



Computer based Interaction Analysis

supporting Self-regulation:
an emerging research field

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Field Purpose and emergence's reasons

The field's sources

The field's Main Concepts

IA tool generic process

IA indicator as a central concept of the field

IA Indicator Conceptual framework

Research dimensions and research questions

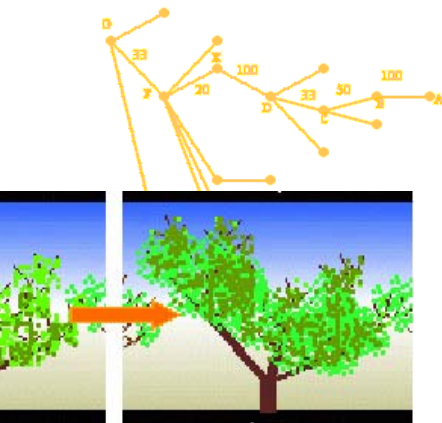


Interaction Analysis ⇒ Purpose

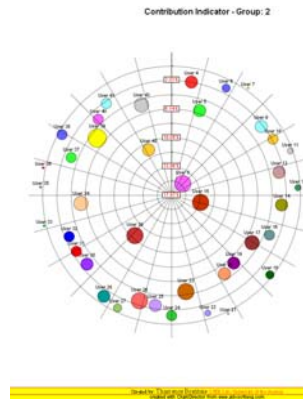
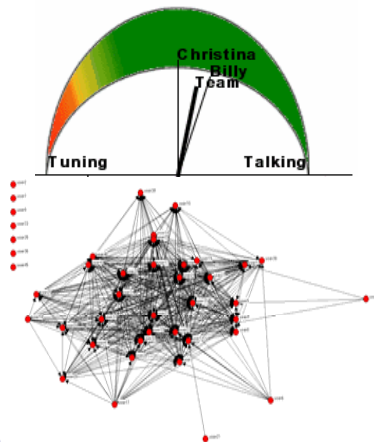
IA for selfregulation core purpose is to assist technology based activities' participants (with different profiles & roles), working on standalone or social environments, **providing a cognitive or metacognitive support.**

The support is provided via Interaction Analysis [IA] tools that

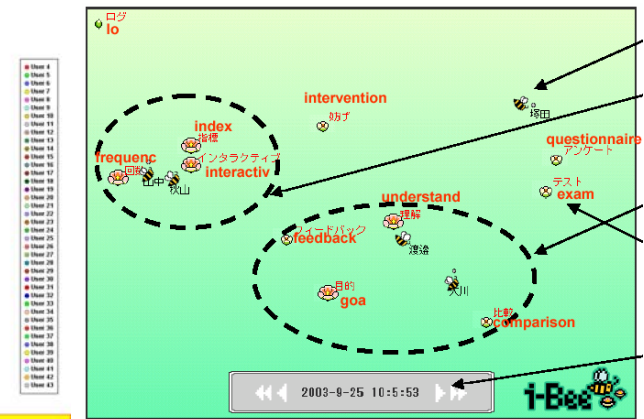
- offer **directly information on interactions and activity products** (e.g. via visualised IA indicators) to the participants, so as
- to **be aware of and regulate** their behaviour (either as individuals or groups)



LEARNING TECHNOLOGY AND



ORATORY



www.LTEE.gr/adimitr



Interaction Analysis ⇨ Purpose

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- offer **directly information on interactions and activity products** (e.g. via visualised IA indicators) to the participants, so as
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For instance, Interaction Analysis Tools could support:

- students, groups: **awareness, self-assessment, metacognition** ⇨ selfregulation of their own activity
- teacher(s): **diagnosis, assessment** ⇨ teachers' strategies adaptation



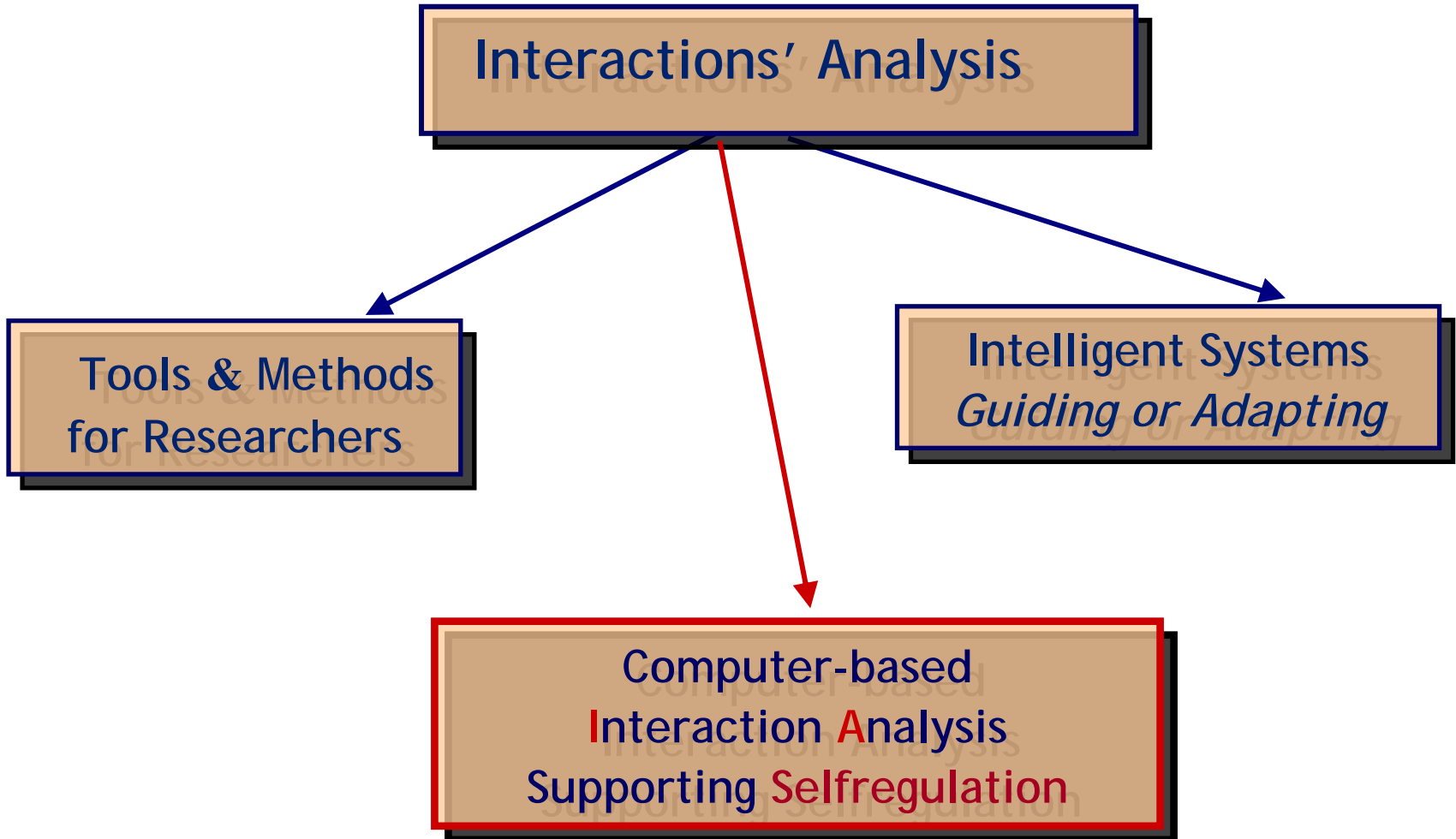
IA ⇒ Emergence's reasons

The need to support 'participants' in a metacognitive level:

- ◆ Working in computer based LE is an activity more complex than in paper-pencil: it is difficult to be aware of «what we have done »
- ◆ Working in CSCL systems is an activity much more complex than working individually
- ◆ Students cannot create an 'image' of their own activity, or this of other students/collaborators (as individuals, group or community).
- ◆ For teachers, it is very-very hard to manage activities in collaborative environments or in stand-alone systems, due to the very complexe interactions that occur.

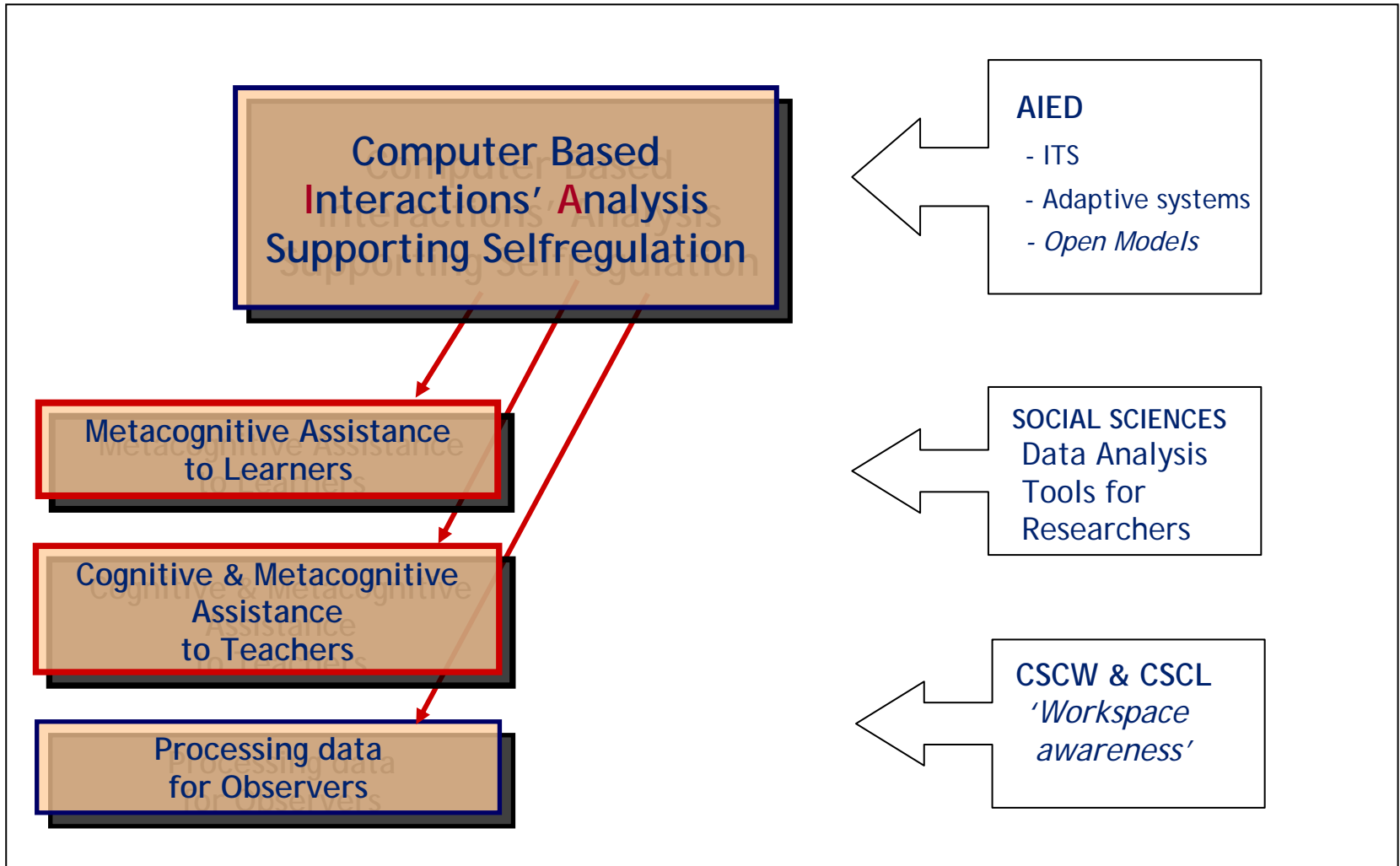


Interaction Analysis \Rightarrow Territory





Interaction Analysis ⇒ Influences

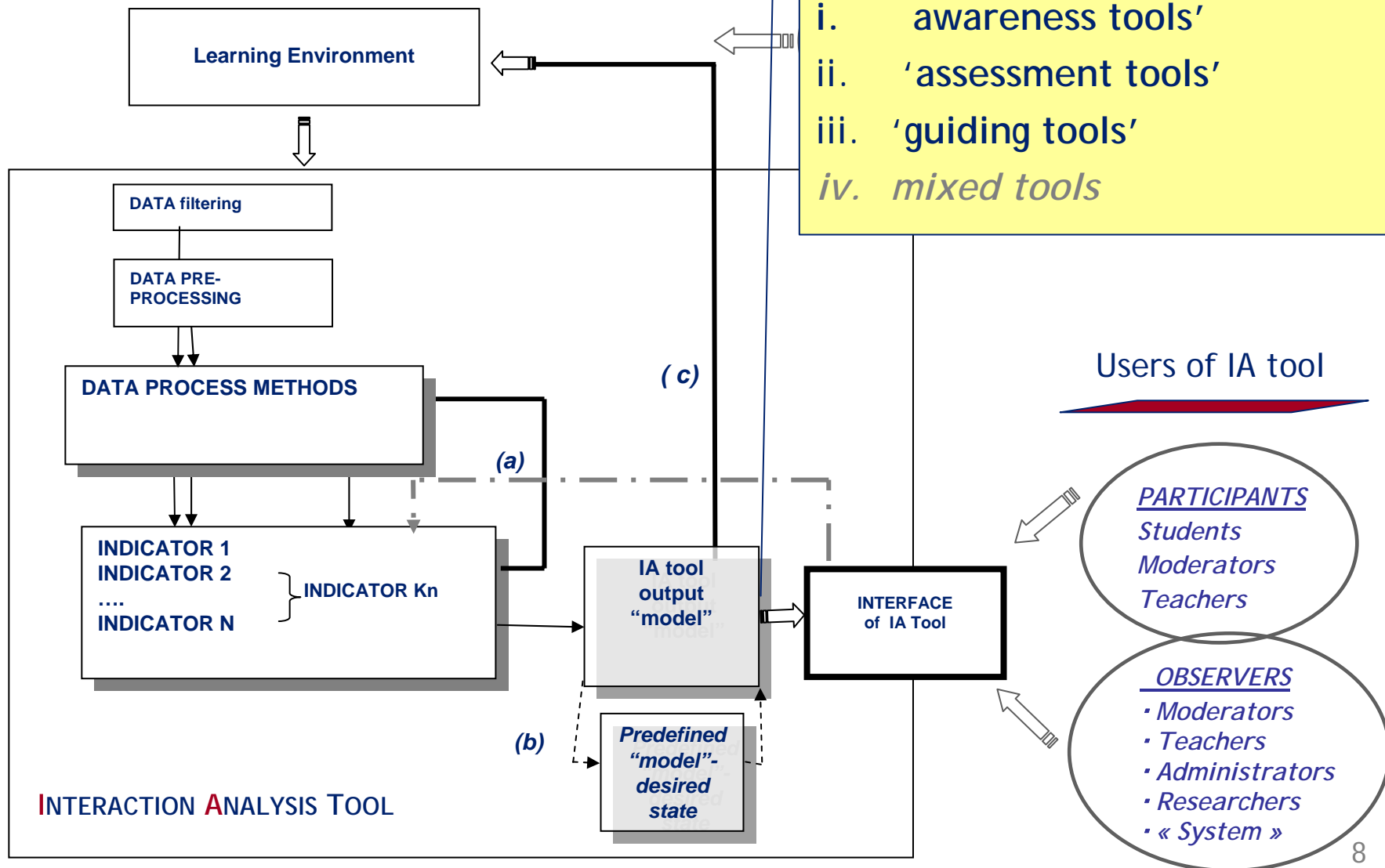




IA tool ⇒ Generic Process

➤ Interaction analysis tools:

- i. awareness tools'
- ii. 'assessment tools'
- iii. 'guiding tools'
- iv. *mixed tools*





IA ⇒ IA 'tools' examples e.g. in LE

'Awareness' functions addressed to the 'administrator' or the teacher

Forum Statistics

Statistic	Value	Statistic	Value
Number of posts	3	Posts per day	3
Number of topics	3	Topics per day	3
Number of users	3	Users per day	3
Board started:	28 Aug 2007 10:26 pm	Avalar directory size:	Not available
Database size:	69.83 KB	Gzip compression:	OFF

Who is Online

Users	Profile	Last Refreshed	Private Location	IP Address
Admin		28 Aug 2007 10:26 pm		Private info

Summary of Activity Report: 2004-2005

Report generated 13 January 2006
 Report period: 1 January 2004 to 13 January 2006
 Note: The active time for this report was not included in the report when the system was down.

Statistic	Value
Total user sessions	38
Average user session length	00:10:41
Average user sessions per day	2
Average user sessions per day on weekends	2
Average user sessions per day on weekdays	1
Least active day	---
Most active hour of the day	5:00-6:00 pm
Least active hour of the day	9:00-10:00 am

phpBB
Forum statistics
 Number of posts
 Number of users
 Database size

Webct,
Summary of activity report:
 Most active day,
 Most active hour per day,
 Average users per day, etc.

'Awareness' functions addressed to students

Activity Analysis v4.9b - Oncom

Activity Analysis v4.9b - Oncom

Activity Analysis v4.9b - Oncom

Hoppe, 2001

```

Code (ok)
public void main() {
    spiral(100,40,10);
}

public void spiral(double d, double phi, int i) {
    move(d);
    turn(phi);
    if (i>0)
        spiral(d/2,phi,i-1);
}
  
```

Activity by Users

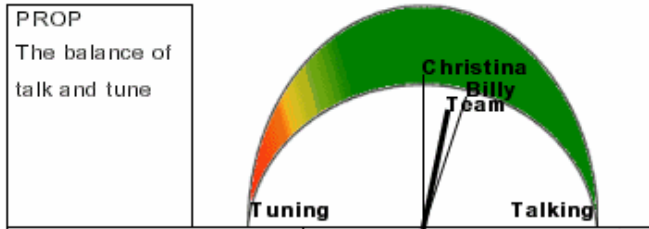
Activity by Users

LTEE, 2001



IA ⇒ IA 'tools' examples

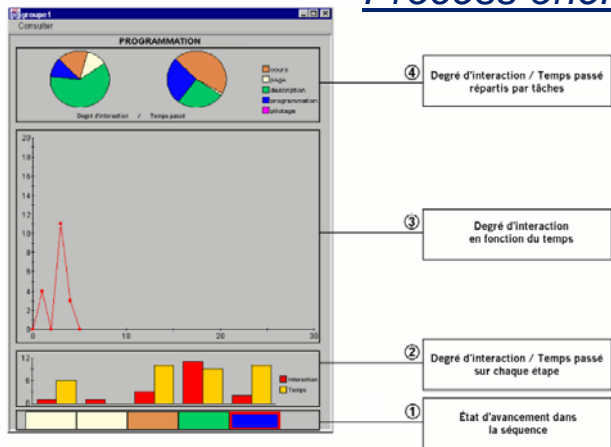
- Addressed to students: Metacognitive- Assesment
[collaboration mode & coll. quality assessment]



Jermann, 2001

- Addressed to teachers

Process oriented Awareness



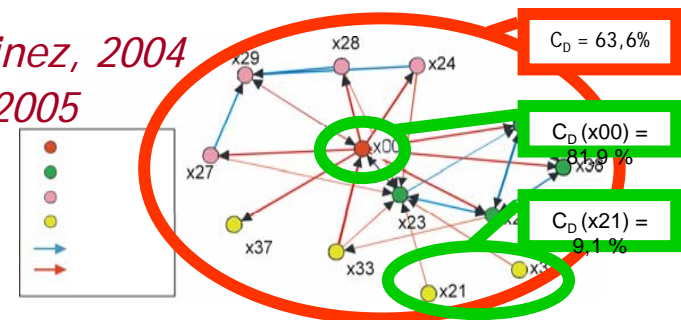
Despres, 2000

Global Analysis for experience ENTORNO2					
ATRIBUTOS	- VALORES -			INFERED FROM	
Argumentation	about	low	subtle	Risk	DepthTree Interactivity Initiative Work
Collaboration	verfoll	normal	good	verflood	Argumentation Cooperation Coordination
Conformity	low	intermediate	high		
Cooperation	small	low	intermediate	good	Argumentation Conformity Creativity
Coordination/Message	little	enough	much		
Coordination	low	subtle	good	high	Argumentation Coordination/Message Initiative
Creativity	low	intermediate	high		
DepthTree	low	average	high		
Elaboration	low	subtle	high		
Initiative	low	intermediate	high		
Interactivity	low	subtle	much		
MContributionNumber	little	appropriate	much		
MContributionSize	short	average	long	VeryLong	
Work	little	subtle	high		MContributionNumber MContributionSize Elaboration

Barros, 2000

Collaboration mode

Martinez, 2004
Hlapanis, 2005



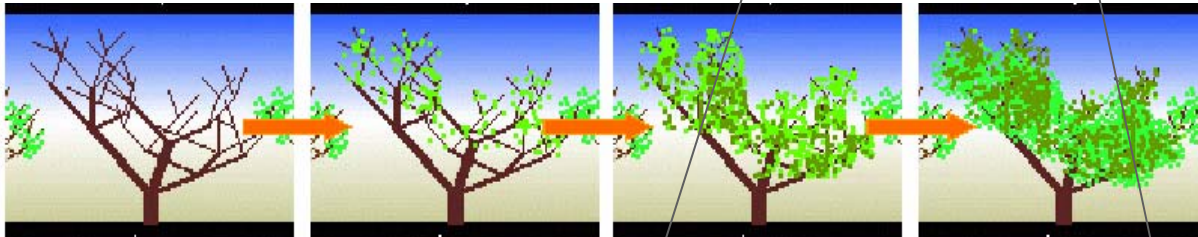


IA Indicator \Rightarrow A central Concept

Interaction Analysis indicators constitute variables that describe 'something' related to:

- the mode, the process of the activity of the considered 'cognitive system' (individual, group, community)
- the features or the quality of the interaction product,
- the mode or the quality of the collaboration, (when acting in the frame of a social context formed via the technology based learning environment).

These variables have to be interpreted, taking into account, the learning activity, the profile of the participants, the context of interaction, etc.

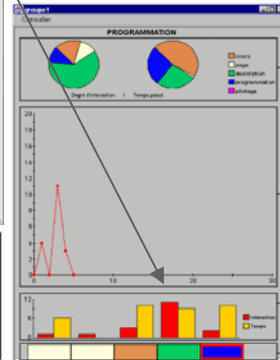


ATTRIBUTE	VALUES	DIVERSED FROM
Argumentation	low, variable, high	DigitalTive University Subjects Work
Collaboration	low, medium, high	Argumentation Collaborative Creativity
Confidentiality	low, intermediate, high	Argumentation Creativity Creativity
Cooperation	low, intermediate, high	Argumentation Creativity Creativity
Coordination/Management	low, medium, high	Argumentation Creativity Creativity
Contribution	low, variable, high	Argumentation Creativity Creativity
Creativity	low, intermediate, high	Argumentation Creativity Creativity
DigitalTive	low, average, high	Argumentation Creativity Creativity
Disruption	low, variable, high	Argumentation Creativity Creativity



Statistic	Value
Number of Posts	0
Number of Topics	0
Number of Members	0
Number of Online Members	0

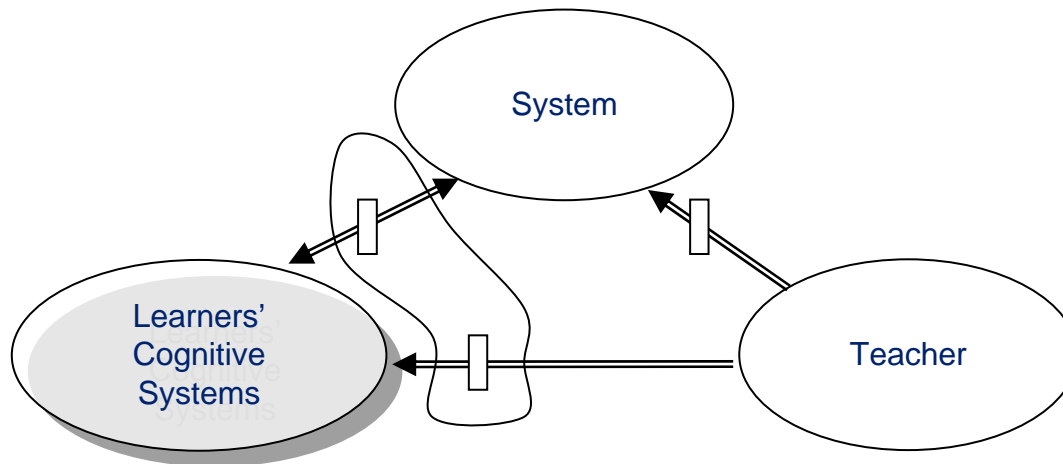
Who is Online	Who is Online
Guest	Guest
Guest	Guest





Conceptual Framework: Considerations

↪ **C1:** *A consideration of the control of learning activity process as distributed to all the agents*

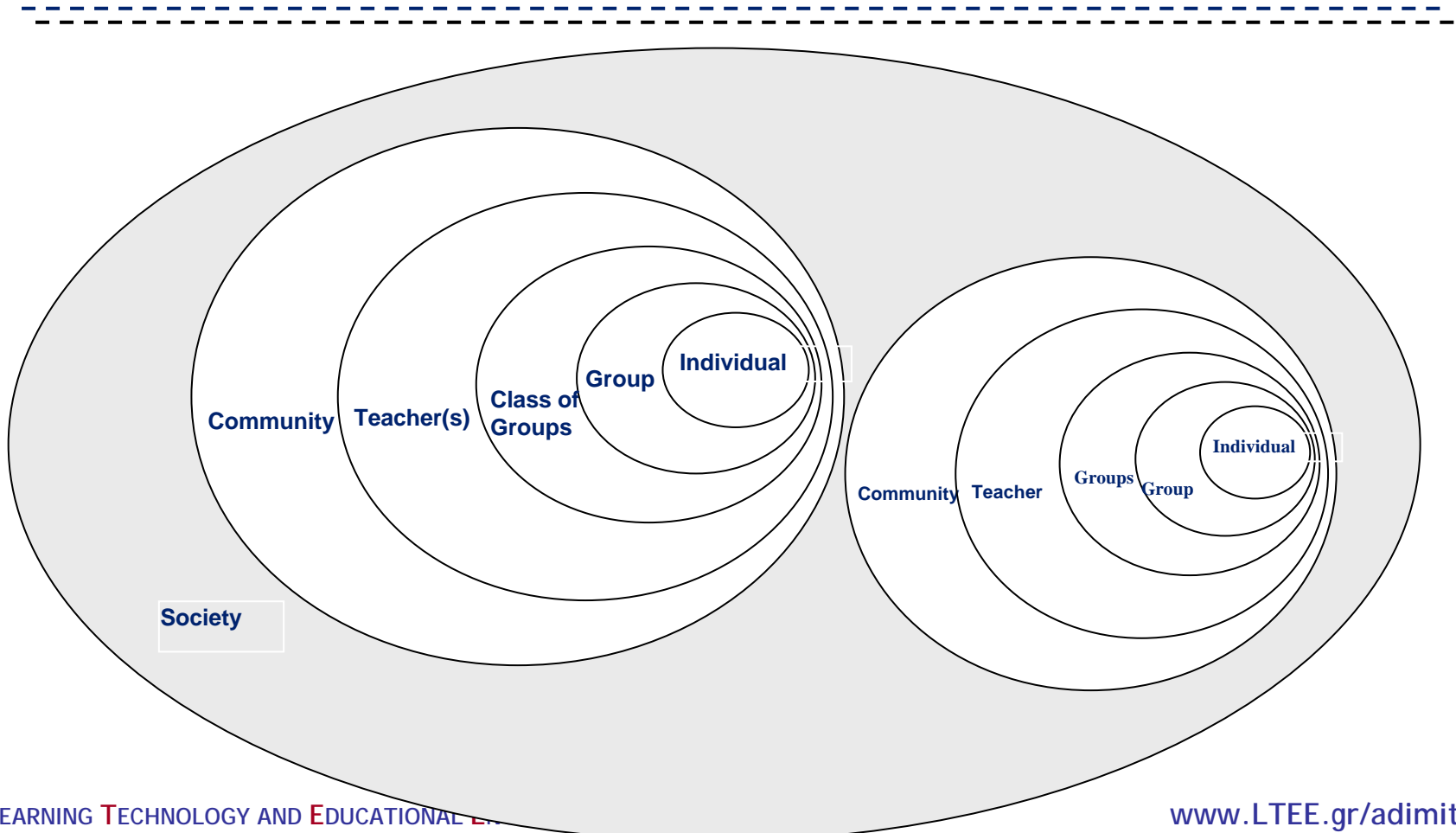


- ◆ Self-regulation (via metacognitive support)
- ◆ Teacher supervision and/or evaluation & also self-assessment
- ◆ Advisors ('pedagogical agents') and/or environment adaptations activated by the system



Conceptual Framework: Considerations

↪ **C2:** *A consideration of all agents and cognitive systems involved in collaborative learning settings*



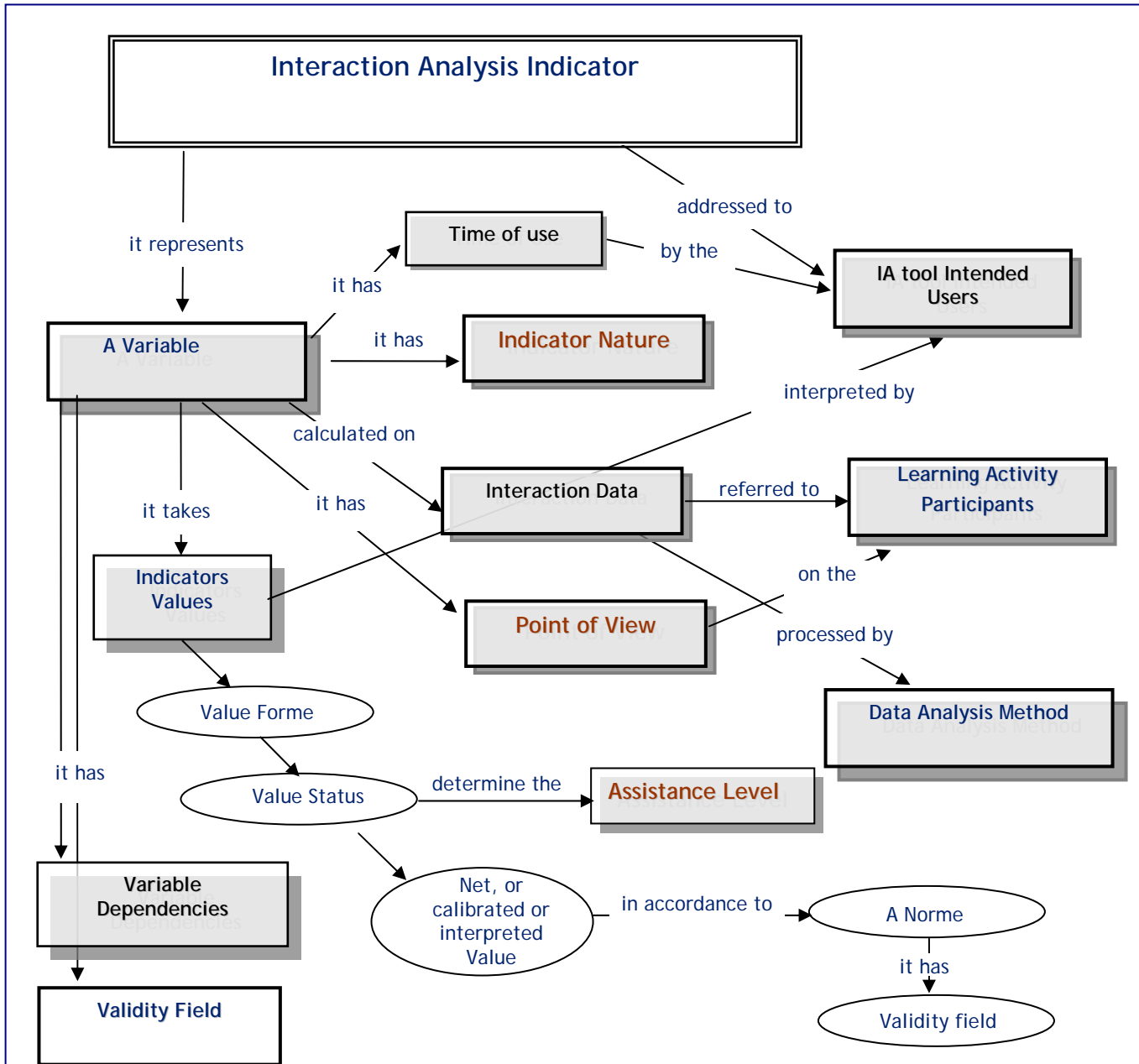


Conceptual Framework: Considerations

↪ C3: *Make emerge the core nature of indicator regarding the diversified aspects of participants' behaviour*

↪ C4: *Dispose a coherent set of indicators which provide different types of assistance*

↪ C5: *An indicator is a mathematical variable, which has a serie of related features.*

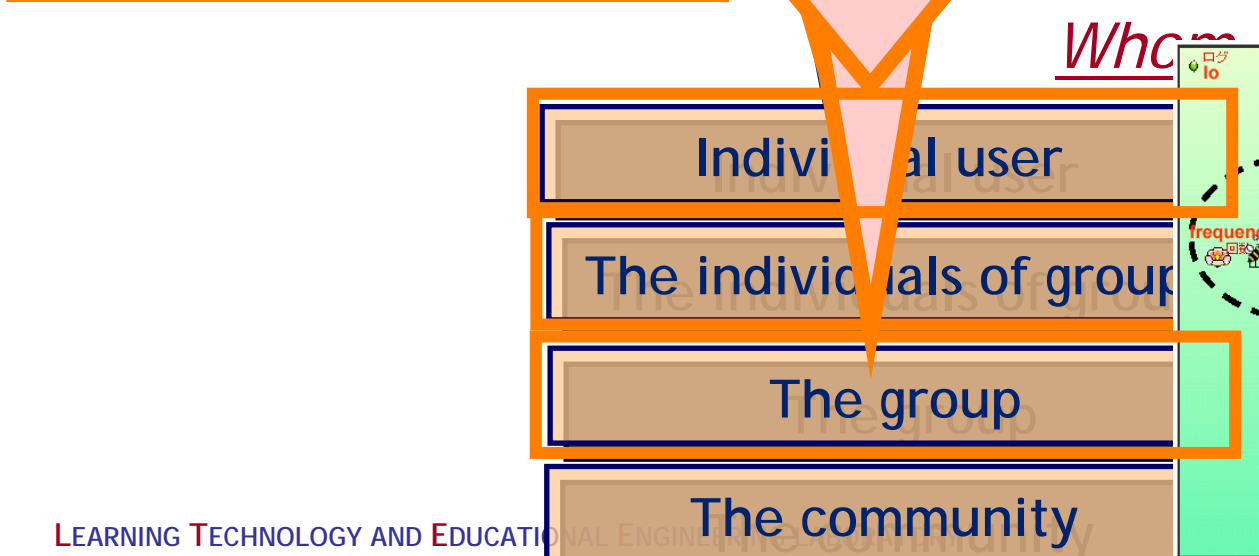
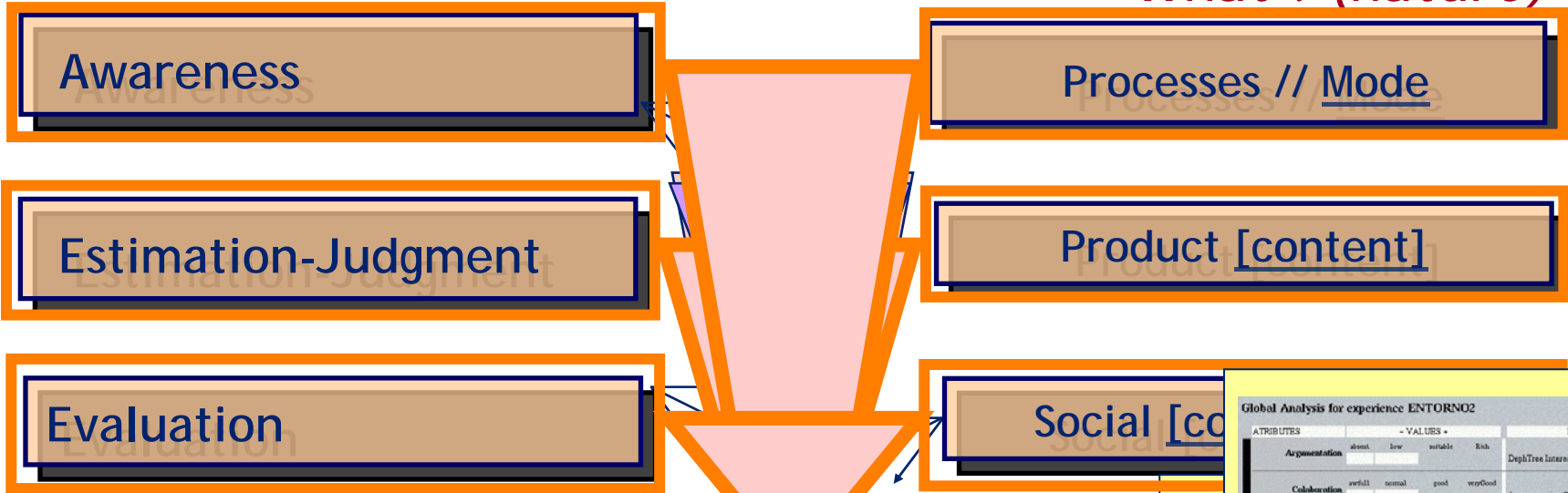




IA ⇒ Indicators attributes

Level of assistance?

What? (nature)



Global Analysis for experience ENTORNO2

ATRIBUTES	- VALUES +				INFERED FROM
	absent	low	suitable	Risk	
Argumentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		DepthTree Interactivity Initiative Work
Colaboration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Argumentation Cooperacion Coordinacion
Conformity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Cooperation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Argumentation Civil society Creativity
Coordination/Message	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Coordination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Argumentation Coordinacion/Message Initiative
Creativity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
DepthTree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Elaboration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Initiative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Interactivity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
MContributionNumber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
MContributionSize	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MContributionNumber MContributionSize Elaboration



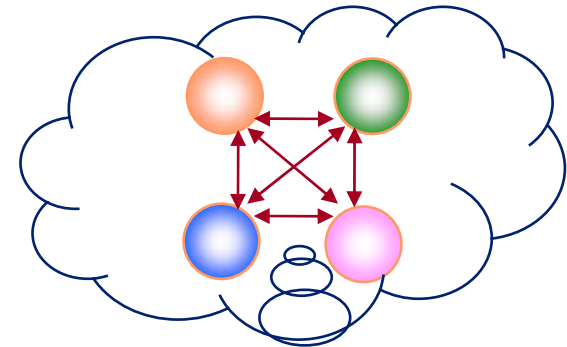
IA \Rightarrow IA Indicator vs IA Model

➤ Interpretative value & Significance of Interaction Analysis Indicators:

- High Level Indicators that have an inherent interpretative value (usually inferred via complex processing: e.g. '*argumentation quality*')
- Low level Indicators, those that have not an autonomous interpretative value

➤ Indicator & Interaction Model :

In an ideal case, for each learning activity, a number of complementary indicators could be produced.



Different indicators & combinations could form a **descriptive model** or even **evaluative model** according to specific categories of learning activities.

For this purpose, it is necessary to attribute a **psychological/pedagogical meaning** to most of the indicators.



IA ⇒ Research Dimensions

- ⇒ **Design of interaction Analysis tools/components & functions**
 - ⇒ Interaction Analysis Indicators (produced vs suitable)
 - ⇒ Values presentation form
 - ⇒ Calibrated values
 - ⇒ Design Principles

- ⇒ **Development**
 - ⇒ Data process methods
 - ⇒ Representation formalisms
 - ⇒ Independent interoperable tools

- ⇒ **Research with IA tools users (users' requirements, tools' effects)**
 - ⇒ Empirical Results
 - ⇒ Methods for teachers & students' needs & requirements



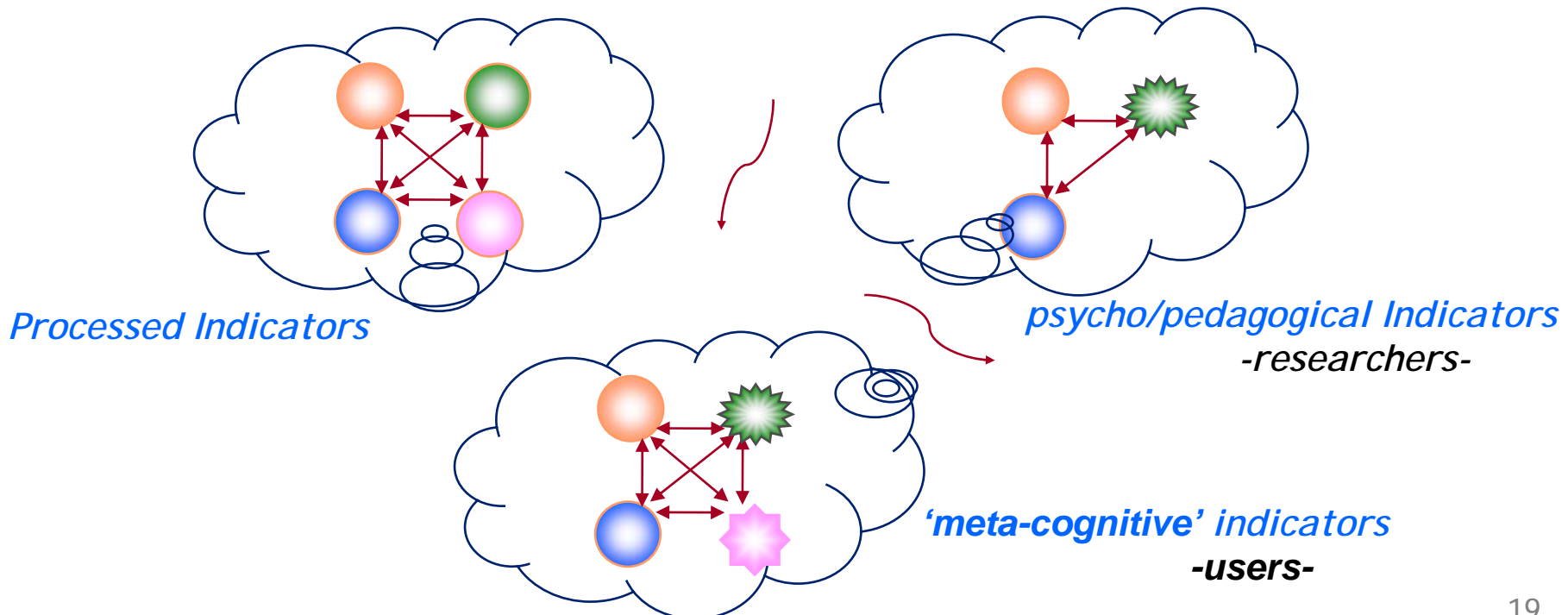
IA ⇒ Research Questions

I. Design

✘ Focus & work, in a profound way on IA 'indicators':

There are differences or even gaps among:

- the indicators that we 'process'
- these having a psychological/pedagogical significance
- those that can activate a metacognitive process to users





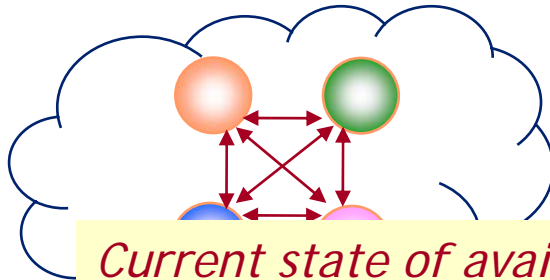
IA ⇒ Research Questions

I. Design

⊠ Focus & work, in a profound way on IA (indicators):

There are differences or even gaps

- the indicators that we 'produce'
- these having a psychological basis
- those that can activate a motivation



Current state of available indicators:

Processed Ind.

- ⇒ The defined indicators do not form a coherent set(s)
- ⇒ Most of them are low level indicators (e.g. participation rates)
- ⇒ Lack of indicators that analyse cognitive aspects
- ⇒ Lack of indicators that analyse various aspects of expression {dialogue + action}



IA ⇒ Research Questions

III. Research

⊗ Knowing better the IA tool User:

Different Indicators and/or different visualisations :

taking into account:

- ⇒ the profiles and the roles of users
- ⇒ the type of the activity
- ⇒ the context

Tailoring IA indicators for different types of users »

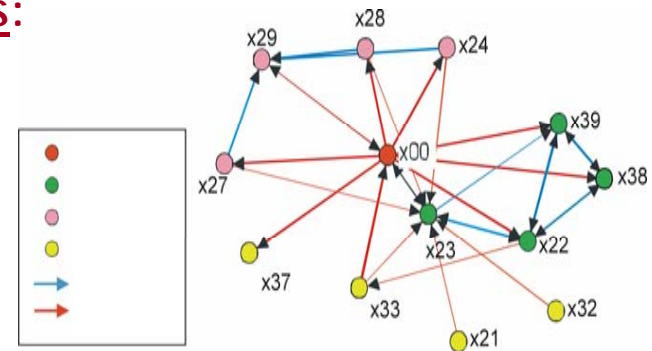
⊗ Does it work? More research is needed so as to study the effects of IA Indicators -> the IA tools users:

Study the significance: of these 'tools'

- *What is the 'meaning' of the IAI concept?*
- *How they do decode the visualisations?*

Study the effects of these 'metacognitive tools'

- *Do they affect the learning process?*
- *Do they help to develop users own regulation competences?*





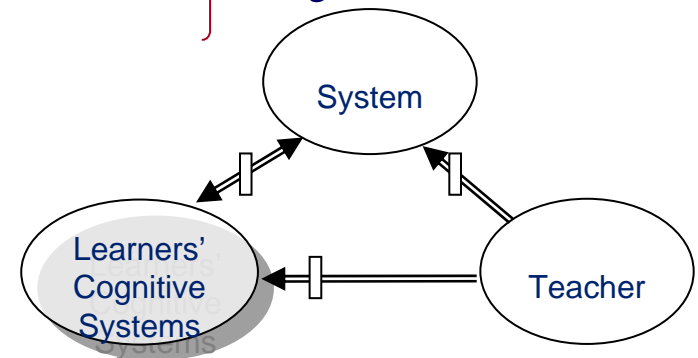
IA ⇒

Perspective:

Explore the complementarities between the various approaches

☒ Combine adaptive systems with IA outputs for selfregulation:

- e.g. ♦ take into account IA tools outputs so as to adapt interface
♦ provide IA tools outputs for selregulation
♦ advise or guide students
- (e.g. Reyes, 2005)
- (e.g. Barros, 2002)





Biblio →

- ⇒ www.noe-kaleidoscope.org {open archive on TEL}
- ⇒ www.rhodes.aegean.gr/LTEE/kaleidoscope-IA
- ⇒ www.ltee.gr/adimitr

