

# Knowledge preservation and PLM: a cultural perspective

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# Prologue

- PLM deals with information related to product life :
  - The issue is to collect knowledge to manage a temporal process.
  - The product is in time. Information helps managing this property.
- Bad news :
  - Information is also in time and has a lifecycle.
    1. A piece of knowledge elaborated and mastered by some specialists.
    2. A piece of knowledge shared by society or designated communities
    3. A forgotten piece of knowledge, whose medium is corrupted and content unintelligible.
    - The issue is knowledge preservation
  - Digital information is much more fragile than ordinary one.
    - Digital information requires new approaches

PLM should deal with the digital nightmare of knowledge preservation :  
welcome in hell !

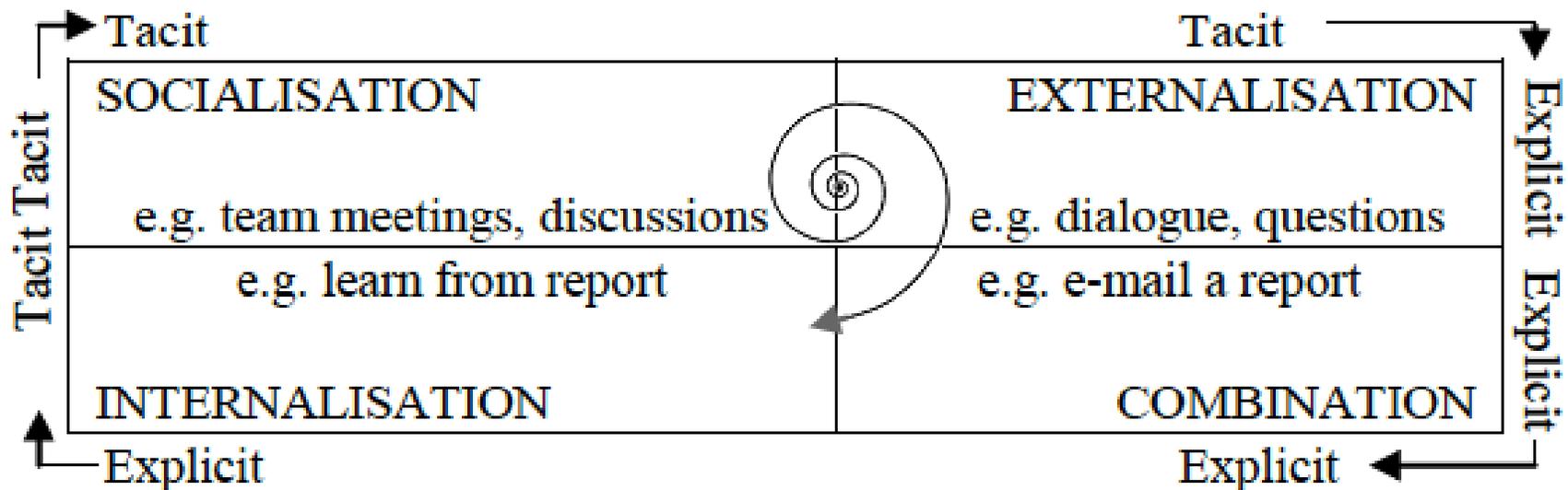
# Contents

- Memory gaps
  - From knowledge management to memory management
- Memory Conflicts
  - Two models : the static model, the dynamic model.
- Digital memory
  - Currently a deadlock, the dynamic model helps dealing with it.
- Memory management
  - Need for new tools and approaches :
    - Criticizing contents, maintaining interpretation.

**MEMORY GAPS**

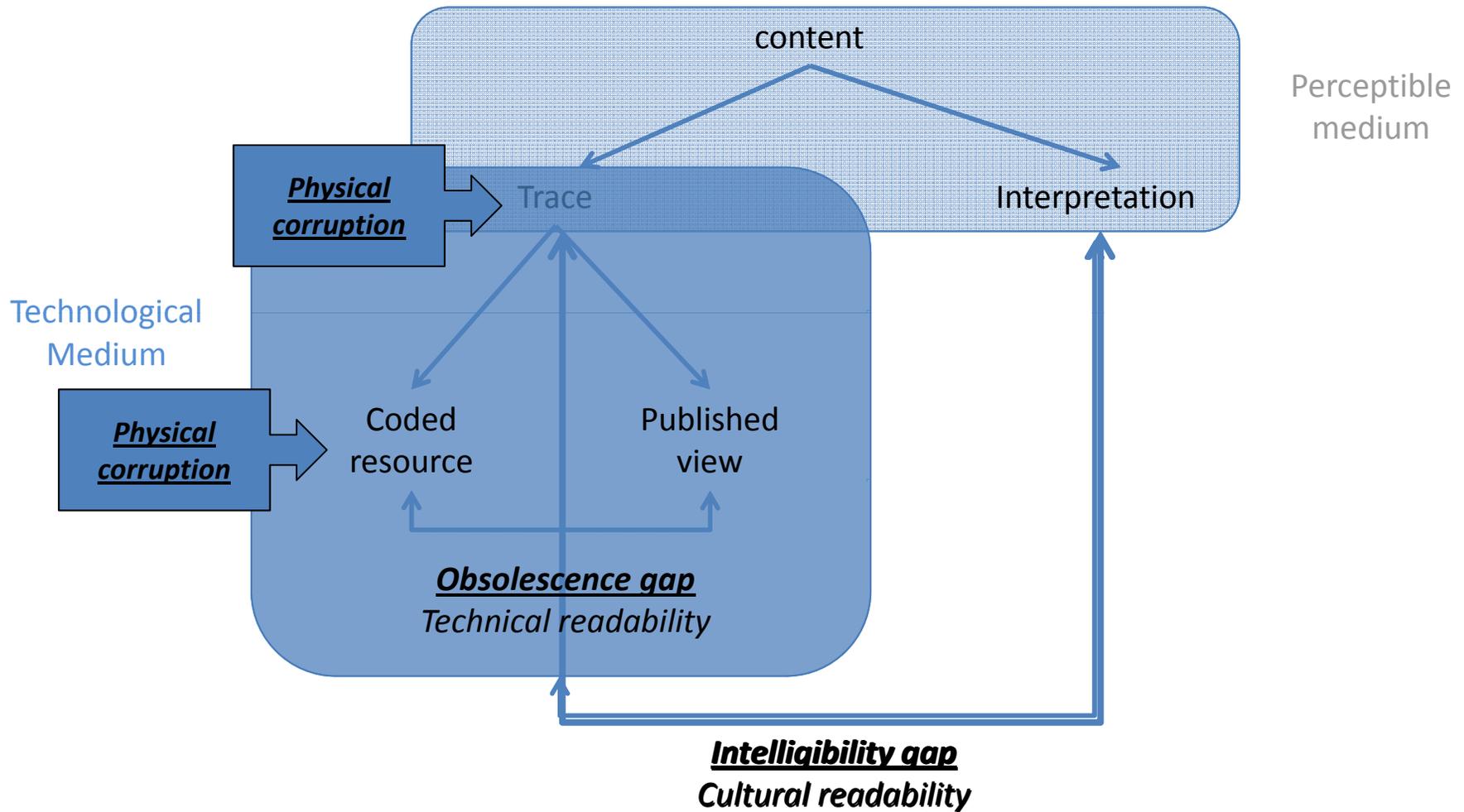
**THE WILD LIFE OF KNOWLEDGE**

# An usual perspective on KM



- KM deals with knowledge formats : from tacit to explicit, and conversely.
- No attention paid to time, memory and intelligibility.

# Three challenges



# Two complementary problematics

## Knowledge and *hypomnemata*

- Knowledge is not (only) cognition.
- Knowledge as such should be materialized in people mind, social codes and correlated with material artefacts (documents, books, tools, etc.) : the *hypomnemata*
- Knowledge is not a material object but the interpretative process enabled by the *hypomnemata*.
- Knowledge relies on :
  - the preservation of the material counterpart of the *hypomnemata*
  - the interpretative capacity of understanding them.

What are the relevant artefacts for knowing something ?

How to preserve the interpretative capacity ?

## Knowledge and memory

- Knowledge management is a problem of :
  - Memory management
  - Knowledge preservation
- Knowing is something like remembering (Plato).

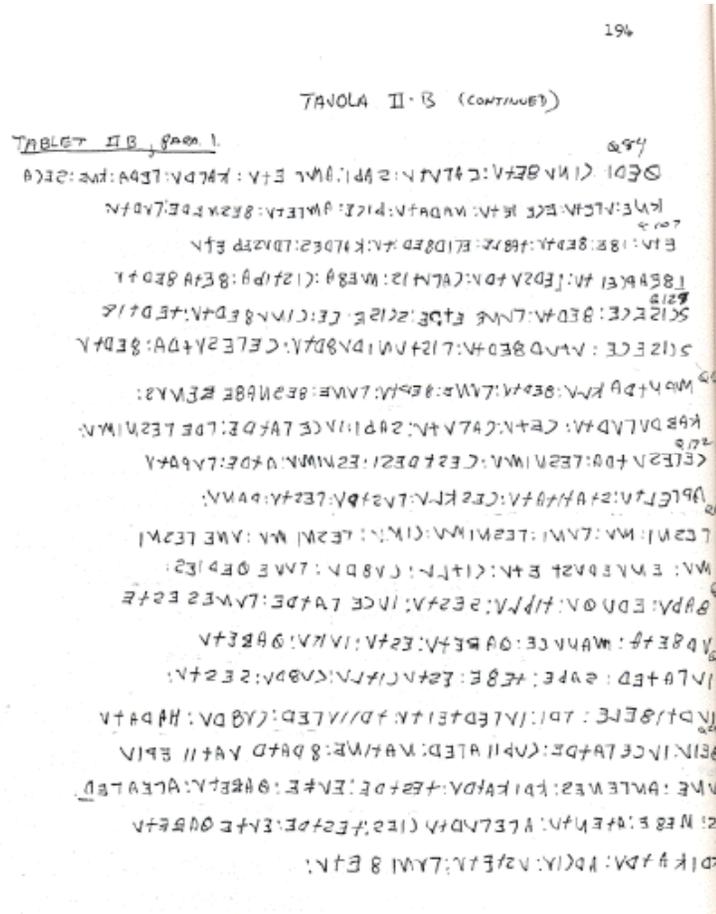
What does that mean to be able to remember/know something ?

**ADOPTING A KNOWLEDGE /  
MEMORY UNDERSTANDING**

# Two approaches

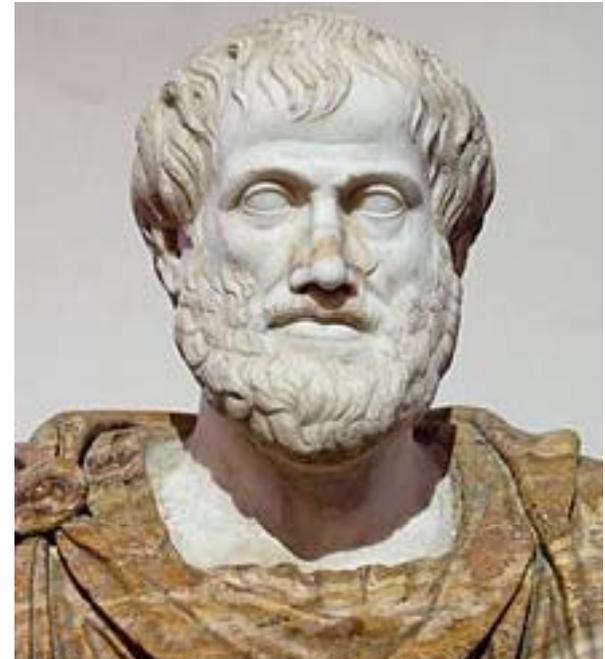
- “classical” approach
  - One has memories:
    - Objective traces (documents, vestiges, indices): enables History;
    - Subjective traces (memories) : enables remembrance.
  - If one keeps memories intact, one gets a trusted memory.
    - The issue is the preservation of intact items.
  - Remembrance relies on intact memories
- An other approach
  - Memories cannot remain intact:
    - Physical Corruption of medium
    - Unintelligibility and unreadability if contents remain unaccessed
  - Through remembering as a process memories are reactivated and technically and intellectually actualized.
  - Memories rely on remembrance.

# Etruscans: intact memories, no remembrance

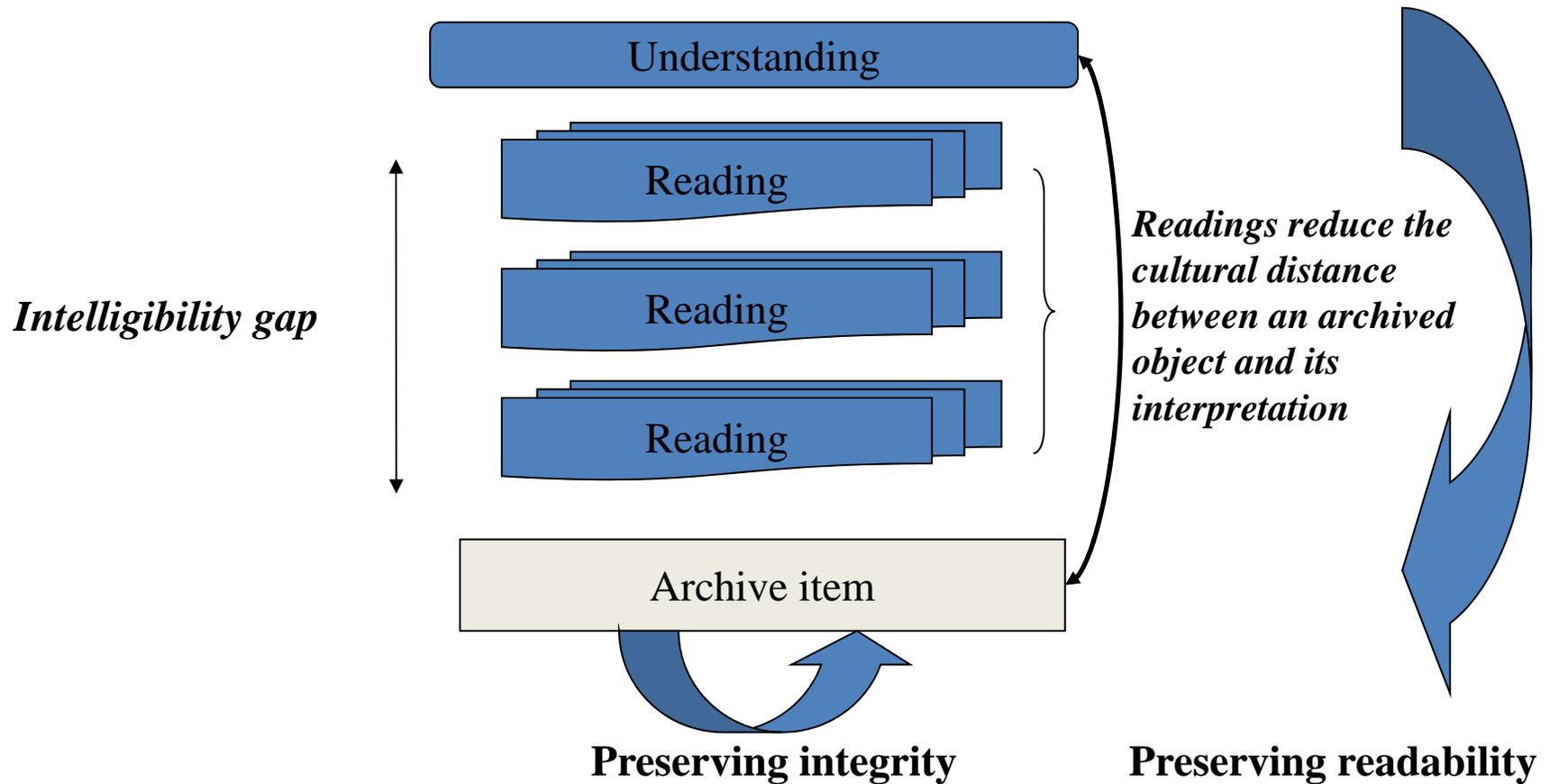


# Aristotle: no memories, full remembrance

- Why is it still possible to read Aristotle today?
  - No original traces: the oldest come from the IX<sup>th</sup> century AD (Aristotle died in 322 BC).
  - Many copies done because Aristotle has always been read and commented.
  - Each succeeding generation has made his works intelligible for its time, according to its own interests.
- The preservation of the works of Aristotle is the process of explaining what these works mean using language and concepts intelligible by today's public.
- Preservation thus results from the attempts of scholars to understand and interpret Aristotle



# Re-inventing the past



# A success story : music

- Scores
  - Keeping a user manual telling how to reproduce a given piece of music;
- Organology:
  - Coupled with scores, organology is an artisanal tradition preserving and transmitting instrument elaboration ;
- Music School / Conservatory
  - Preserving know-how by a perpetual practice merging generations.

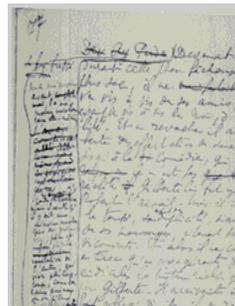


# First conclusions

- Our experience from the long term history learns us that:
  - Contents are never completely preserved
    - Libraries always burn one day...
  - We are nevertheless able to remember, because remembrance is an invention and interpretation process based on critical tools and methods.
- Memory is a dynamic process inventing its objects and faithfully using them.

# **ESCAPING FROM THE DIGITAL NIGHTMARE**

# The original paradise before the Fall



Copy : bitwise copy: perfect and eternal  
Ubiquity: multiple access to the same resource

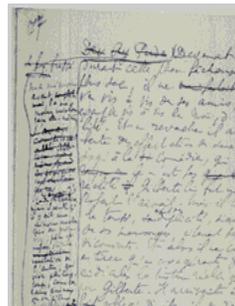
Universal: every content may be digitized

Homogeneous: everything may be digitally

processed

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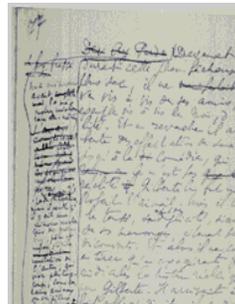
# But...



In fact....

0010111001110110001100100010010001111101000101

# The digital damnation: the four horsemen of the digital Apocalypse



Platforms: Windows, Linux, MacOS, etc.

Environments : Word, WMP, Realplayer, VLC, EMACS, VI....

Formats (metadata) : XML, LaTeX, mpeg-7, mxf, rdf, TEI,...

Formats (codes) : unicode, ascii, iso-latin1, mpeg, jpeg,tiff,aiff, pdf...

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# The digital schizophrenia

- From the theoretical stance:
  - Everything should be digitized to be preserved
  - Digital memories are preserved intact
  - The main issue : turning everything in an digital counterpart and keep it intact.
- From the practical stance:
  - Digital contents should evolved to remain accessible:
    - Format obsolescence
    - Medium decay.
  - The main issue : transforming contents to keep them alive without loosing their authenticity / fidelity and identity.

# Why such a schizophrenia?

- We do not want to abandon the theoretical stance because it seems to us it is the only way to preserve knowledge :
  - we fear to loose our memories, and hence our capacity of remembrance.
- But:
  - According to the dynamic model of memory, digital contents are nothing particular;
  - One should remember (!) how to do from our past experience of knowledge preservation.

**TURNING THE “OTHER” MEMORY  
MODEL INTO METHODOLOGICAL  
PRINCIPLES**

# Two problems

## Dealing with contents

- Contents should evolve and cannot remain identical
  - Physical and technical transformations
- Contents should be preserved through their use
  - Interpretations to keep them alive and intelligible
- Question:
  - How to transform content and exploit it on a respectful and authentic manner?
- Answer:
  - Some old disciplines to consider with a closer look.

## Dealing with interpretations

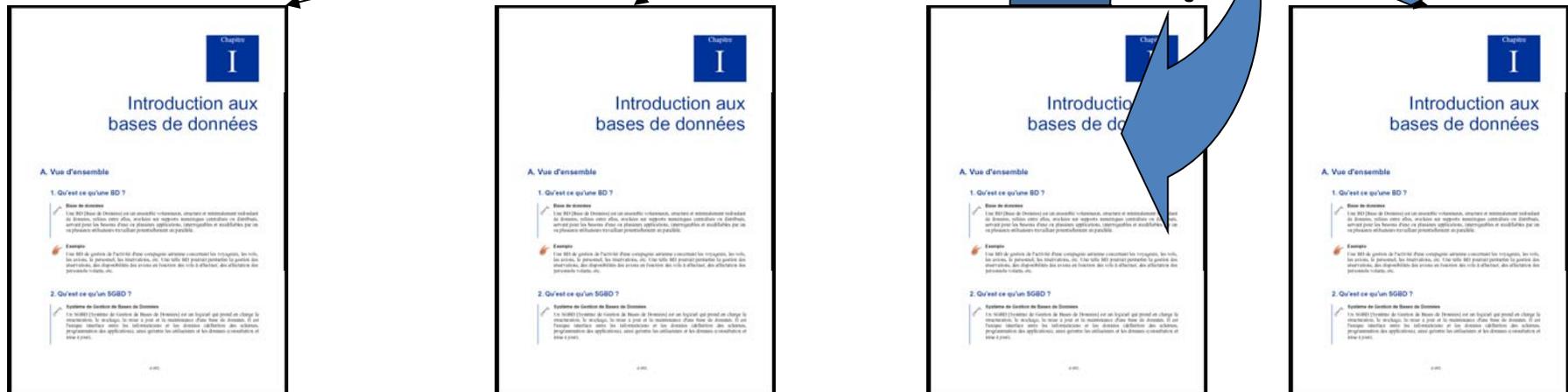
- Interpretation is a cognitive and social process;
- Interpretation should be preserved according to a social need and a given community
- Question:
  - How to ensure the possibility of interpretation ?
- Answer :
  - Principles to manage and organize the memory process: OAIIS and its designated community.

# Contents

Resources are inaccessible in themselves: a mediation is necessary

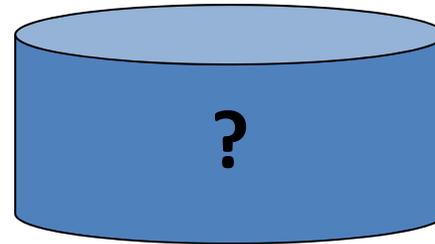
How to assess that the published view is fair and right ?

How to compare and sort the different reconstructions?

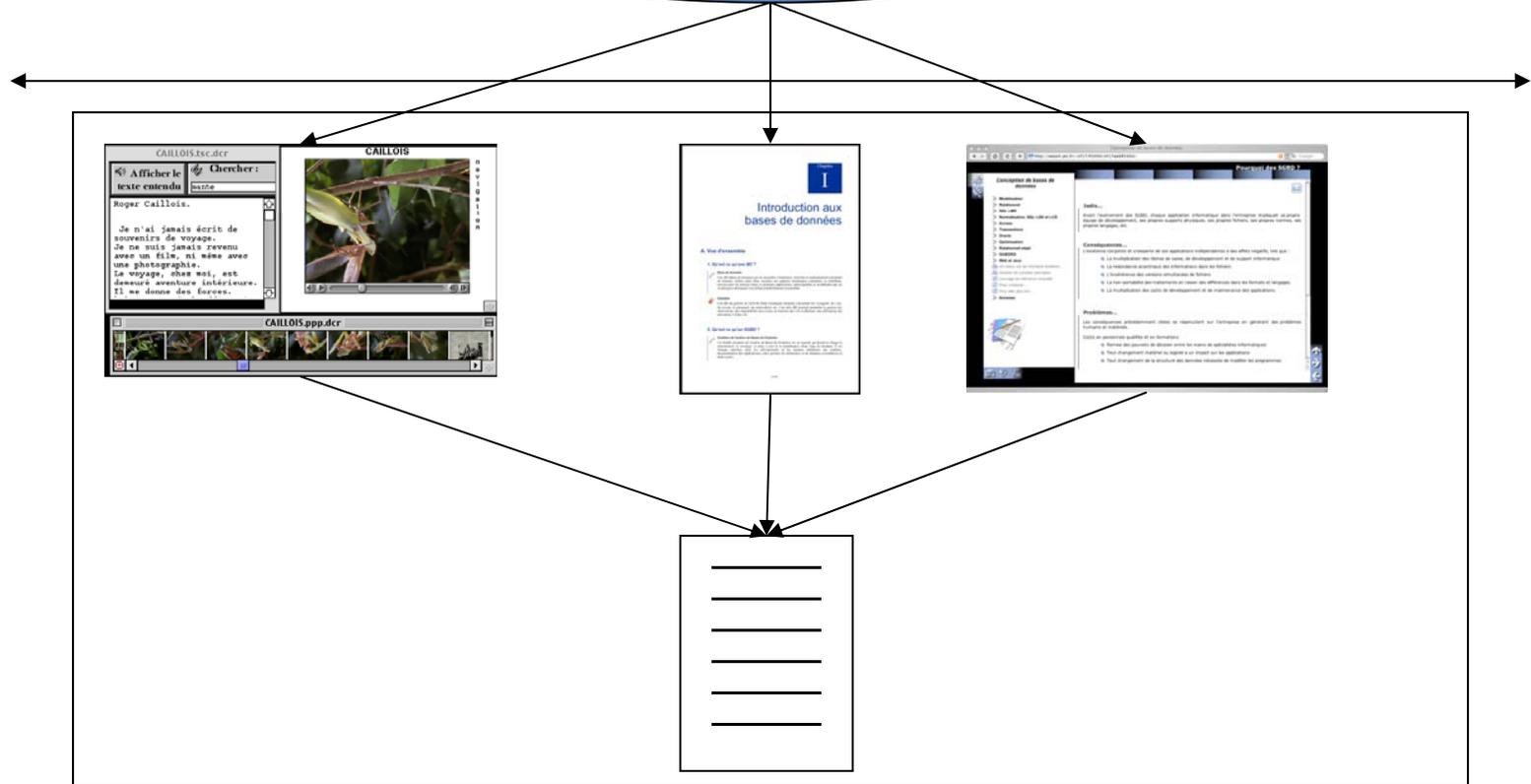


# The problem of a reference establishing content identity

Anonymous Resources



Many Views



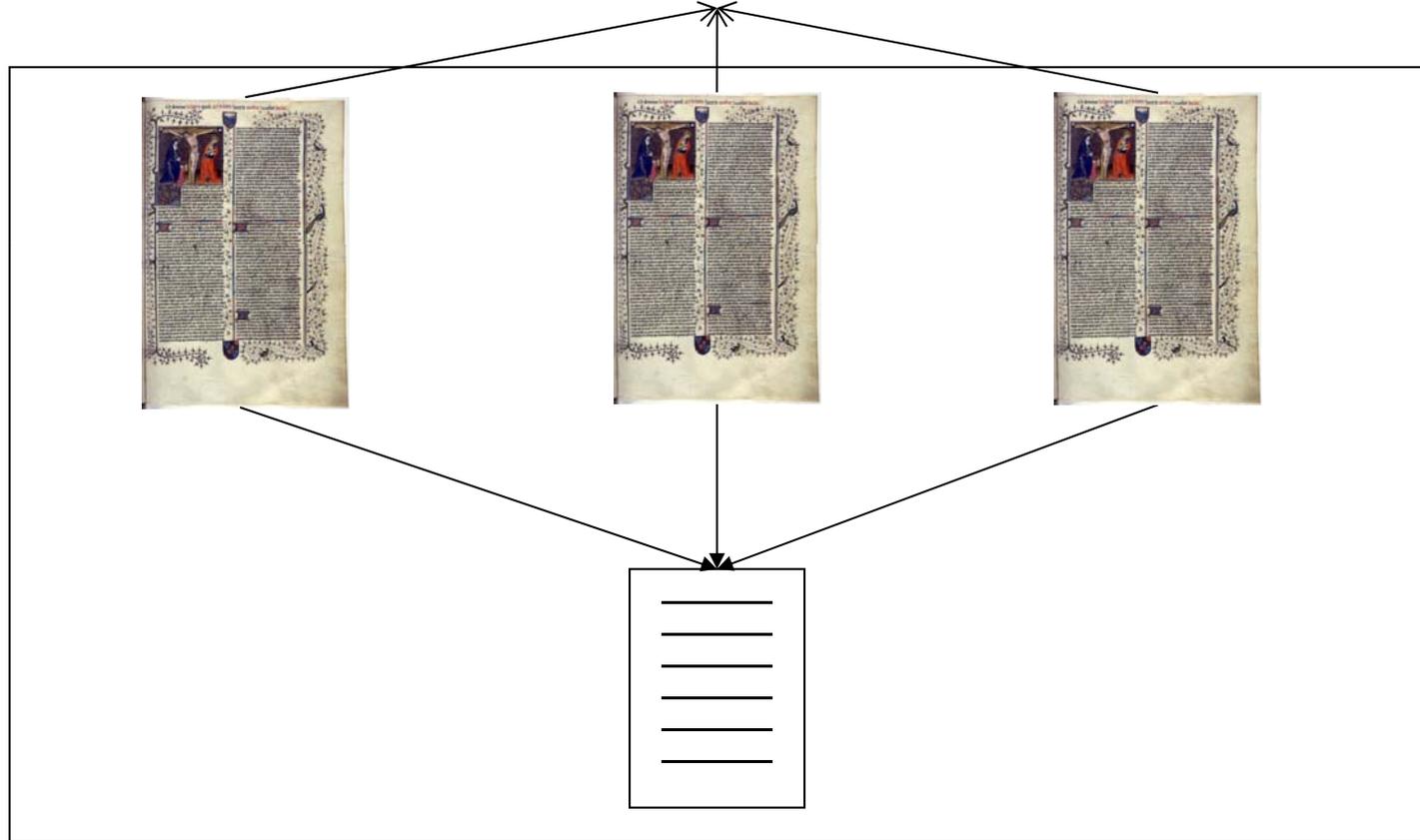
Putative  
Canonical  
reference  
document

# An old problem!



# Manuscripts studies

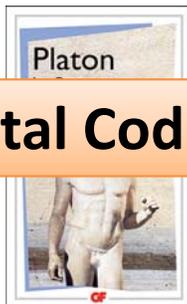
*(original)*



Token Identity

## Digital Codicology

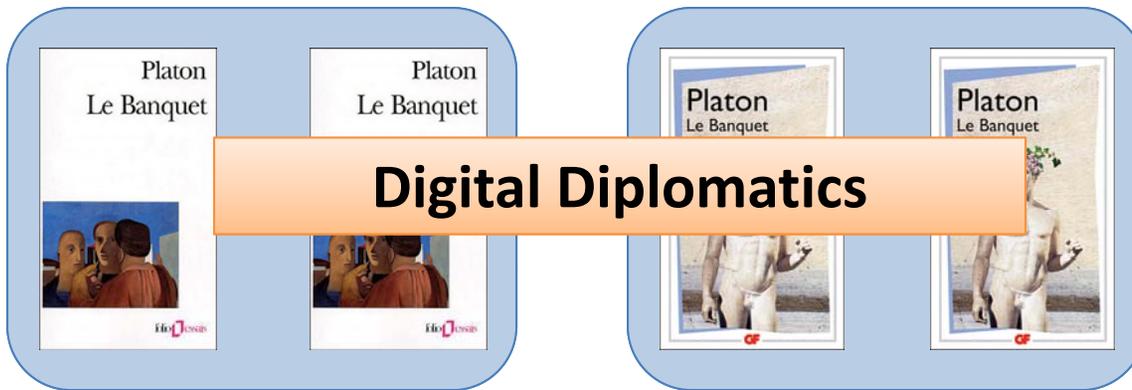
*A unique material object*



Formal Identity

## Digital Diplomatics

*A given formal presentation*



Content Identity

## Digital philology

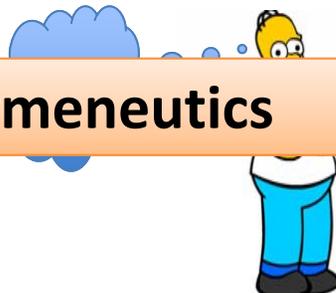
*Content that should be invariant*

APOLLODORE  
[ ]  
Je crois que je suis assez bien préparé à vous faire le récit que vous me demandez ; car, tout d'abord, comme je me rappelle de me laisser de Platon à la ville, un homme de ma connaissance, qui venait derrière moi, m'aperçut, et m'appelant de loin :  
DIAGORAS  
Homme de Platon ! s'écria-t-il en badinant, Apollodore ! ne peux-tu reconnaître le pas ?  
Platon, avait raconté une partie de cette conversation, mais cet homme ne put rien me dire de certain sur le détail de cet entretien : il m'apprit seulement que tu le parais. Comme-tu vois, j'ai aussi bien entendu un détail pour toi de faire connaître de qu'a dit ton ami, j'ai aussi bien dit-moi, était-tu présent à cette conversation ?  
APOLLODORE  
Il parait bien, lui répondis-je, que ton homme de l'a rien [ ] dit de certain, puisque tu parles de cette conversation comme d'une chose arrivée depuis peu, et comme si j'avais pu y être présent.

Semantic Identity

## Digital Hermeneutics

*Commentaries and content explanations*



# Strategies

## Focused on materials

- Museal approach
  - Keeping operational the whole set-up: contents, devices ;
- Emulation approach
  - Keeping contents intact ; emulating obsolete rendering devices on contemporary systems
- Migration approach
  - Migrating contents from obsolete formats to contemporary ones in order to use the current rendering devices (proposed by the market)

## Focused on meaning

- Descriptive approach
  - Scoring : Contents are too complex to be preserved, emulated or migrated. A description is made and kept in order to re-invent content with the future current technologies
  - Modeling : contents or objects are modeled to extract the very objects meaning and express it in a consistent and faithful way.
- But :
  - producing new descriptions / models that are documents
  - Needs for their preservation.

# Interpretations



This is not a pipe

concept

This is not a concept  
(piece of knowledge)

# An essential tension

## Formalised language

- Syntax is set up to control semantic interpretation:
  - No ambiguity
  - Formal calculus
  - Formal reasoning
- Expressions are not contextual
- Problems :
  - Reduced expressivity
  - Need for a convention to interpret syntactical expressions.

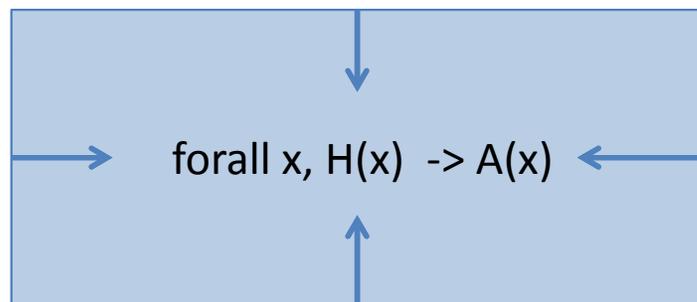
## “natural” language

- Semantics depends on context
- Context cannot be fully explicit
- Problems :
  - Rich expressivity
  - Semantics should be negotiated according to context, actors, situations.

# A necessary tradeoff

## Freezing the context: from context to formalization

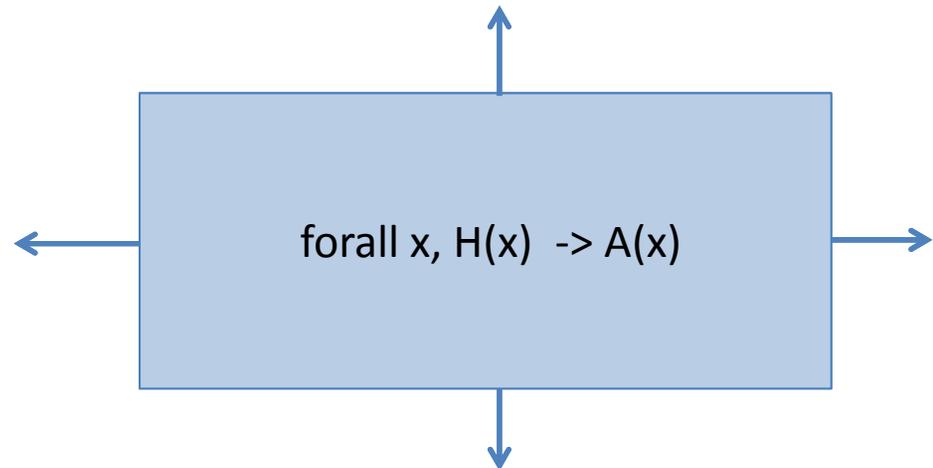
- Formalization as a means for reducing ambiguity, variability and enhancing interoperability.



H, A: predicates, whose reference are defined through sets in a reference model, based on set theory: how to relate these sets to effective reality?

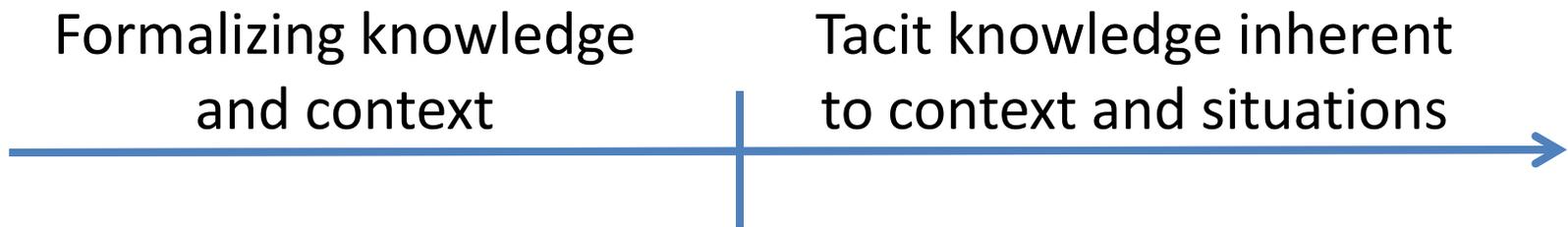
## Making sense of the formal: from formalization to context

- Putting the formalization in context to apply formal constructs on real items.



H, A : interpret them in the effective contexts, according to actors' knowledge.

# Context cannot be eliminated



The borderline can be displaced,  
never suppressed.

# A traditional approach

- Historical examples :
  - 1537 : royal library of France (édit de Montpellier)
  - 1530 : collège des lecteurs royaux (former « Collège de France »)
- Lesson :
  - On one side, you keep materials
  - On an other side, you preserve the reader, and maintain a continuous tradition of reading



Guillaume Budé  
1467 - 1540

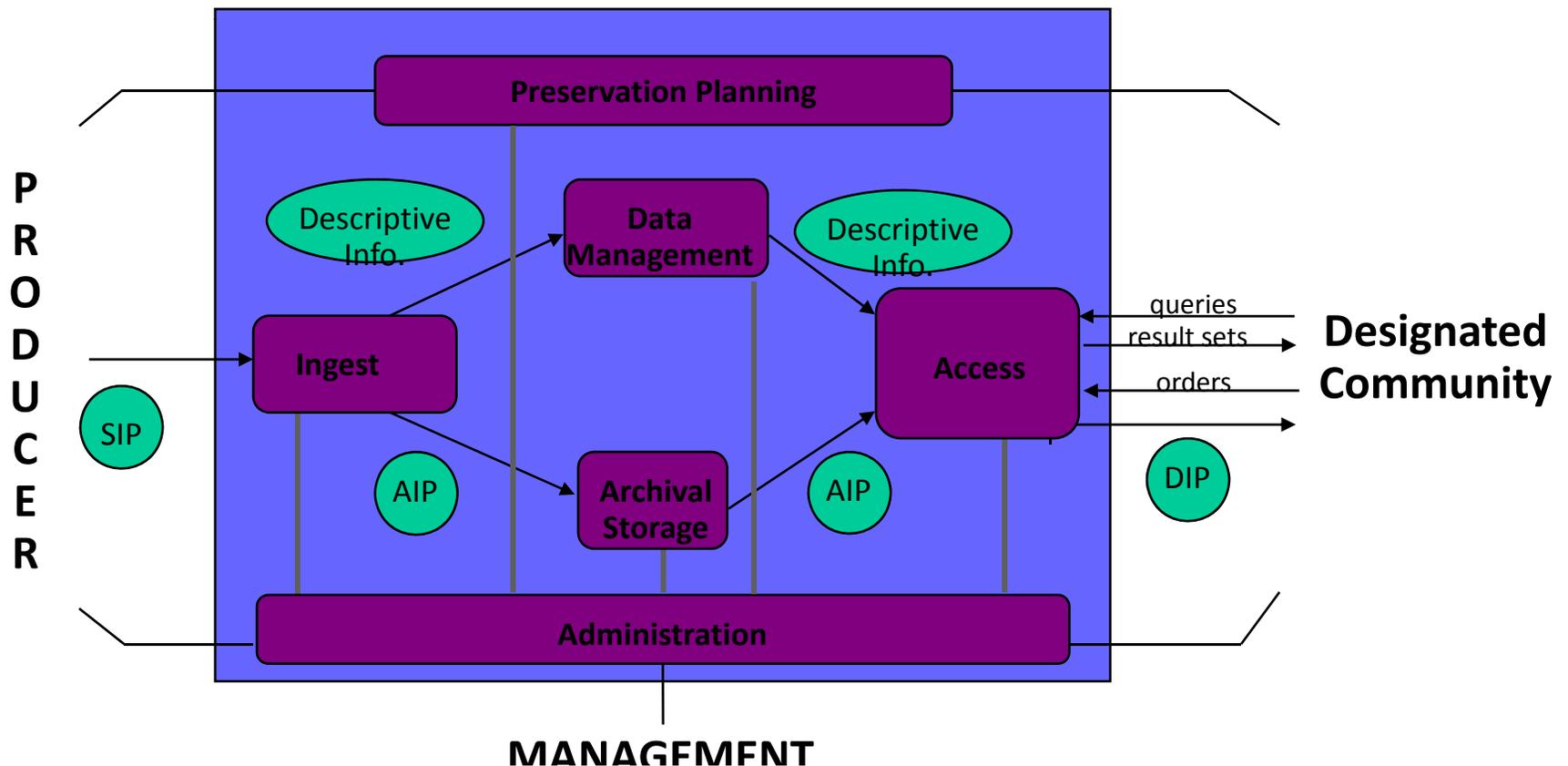


François 1<sup>er</sup>  
1494 - 1547

# Relying on context and current state of tacit knowledge : example of OAIS

- **Designated Community:**

- An identified group of potential Consumers who should be able to understand a particular set of information.



# Conclusions

- PLM needs KLM
- KLM relies on contents and interpretations:
  - Preserving contents and their authenticity/identity
    - Conceptual and critical organization of knowledge
  - Preserving interpretation by managing / monitoring designated communities
    - Social organization of knowledge
- KLM needs tools to manage *hypomnemata* (ontologies, document engineering, metadata, etc.), and methods to manage communities (OAIS, CSCW, etc.).

Thanking audience for being here and quiet

*Time flies....*

This was the excipit

Thank you for your attention!  
**Thank you for your attention!**

Usual formula in XXIst century in colloquium