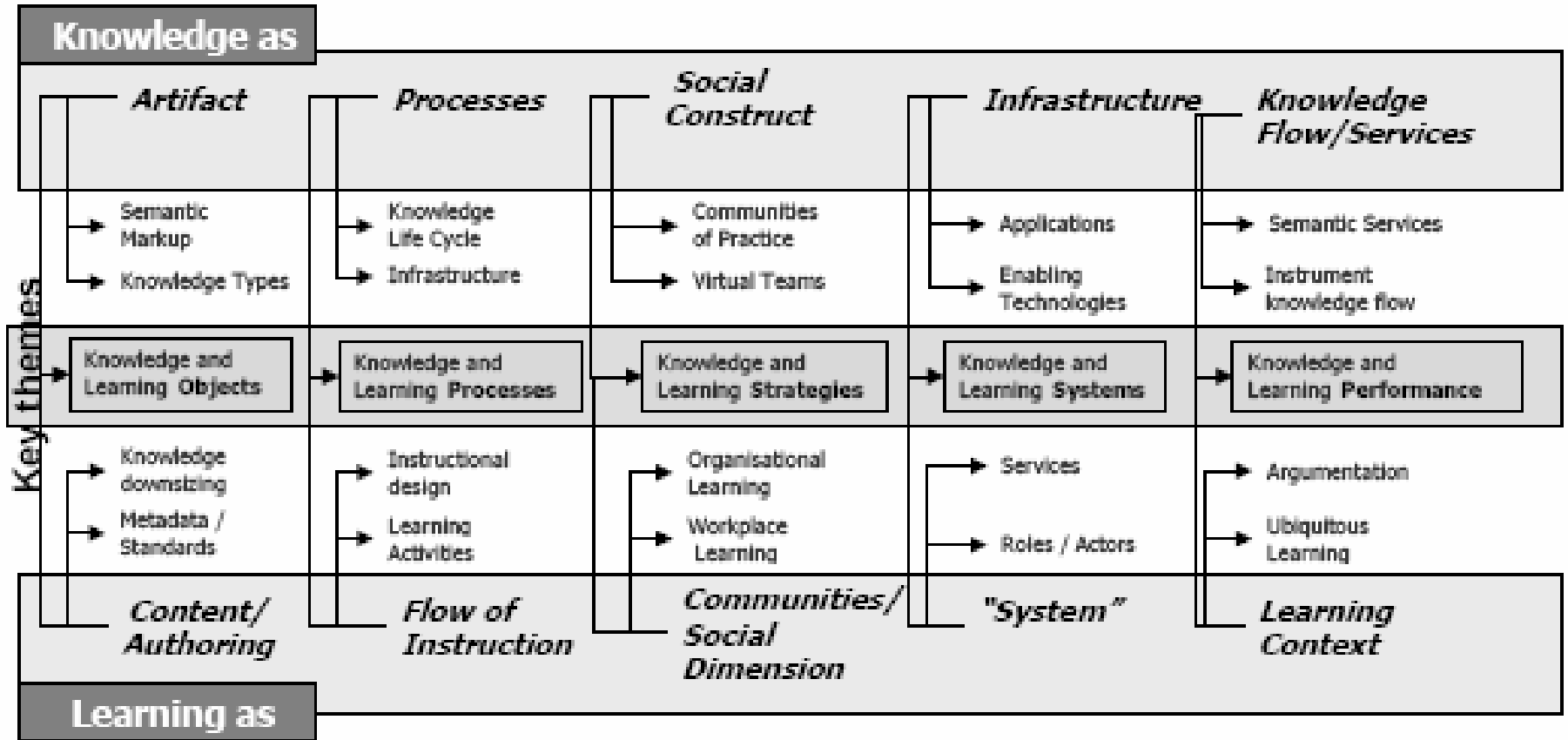
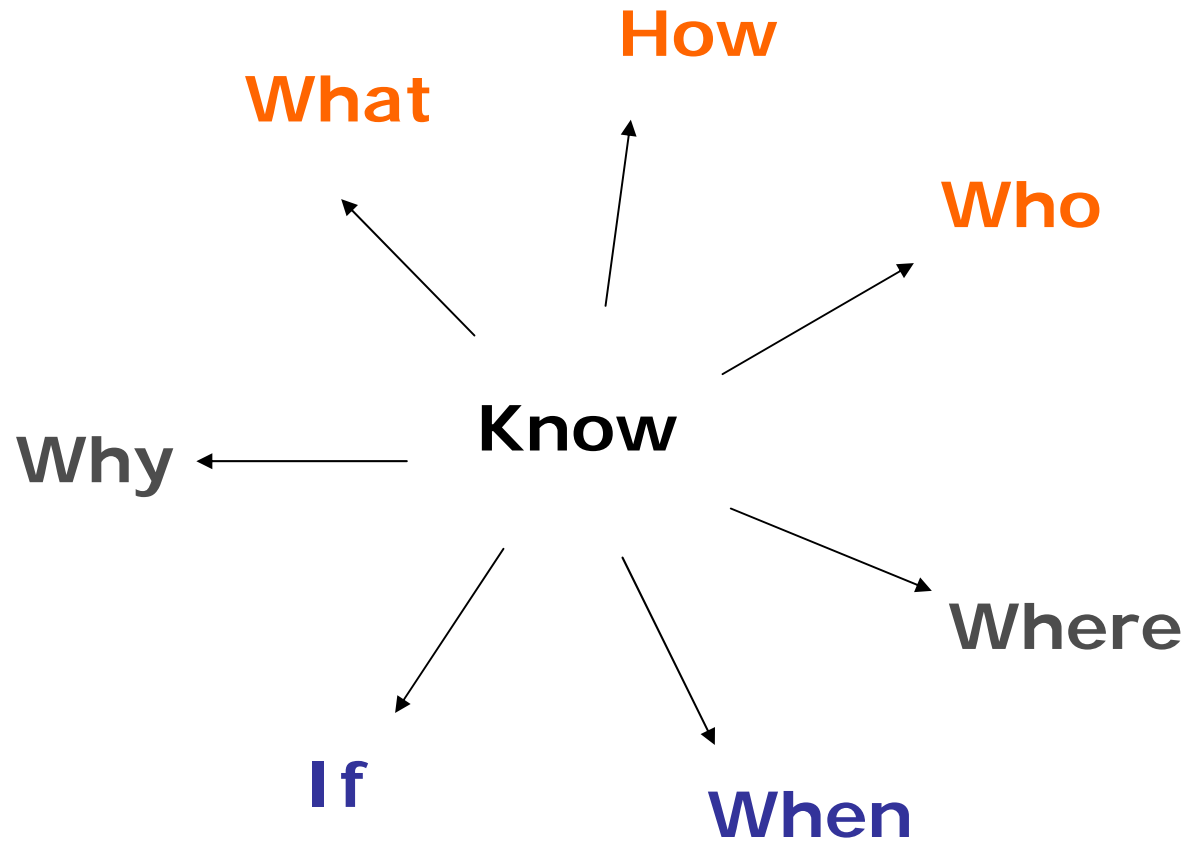


Figure 1 Knowledge and learning key pillars



Source: M. D. Lytras & M. A. Sicilia (2005). *The Knowledge Society – A Manifesto for Knowledge and Learning*, *Int. J. Knowledge and Learning*, Vol. 1, Nos. 1/2, 2005. page 3

<http://www.inderscience.com/storage/f410121258637119.pdf>



# Know-What

- Data:** a collection of unorganised facts and/or figures
- Information:** data that has been organised in such a way that it achieves meaning, in a generalised way
- Knowledge:** information that is presented within a particular context, yielding insight/understanding on application in that context

*A Fundamental (recursive) Value-Chain*

# Know-What

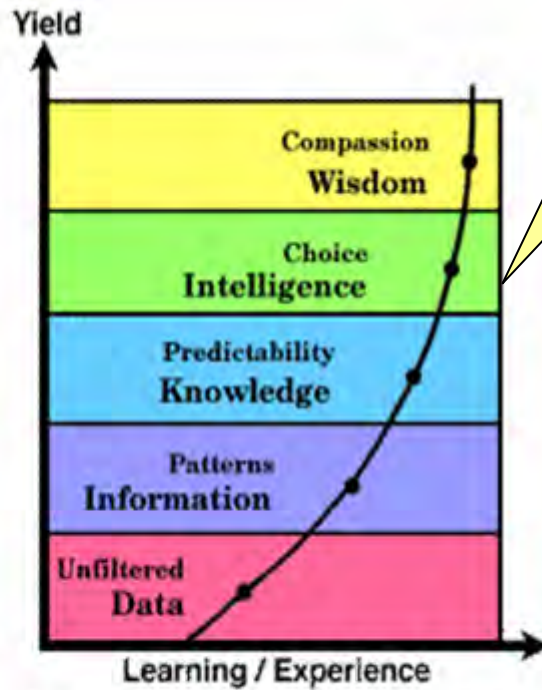
**Data:** a collection of unorganised facts and/or figures

**Information:** data that has been organised in such a way that it achieves meaning, in a generalised way

**Knowledge:** information that is presented within a particular context, yielding insight/understanding on application in that context

**Intelligence:** mental attribute signifying capacity for understanding, developing & processing knowledge

**Wisdom:** the reflective or realised insight resulting from successful application and/or synthesis of knowledge



Yield = Intellectual dividends per measure of effort invested.  
 Examples: Increased clarity, deeper understanding.

Howard Gardner  
 – Multiple Intelligences

Daniel Goleman  
 – Emotional Intelligence

...

– Artificial Intelligence

Source: [www.co-i-i.com/coil/knowledge-garden/dkescop/dwcurve.shtml](http://www.co-i-i.com/coil/knowledge-garden/dkescop/dwcurve.shtml)

# Definitions – Five Perspectives

- **Personal** KM (individual dispositions and behaviours)
- **Organisational** KM (multi-national corporations, small-to-medium enterprises, Governments, Non-Government Organizations, Educational Institutes)
- **Sectoral** KM (education, information technology, pharmaceuticals, agriculture, etc.)
- **Cultural** KM (indigenous, community-of-practice, ...)
- **National** KM (national policies for stimulating innovative cultures within industry)

# Definitions

- **Nouns**

- learning, knowledge, management

- **Verbs**

- learn, know, manage, innovate ... (learning, knowing, ...)

- **Knowledge**

- is both a **thing** and a **flow**
  - e-learning & KM systems are dynamic systems
  - like particle & wave theories in Physics
  - (typically) cumulative, adaptive



# Definitions - Dave Snowden, IBM

## Three Heuristics

- Knowledge is volunteered, not conscripted
  - shared knowledge is more powerful than pooled information. Trust is key
- We will always know more than we can tell, and tell more than we can write down
  - writing is reflective knowledge
- We only know what we know when we need to know it.
  - knowledge is always contextual

**Definitions** - Rudy Ruggles, Dan Holtshouse – The Knowledge Advantage

## **Seven Levels of Knowledge Management**

**Infrastructure** – physical & technical support structures

**Content** – intellectual capital (knowledge representation)

**Processes** – expressing knowledge development

**Organization** – creating structures to support KM  
(recognizing communities of practice)

**Relationships** – establishing & maintaining

**Products & Services**

**Strategy** – with knowledge recognized as the key  
resource

# Definitions - Standards Australia

## Knowledge Management ...

“is a multi-disciplined approach to achieving organizational objectives by making the best use of knowledge. KM focuses on processes such as acquiring, creating and sharing knowledge and the cultural and technical foundations that support them. The aim is to align knowledge processes with organizational objectives.”

## Definitions - Standards Australia (2)

### Knowledge Management

... “is a set of practices and processes for **systematically adding value** to intellectual and knowledge based resources ... Like finance, land, capital equipment and people, knowledge has become a critical resource for businesses, community organisations and government.”

# What is a Standard?

“A Standard is a published document which sets out specifications and procedures designed to ensure that a material, product, method or service is fit for its purpose and consistently performs the way it was intended to.”

Standards Australia

# Standards are Created

- Depend upon agreement & collaboration (ideally consensus)
- A natural artifact of any human society
- Communities of practice develop standards (& conventions, protocols, fashions, etc)
- Signal marketplace maturity of an industry
- All successful industries depend on standards
- Help create 'trust' infrastructure

***But!***

# Standards are Misunderstood

as

- A means for corporate dominance in a market
- A means for government regulatory control
- Limiting personal freedom of expression
- Limiting frontier thinking & innovation

and, there's wide usage of the term!

# Standards ...

- Utilize and define **boundaries**
- Enable **networks**
- Facilitate development of **systems**
- Stimulate & capitalize on **innovation**
- Promote **interoperability**



**A metaphor?**



Content = Wine

Container = Bottle

Metadata = Label

***...but all made of different stuff!***

# What is a Technology Standard?

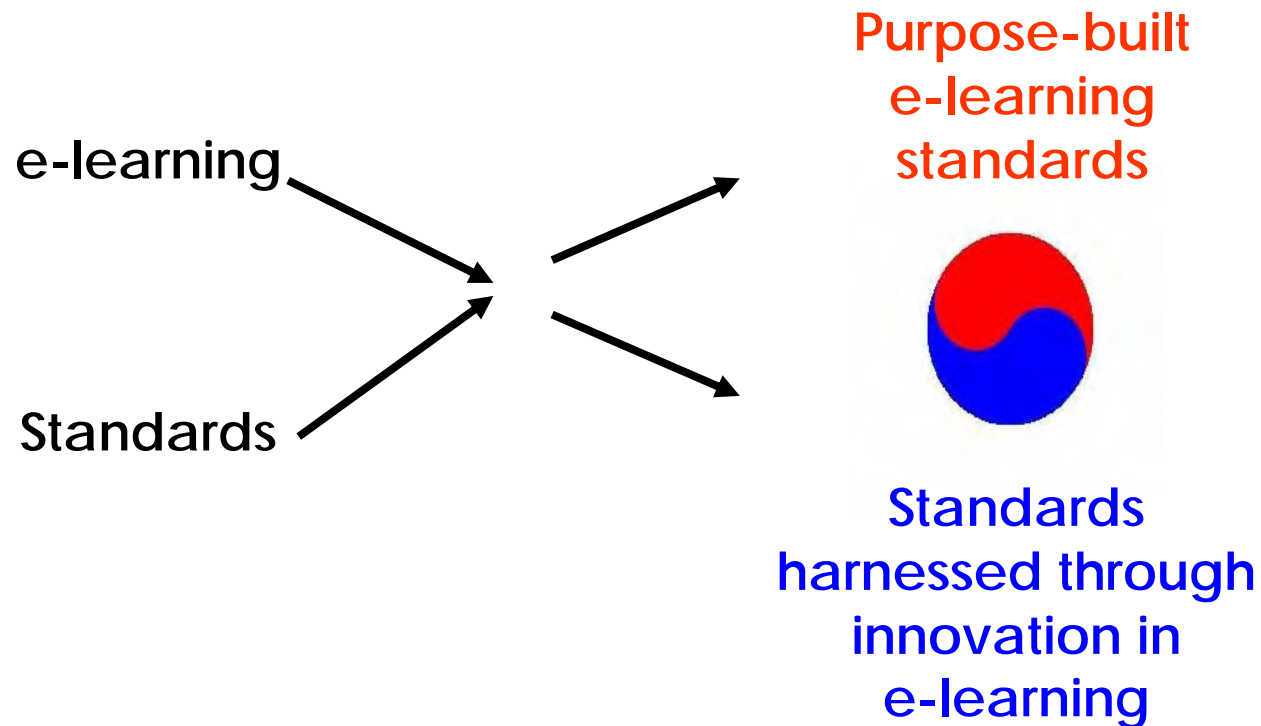
An **interface** and/or a **software protocol** between two or more systems or components that provides **connectivity** and **interoperability**

examples:

- Hardware (USB port; power plug; video tape)
- Data interchange (XML; PDF)
- 'Middleware' (LDAP; Shibboleth; ODBC)

# What is a Learning Technology Standard?

# What Standards?



# How to Model the Problem Space?

- Identifying Key Concepts
- Processes & Functions
- User Requirements & Use Cases!
- Components
- Services
- Frameworks
- What Technology can Do Now
- What we want Technology to Do

# ELF – The E-Learning Framework (JISC-DEST++)

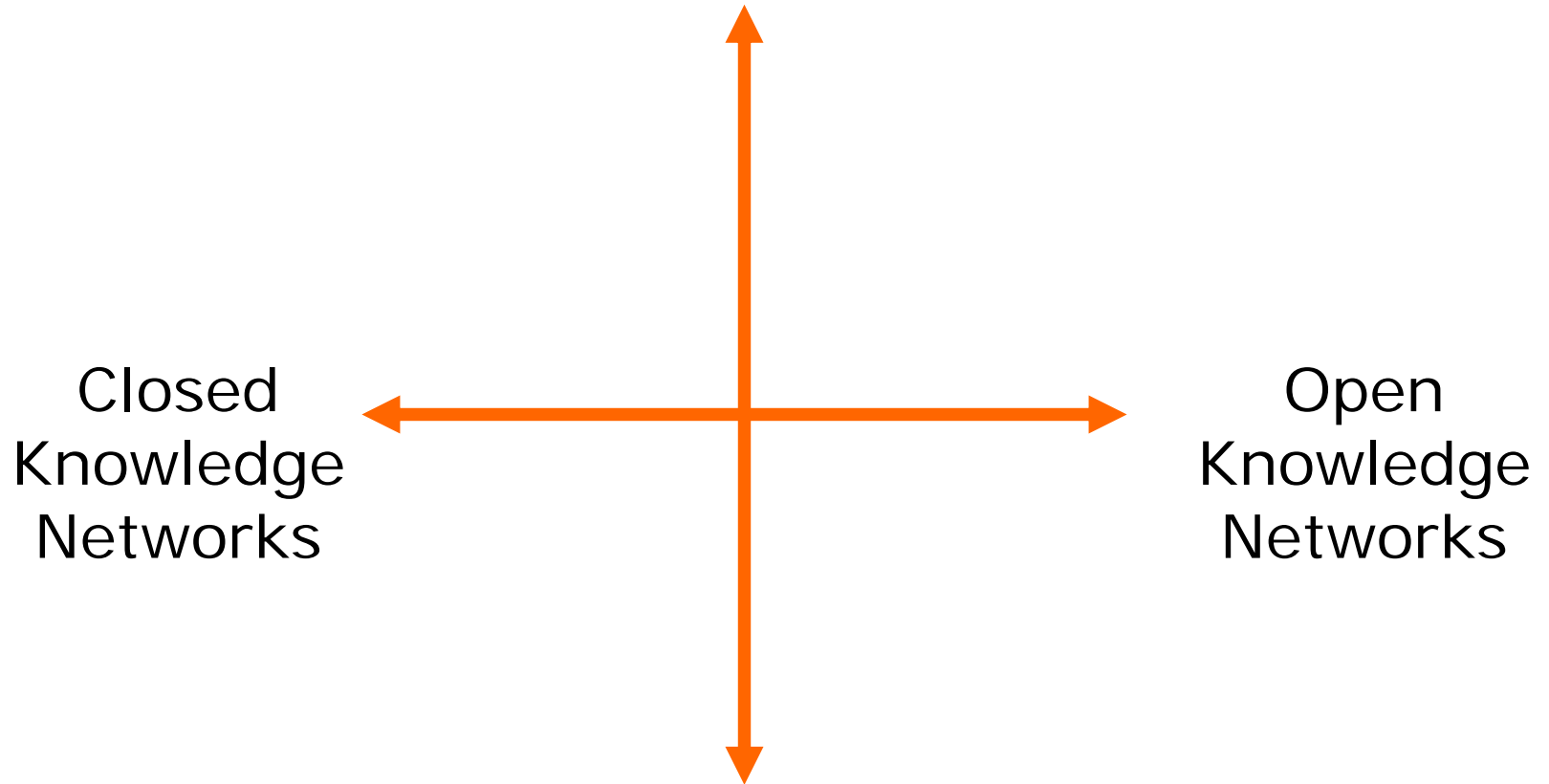
## Learning and Teaching

Sequencing	Assessment	Course Mgt	Course Validation
Activity Mgt	Marking	Resource List	Quality
Learning Flow	Grading	Personal Dev.	Reporting
Tracking	Competency	ePortfolio	Curriculum
Activity Authoring			

## Common Services

Authentication	Resolver	Mapping	Whiteboard
Authorisation	Metadata Schema Registry	Format Conversion	Chat
DRM	Metadata Management	Filing	AV Conferencing
Role	Harvesting	Logging	Context
Rules	Search	Workflow	Presence
Rating / Annotation	Federated Search	Service Registry	E-mail Management
Terminology	Archiving	Identifier	Messaging
Alert	Content Management	Packaging	Scheduling
User Preferences	Member	Calendaring	Group
Forum	Person		

Sustaining Innovation



Closed  
Knowledge  
Networks

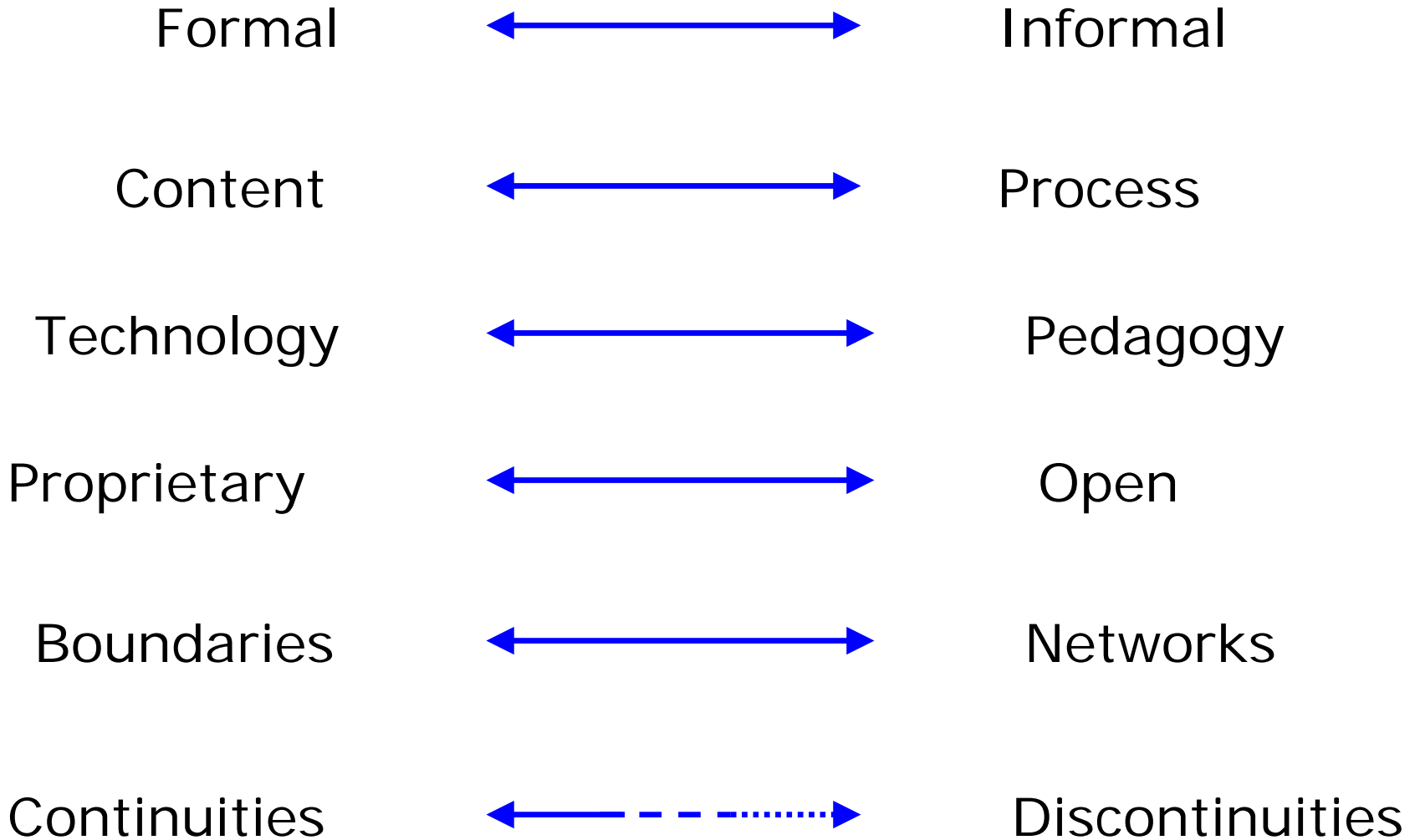
Open  
Knowledge  
Networks

Disruptive Innovation



# Other Tensions

Communities of Practice



# Systems Boundaries

For example:

*Digital* rights management brings new complexity & can imply management of:

- Identity (people & resources)
- Access
- Content (end-to-end, creator-to-consumer)
- Distribution & tracking
- Enabling & constraining technologies
- ‘Trusted Computing’

# Some Success Stories

- SCORM

[www.adlnet.org/](http://www.adlnet.org/)

- IMS Global Learning Consortium

[www.imsglobal.org/](http://www.imsglobal.org/)

- CEN/ISSS/LTWS

[www.cenorm.be/cenorm/businessdomains/businessdomains/iss/activity/wslt.asp](http://www.cenorm.be/cenorm/businessdomains/businessdomains/iss/activity/wslt.asp)

- Medbiquitous

[www.medbiq.org/](http://www.medbiq.org/)

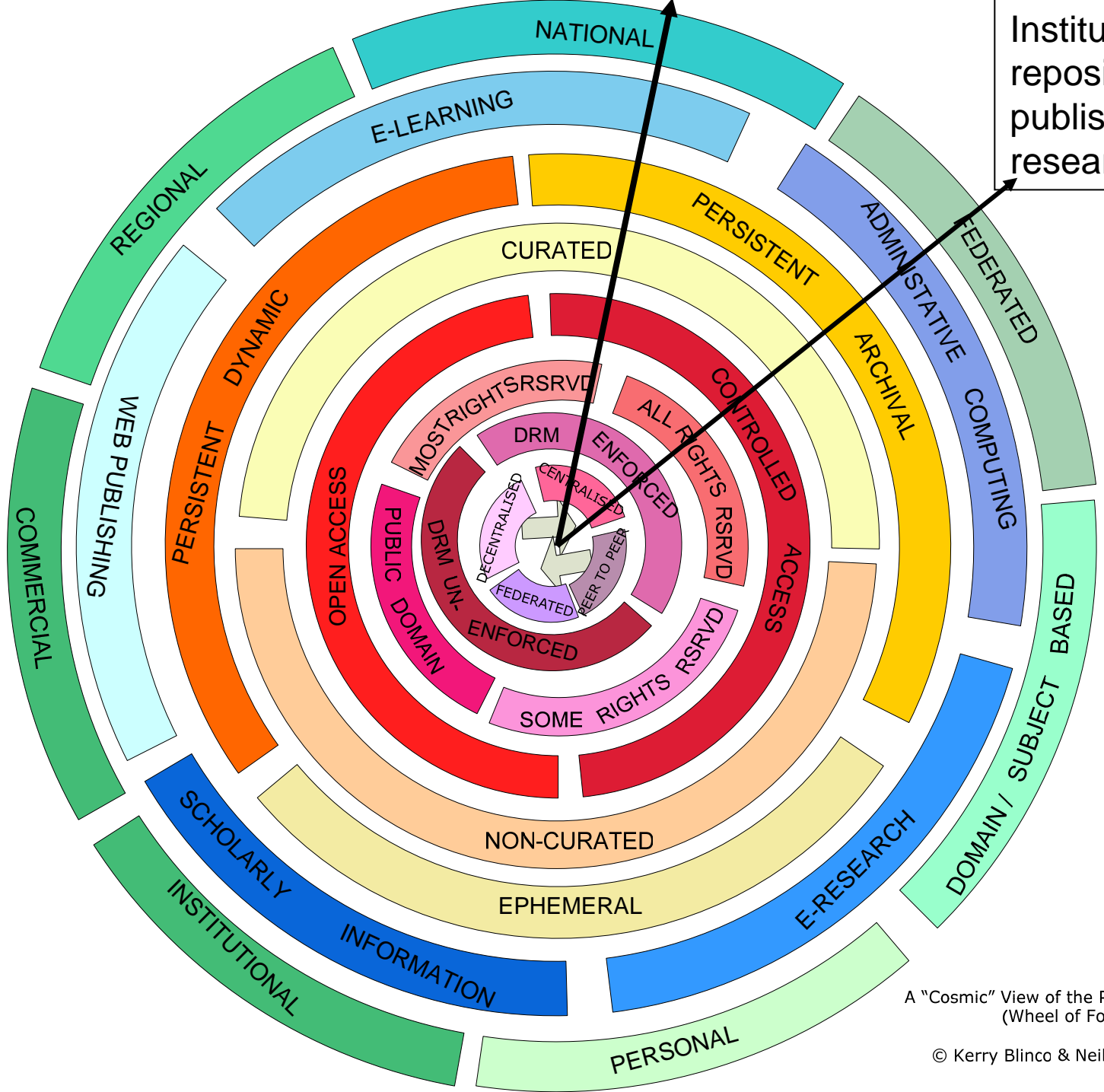
- The Learning Federation

[www.thelearningfederation.edu.au/](http://www.thelearningfederation.edu.au/)

- Trio

[www.progettotrio.it/](http://www.progettotrio.it/)

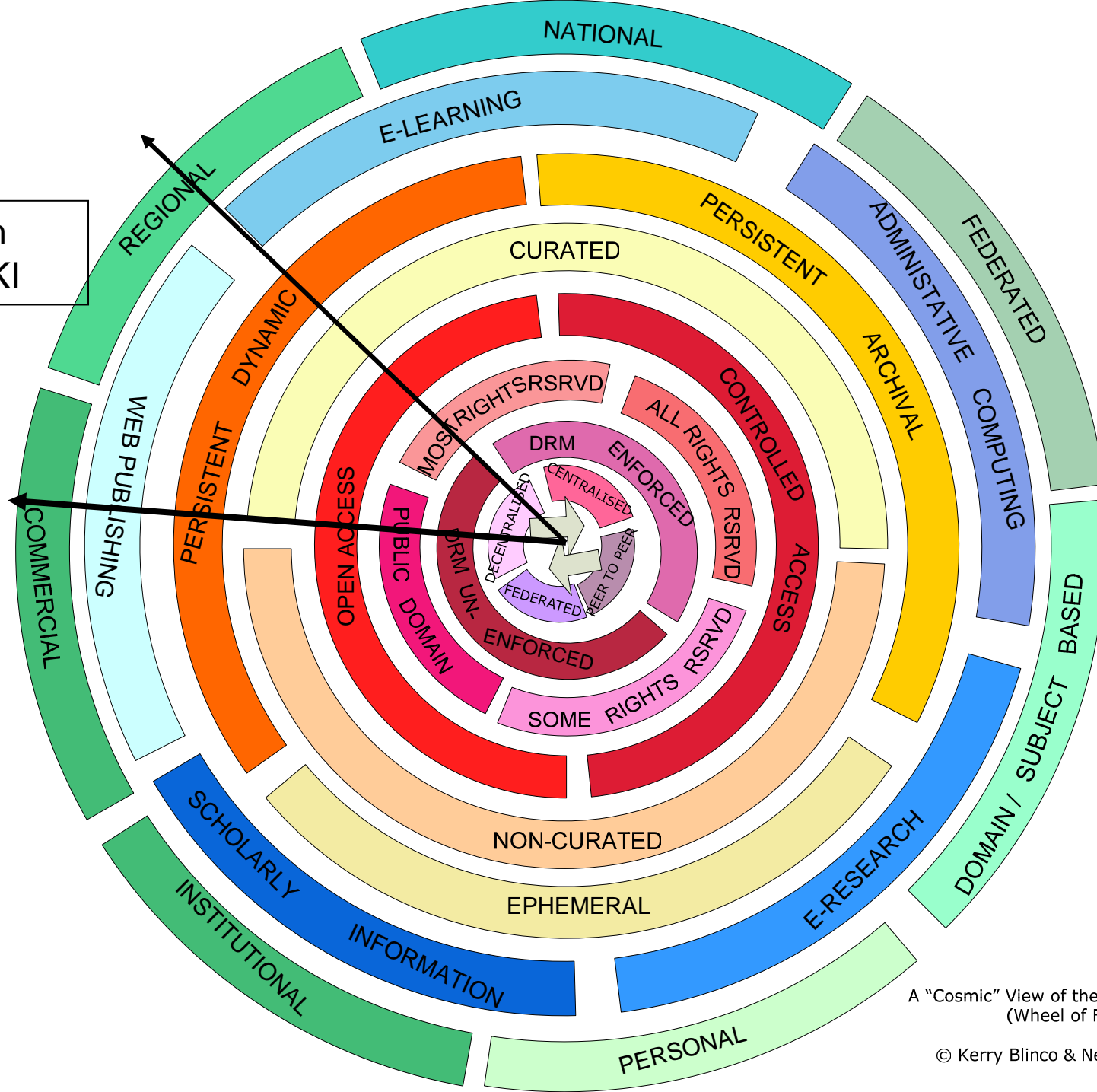
# Modeling repositories



Institutional repository of published research

A "Cosmic" View of the Repositories Space (Wheel of Fortune) 54

Research team WIKI



A "Cosmic" View of the Repositories Space (Wheel of Fortune) 55

# What is Interoperability?



# Interoperability Dimensions

Political	Agreeing to common goals & ground rules for achieving mutual benefit
Jurisdictional	Mapping legal, regional interests
Semantic	Achieving common understanding, common meanings (eg Dublin Core)
Cultural	Communities of Practice, workflow
Syntactic	Sharing grammars, templates, ...
Technical	Systems exchanging data & services

# The interoperability fallacy

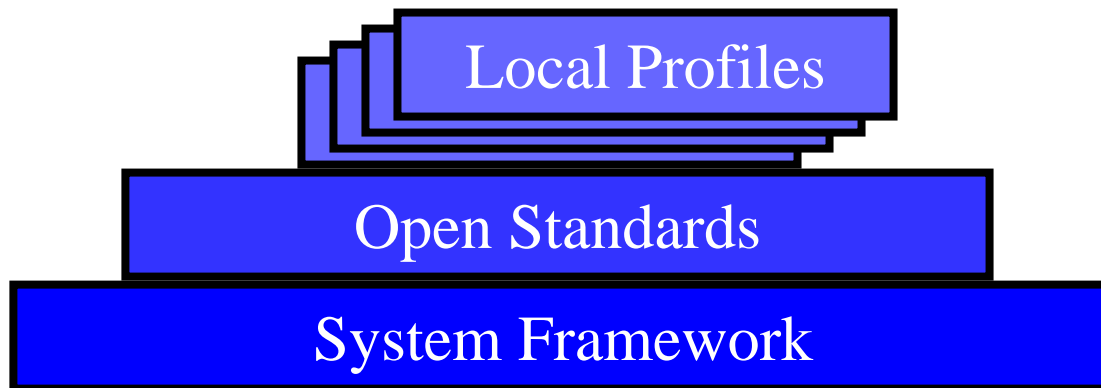
- Legitimate focus on interoperability of technology systems, but coupled with:
  - A techno-fetishist belief that this is enough
  - The analyst facility that it is all about human judgement
- In consequence we have a near complete failure to look at the co-evolution of humans and information systems
- Complete failure to understand interoperability and co-evolution of multi-ontology networks

# The Challenge of Collaboration

- Everyone wants the benefits of interoperability and consolidation but ...
- Everyone wants to meet specific legal, cultural, or business needs



**Resolution:** framework, standards, profiles



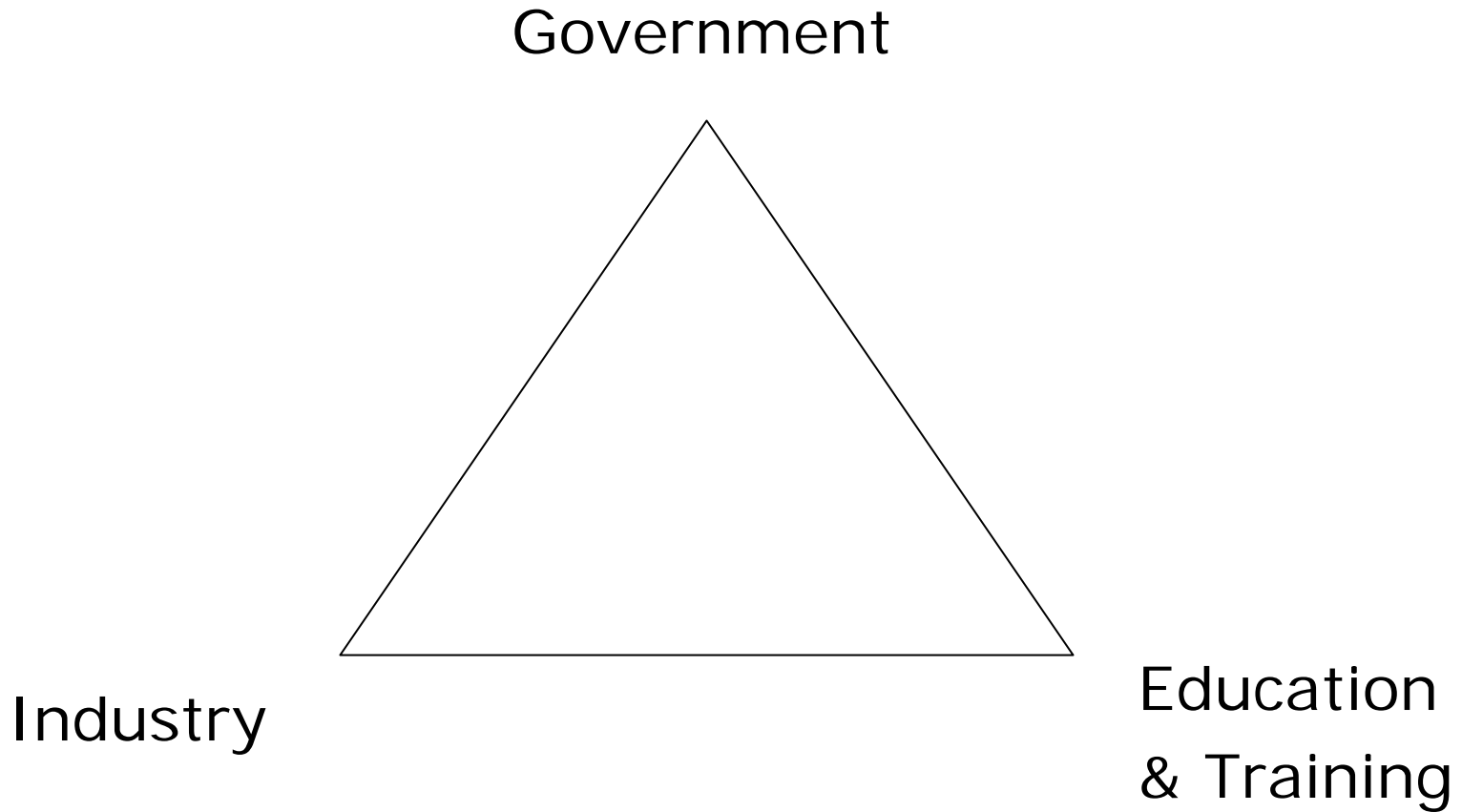
“The story of the creation and development of the Internet is one of an extraordinary human adventure. It highlights people’s capacity to transcend institutional goals, overcome bureaucratic barriers, and subvert established values in the process of ushering in a new world. It also lends support to the view that cooperation and freedom of information may be more conducive to innovation than competition and proprietary rights.”

Manuel Castells

# Collaboration & Trust

- Two sides of one coin
- Organizing principles of knowledge economies

# Where Collaboration is Needed



Consensus  
Building

Knowledge  
Sharing

Collaborative  
Activities

**TRUST**

Outputs

Technologies  
that Work

Standards &  
Protocols

# A Future Case-Study: e-portfolios

- What standards are needed?

- Identity & Access management
- Portable, validated student records
- Competency classification & validation
- Multiple repository/device interfaces
- Content management
- ... (User Control!)



**Trust  
Infrastructure**

- Who will be the trusted service providers?

- Universities unlikely to be sufficient in long term
- IT vendors do not have a lot of "trust equity"

- "i18n" (internationalization)

- Is it sufficient (e.g., IDN & phishing problem)?



# Ongoing Issues

- Internationalization (language & culture)
- Cost of effective Collaboration
- Engagement of key stakeholders
- Organizational / Domain “silos”
- Trust
- Terminology
- Implementation trade-offs
- Building Infrastructure that scales
- Sustainability

# Ongoing Issues (2)

- Intellectual Property
- Open source
- ...

**Questions ...**



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