Methods, Models and Tools for Conversion of Teaching Materials into Digital Learning Objects
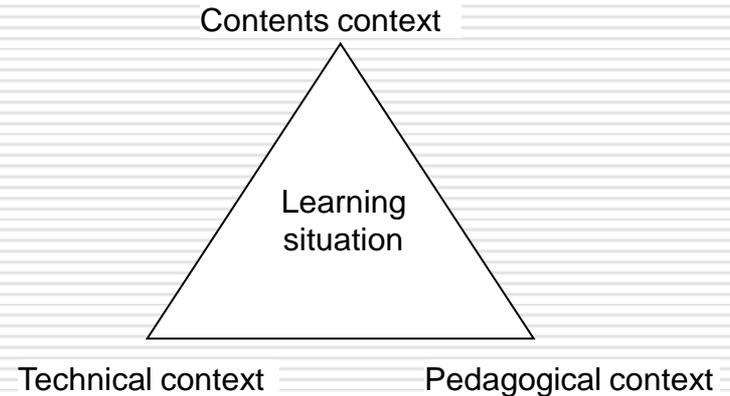
Suggestion for a PhD Thesis

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Learning situation

☐ While creating
learning
material,
lecturer is
confronted
with at least
three
objectives
influencing
teaching

Contents context

Learning
situation

Technical context   Pedagogical context

Learning situation

☐ … or, looking into it from another perspective

☐ … teacher is confronted with at least three phases of teaching

Lecturing phase

Exercising phase

Assessment phase
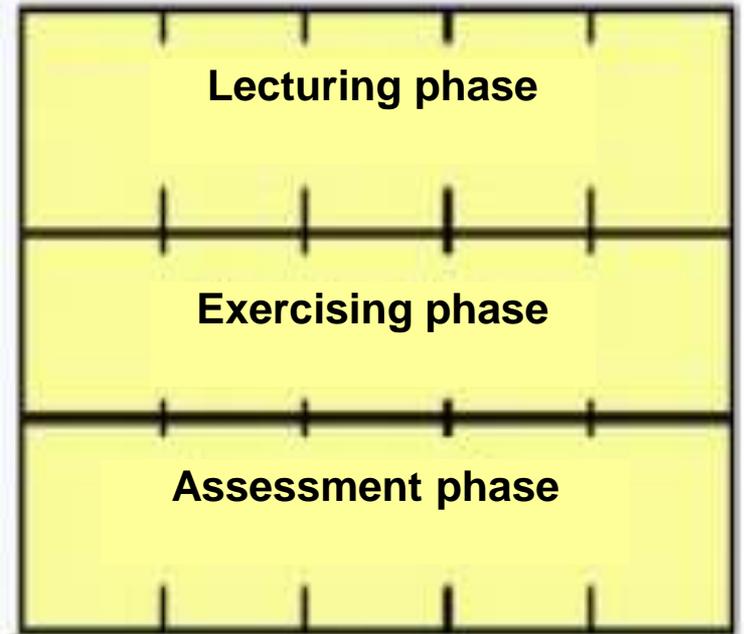
Factual Situation

□ The general feeling of the experts in e-Learning field is: *the most of the current e-Learning offerings lack one or more of the following aspects:*

■ they are of a poor pedagogical quality,

■ they lack portability,

■ they lack adequate tooling.

Factual Situation

☐ Pedagogical quality is considered to be the key issue!

☐ To be successful, e-Learning must both:
- ■ offer effective and attractive courses and programs to learners,

- ■ while providing a pleasant and effective work environment for staff members developing the course materials

On the opposite side – Learning objects

☐ Notion of LO's is introduced as a help to enhance teaching …

☐ … to help in shift from a "simple" Merrill's model, to a "detailed" Bloom's model

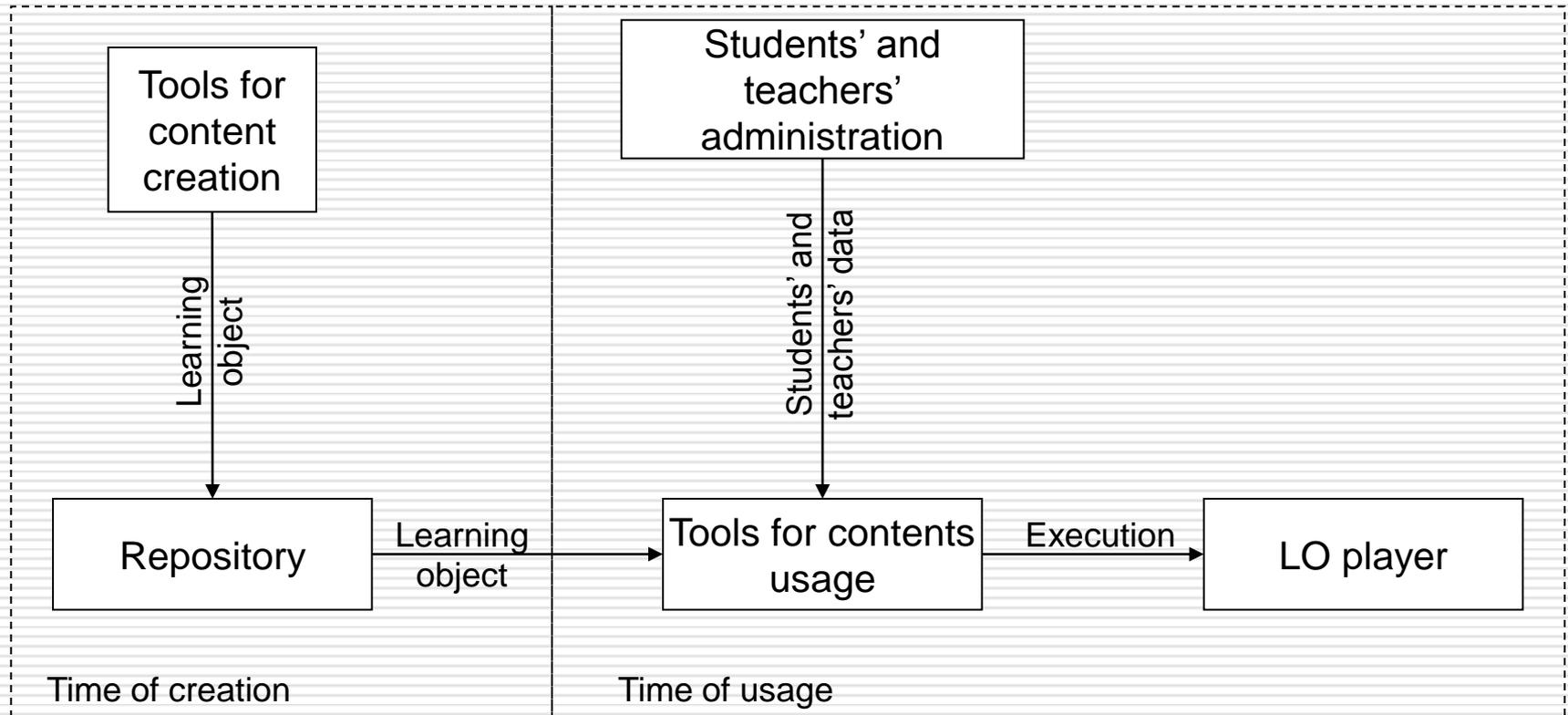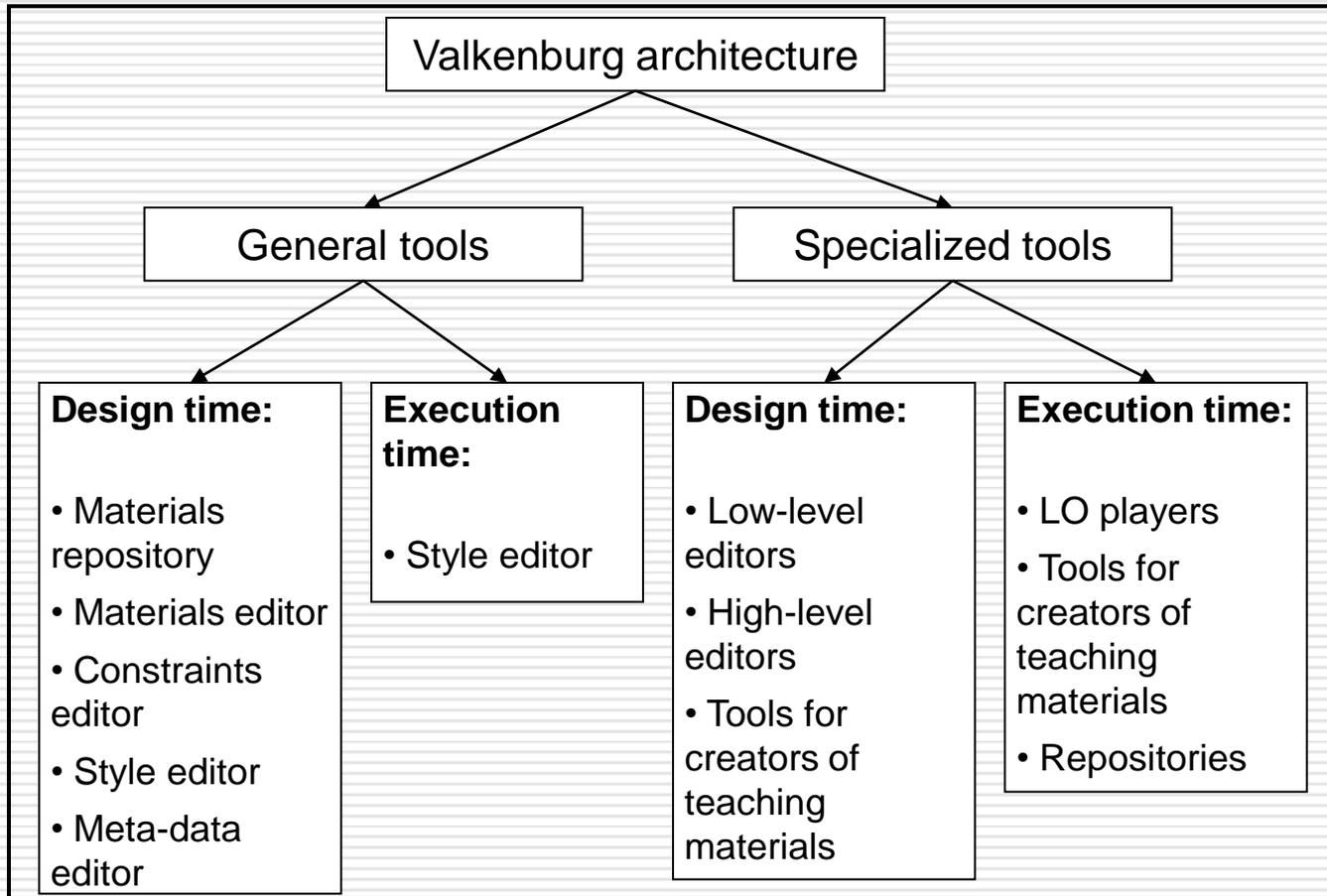| Merrill	Bloom	
Remember	Knowledge	Simple to teach & assess
Use	Comprehension	
	Application	
	Analysis	
	Synthesis	Difficult to teach & assess
	Evaluation	

Connection

- ☐ Thesis is considering a problem of conversion of existing teaching material, given in an arbitrary form (digital or not), into a *standardized* teaching material, *learning objects*, ready to use in (possibly more than one) LMS.

- ☐ *Learning objects* are here regarded as:
  - ■ small, self-sufficient pieces of information,
  - ■ *capable* and big enough to satisfy individual learning needs,
  - ■ yet small enough to be combined with other LO's,
  - ■ in a different ways, creating different structures,
  - ■ according to needs and wishes of course creators.

Schematics of LO development and usage

		Students' and teachers' administration		
Tools for content creation				
↓ Learning object		↓ Students' and teachers' data		
Repository	→ Learning object →	Tools for contents usage	→ Execution →	LO player
Time of creation		Time of usage		

Tools for LO development and usage (source "Valkenburg group")

Valkenburg architecture

General tools | Specialized tools

Design time:

• Materials repository
• Materials editor
• Constraints editor
• Style editor
• Meta-data editor

Execution time:

• Style editor

Design time:

• Low-level editors
• High-level editors
• Tools for creators of teaching materials

Execution time:

• LO players
• Tools for creators of teaching materials
• Repositories

Schematics of the development and usage of teaching material

Author creates learning material

1a Author saves file in a standardized form

Author uses a conversion program

Author saves 1b file in a form suitable for LMS

Program converts material into needed form
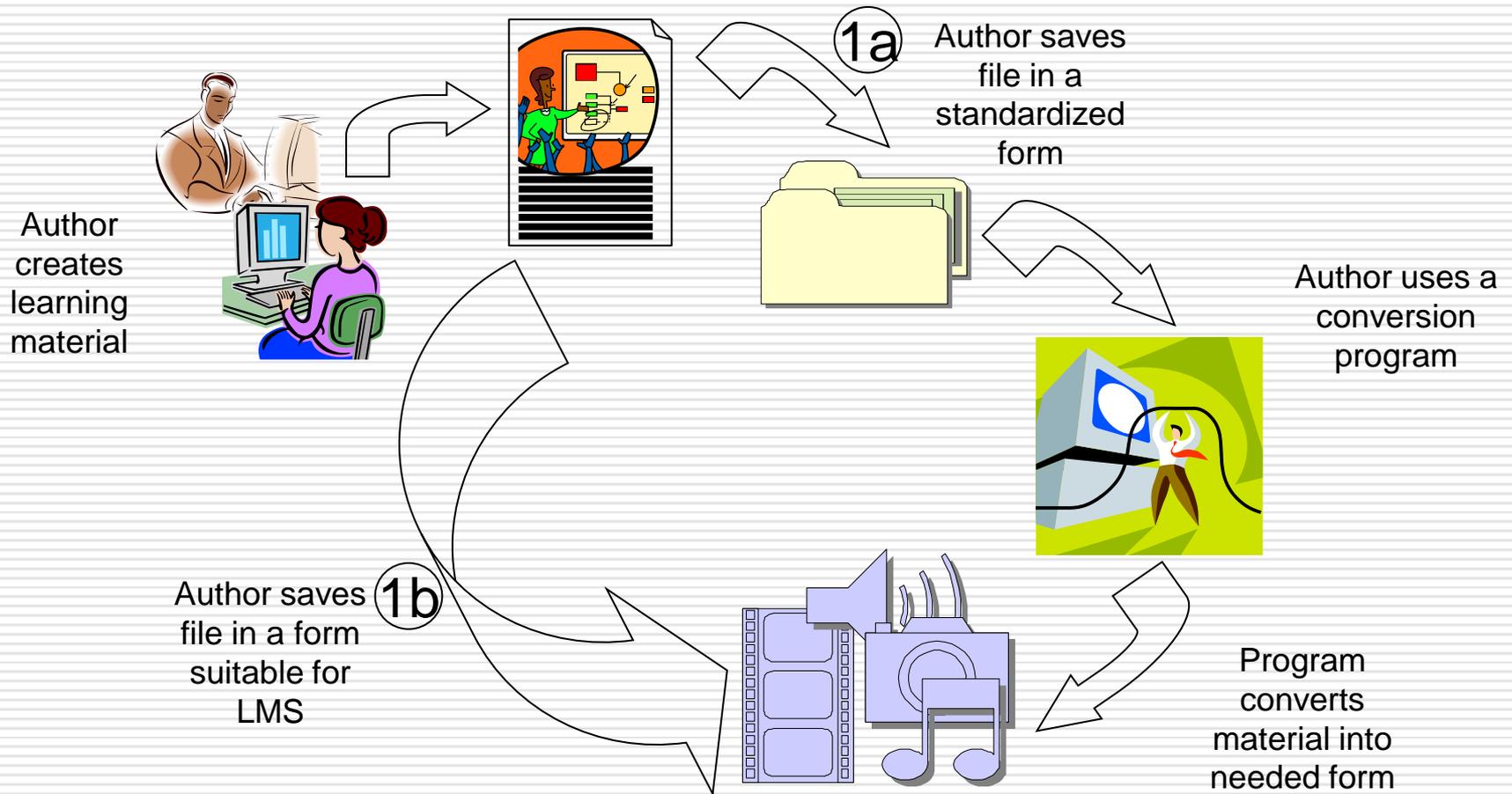
Source: W. Horton and K. Horton, "E-Learning Tools and Technologies", Wiley Publishing Inc., (2003)

# "Transformation of a teaching material" – what is that?

☐ Here we arrive to "*rules derived from best practices*" and "*rules derived from patterns in best practices*".

■ Why is this important?

■ Because we all have a lot of "classic" teaching material personally created, or borrowed/ presented / downloaded from someone else.

Transformation – what is that?

□ Here we arrive to "*rules derived from best practices*" and "*rules derived from patterns in best practices*".

  ■ Why is that important?

  ■ Because we do not want to disregard all of the hard work invested and good experience gained over the years for creation of a high-quality teaching material!

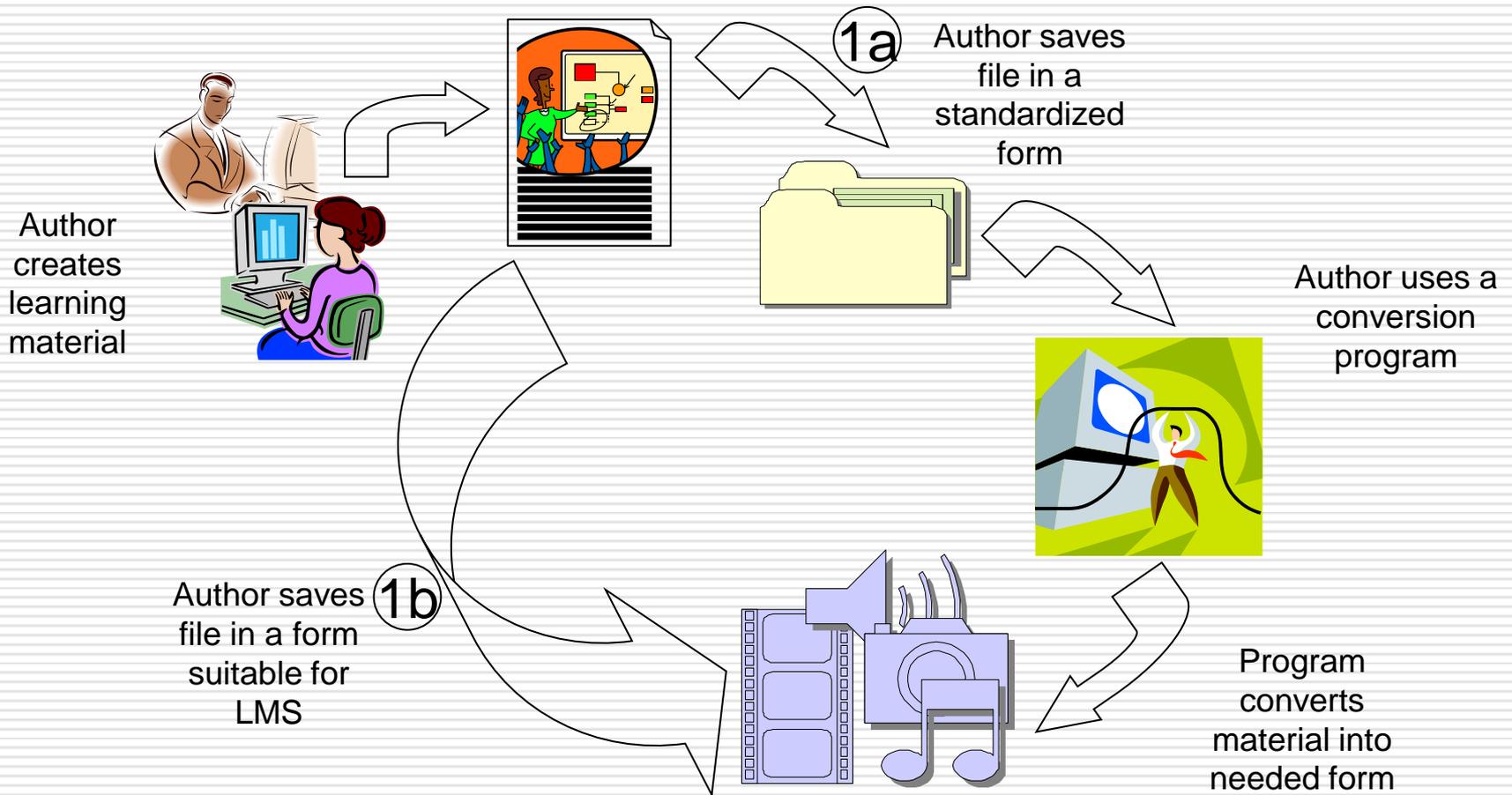# Schematic of a conversion process = Schematics of a PhD thesis ☺
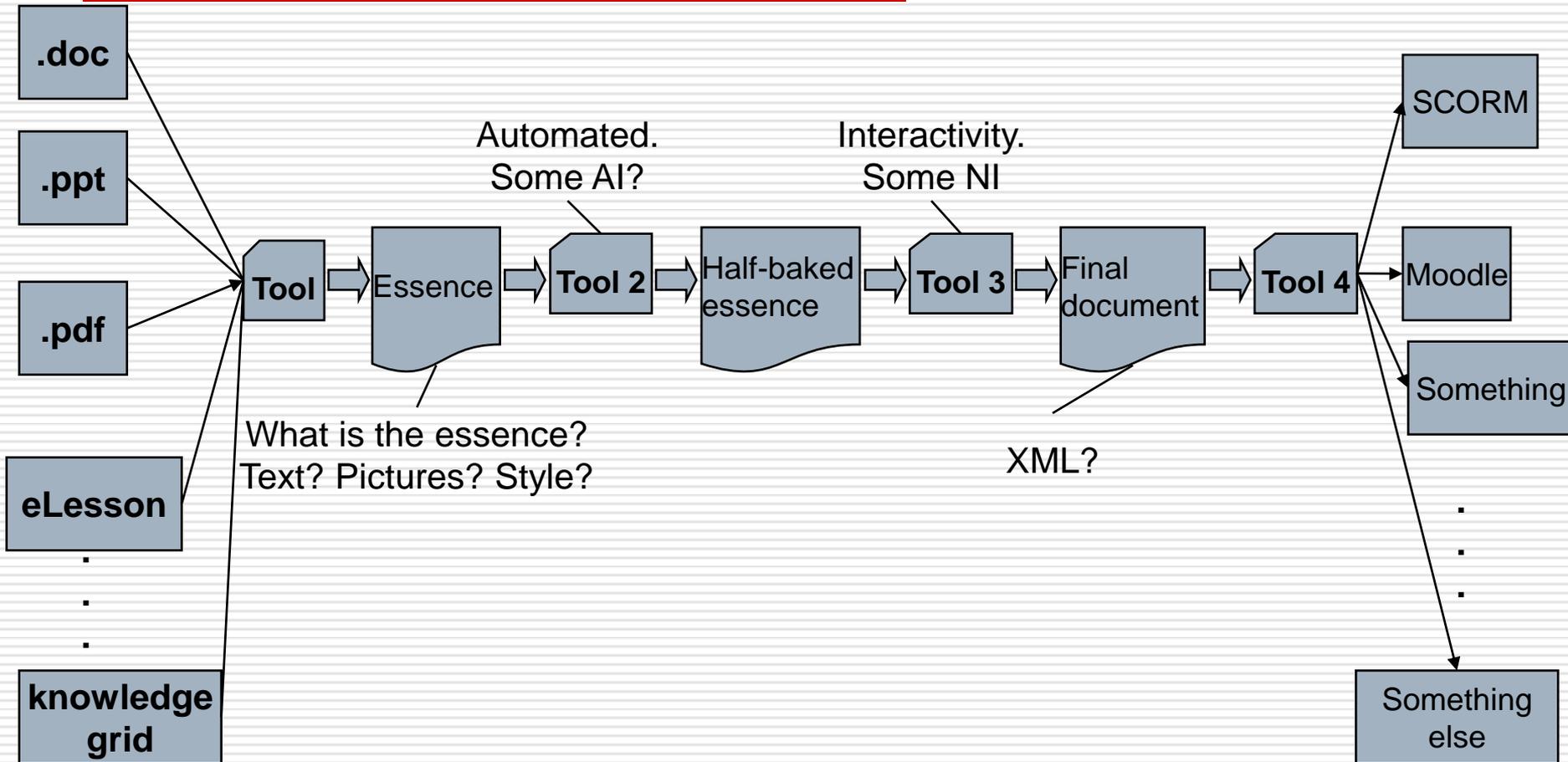
What's our problem?

- ☐ There are several points to be investigated:

  - ■ What is the essence of a good teaching materials?
    - ☐ How do we recognize it? How do we extract it?

  - ■ What is the criteria for a good e-Learning materials?
    - ☐ What is it we want to create? How do we do it?

  - ■ What are the differences in two approaches?
    - ☐ And, thus, what will be the difficulties and the challenges of a proposed transfer?

So – one more time:

Author creates learning material

1a Author saves file in a standardized form

Author uses a conversion program

Program converts material into needed form

Author saves file in a form suitable for LMS **1b**

Source: W. Horton and K. Horton, "E-Learning Tools and Technologies", Wiley Publishing Inc., (2003)

Classic eLearning material creation scheme

☐ Suggested scheme is very useful, and very descriptive.

☐ Perhaps this scheme might be challenged, but we'll not do it here, and not today.

☐ Today, we'll try to bring it down to earth, and suggest a *more practical model* for transformation!
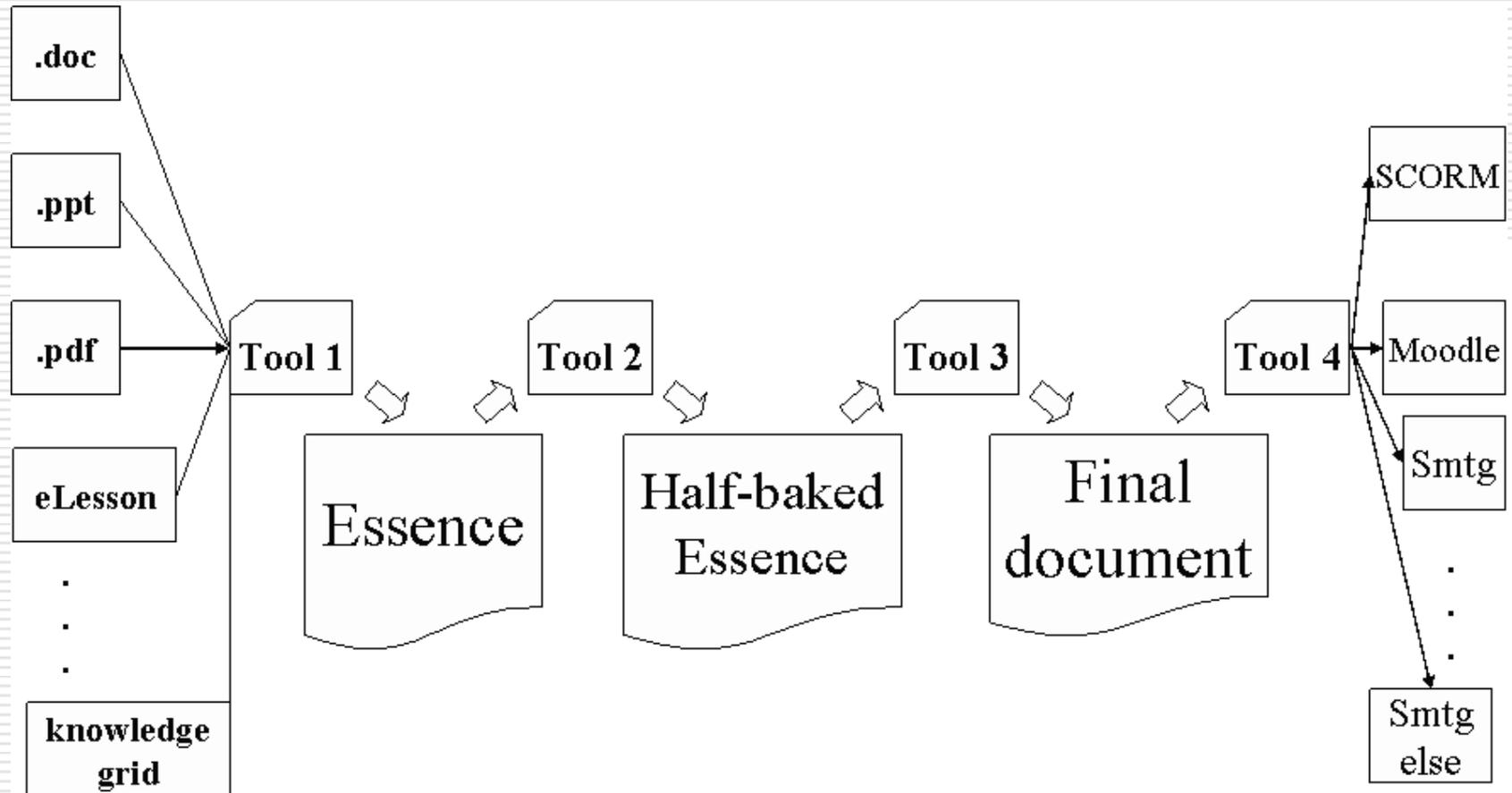
A practical model

☐ So – instead of (what we basically had):

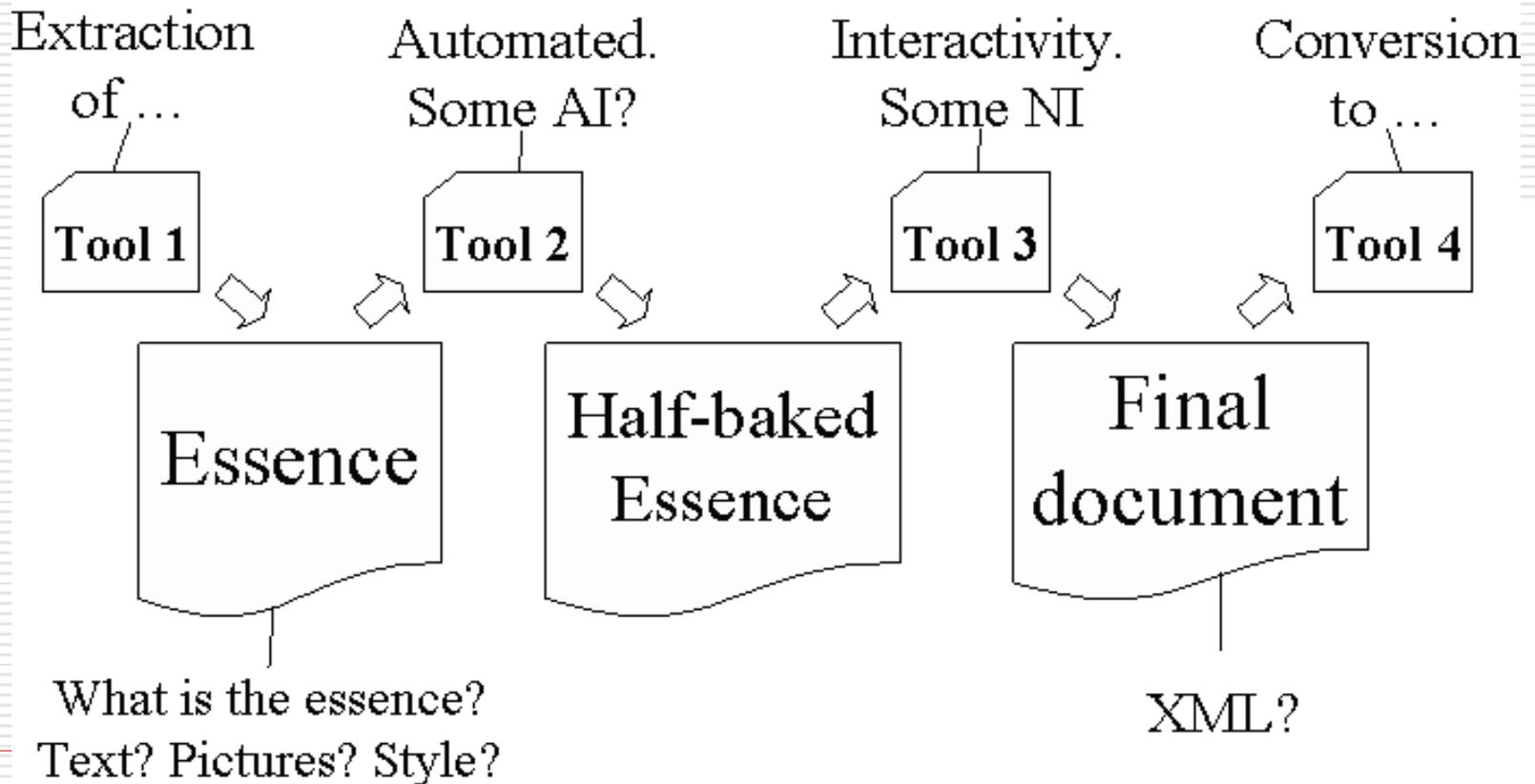| Existing material | → | Conversion | → | Resulting material - LO |
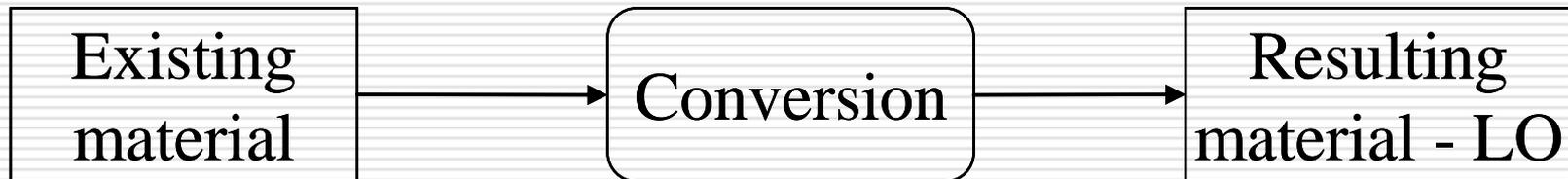
A practical model

☐ … we suggest something like:

A practical model

□ ... or, if we concentrate on tools only:

Extraction of ...

Automated. Some AI?

Interactivity. Some NI

Conversion to ...

Tool 1

Tool 2

Tool 3

Tool 4

Essence

Half-baked Essence

Final document

What is the essence? Text? Pictures? Style?

XML?

What's our problem?

- Here are the points to be investigated:

- What is the proper methodological strategy of transforming teaching materials to e-learning materials?
    - In order to avoid the greatest pitfall of e-Learning = poor pedagogical quality

- What about the tools?
    - How do we do it? Based on the proposed methodology and needed pedagogy, is there some tool support available?

        If not, can we create it (at least in theory)?

Pieces of a model:

☐ While difficult at first sight, model can be approximated, and thus relaxed through several valid assumptions:

- ■ a great majority of non-expert creators of teaching material, will use tools of Microsoft Office© family (Word and PowerPoint), or Adobe PDF© format;

- ■ CS experts will use the same + (if) some standardized format for LMSystems (SCORM, IEEE LOM, LD or CISCO standards for LMS …)

Pieces of a model:

☐ Even though often different, all of LMS's follow some standard;

☐ Those are described by consistent and uniform meta-data, and cover a lot of the same notions:
  ■ title (name of the resource),
  ■ creator (name of the author),
  ■ description (short depiction of the content),
  ■ date (important for a lifecycle of a resource) …

☐ While these notions are named different in each standard, they cover very similar notions.

Pieces of a model:

□ Application of a needed tool, in our opinion, considering the *import* of a material (let's call it *Phase 1*), should pursue the following sequence:

- ■ identification of a file type to be analyzed;

- ■ choice of an appropriate parser/tool, or
- ■ identification of a standard LMS format used;

- ■ extraction of a content;

- ■ conversion into a middle-form, and

- ■ presentation of content to the user.

Pieces of a model:

☐ While export phase (*Phase 3)* is simply an inversion of Phase 1, technical and practical tasks for the developer should be mentioned:

- ■ choose standards that converter should create;

- ■ find detailed specification for each of LMS standards – (the most demanding task, both financially and by size), and

- ■ Develop a converter able to re-pack content of a learning object from one standard into the other.

Conversion phase

- The most demanding is *Phase 2*, conversion phase!

    - What is the essence of teaching resources?

    - How can we create *learning object* that is:

        - big enough to stand alone as a meaningful entity, and

        - small enough to be used as a building element of eLessons, eModules, eCourses … finally, eCurricula!

Conversion phase

- ☐ While it is often described as impossible to recognize creativity, didactic values, pedagogy … and other elements of a successful teaching –

- ☐ – there exist attempts to deepen potential usability of a conversion tool, attempts to automatically extract meaningful material from existing teaching resources!

Conversion phase

- Publicity material for such kind of tools claims for example:

  - "… The content transformation engine can (semi-)automatically extract meaningful unit, chapter or section, from … files and package these generated learning objects by the content packaging of … LMS standard.", or

  - "… tool doesn't stop there, it offers authoring tool for editing of transformed material…"

Conversion phase

□ Still, in our opinion, conversion part of a model produces most of the problems, and is not yet practically usable:

- ■ Task is too creative to be automated and too connected to didactics, so it remains a task for a lecturer.
- ■ Tool used, should just simply relieve author of the most of technical burdens.

- ■ This is specially true for additional authoring of extracted teaching material.
- ■ This phase we consider as highly creative and complex, not suitable for automatic resolving.

Conclusion

- ☐ Conversion of raw teaching material into learning objects suitable for LMSystems does not necessarily produce usable, functional, practical and shareable material.

- ☐ The simple reason is the fact that this process is mostly technical, possessing no pedagogical structure.

Conclusion

- General structure of a creation/conversion process of learning objects is well known for a long time and well defined in several models, one of them being a famous W. and K. Horton model.

- In this thesis, a practical scheme, more concerned with the challenging and tricky details authors encounter during the process, is proposed.

Conclusion

- ☐ We tried to differentiate separate phases of the process, recognize and separate the more difficult ones from the research point of view, from those complicated in a practical sense.

- ☐ Our model is based on application of learning objects, because they offer:
  - ■ increased possibility for control and management of teaching experiences,

  - ■ easier acceptance of materials presented, and

  - ■ improved possibilities for application and practicing of knowledge acquired.