AN ADAPTIVE CONVERSATION-BASED LEARNING APPROACH

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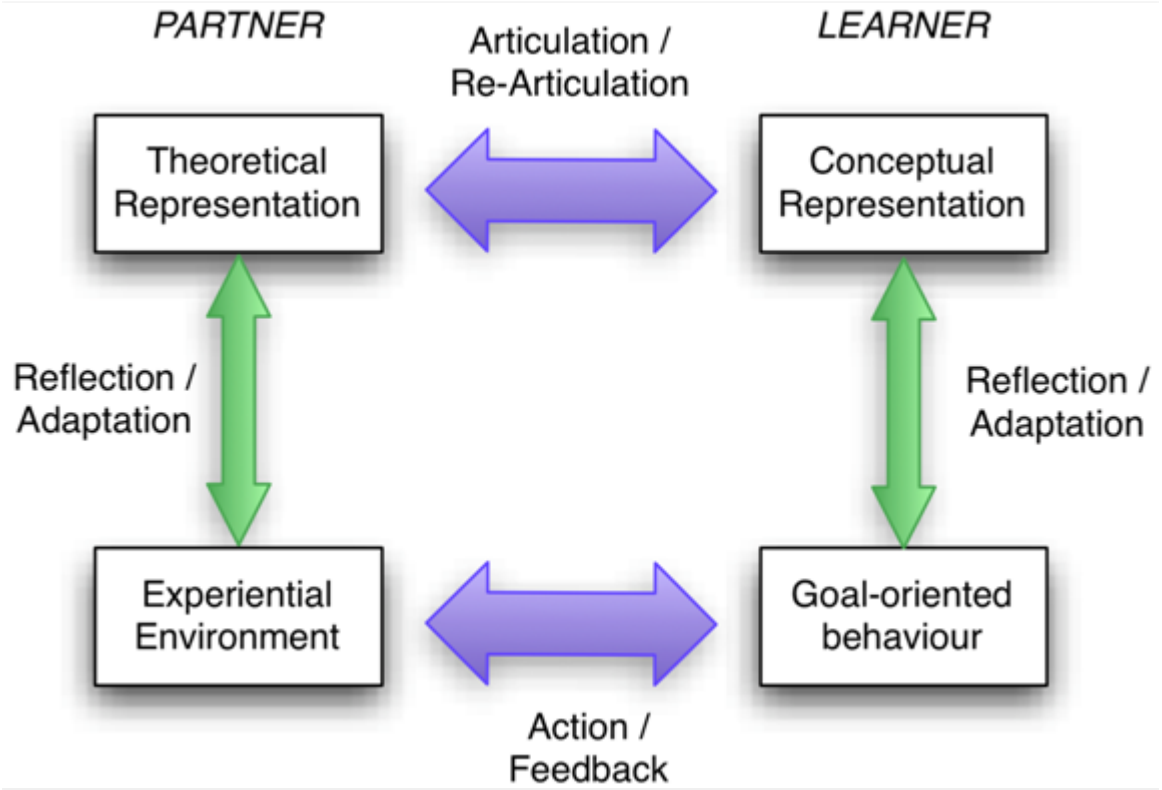
Learningful conversations

- A conversation is a dialogic process (Van Aalst, 2009) involving a mentor and a mentee, that is useful to sustain acquisition of:
  - *declarative knowledge* (concepts, principles, ideas, theories)
  - *procedural knowledge* (practical knowledge, knowledge on how-to-do, subject-specific skills, algorithms, subject-specific techniques and methods, criteria for determining when to use appropriate procedures)
  - *situational knowledge* (knowledge about specific work situations)

A conversation learning model

Laurillard's Conversational Framework



- *D. Laurillard, "The pedagogical challenges to collaborative technologies," International Journal of Computer-Supported Collaborative Learning*

Conversations at workplace

- The dialogic mediation becomes a fundamental strategy to valorize the working practices and transform them into significant experiences in the professional sphere.
- At workplace, conversations can
  - be exploited as a training method able to link learning and working activities
  - enable knowledge acquisition by fostering reflection, inquiry and deepening on specific issues
  - support the development of specific capabilities

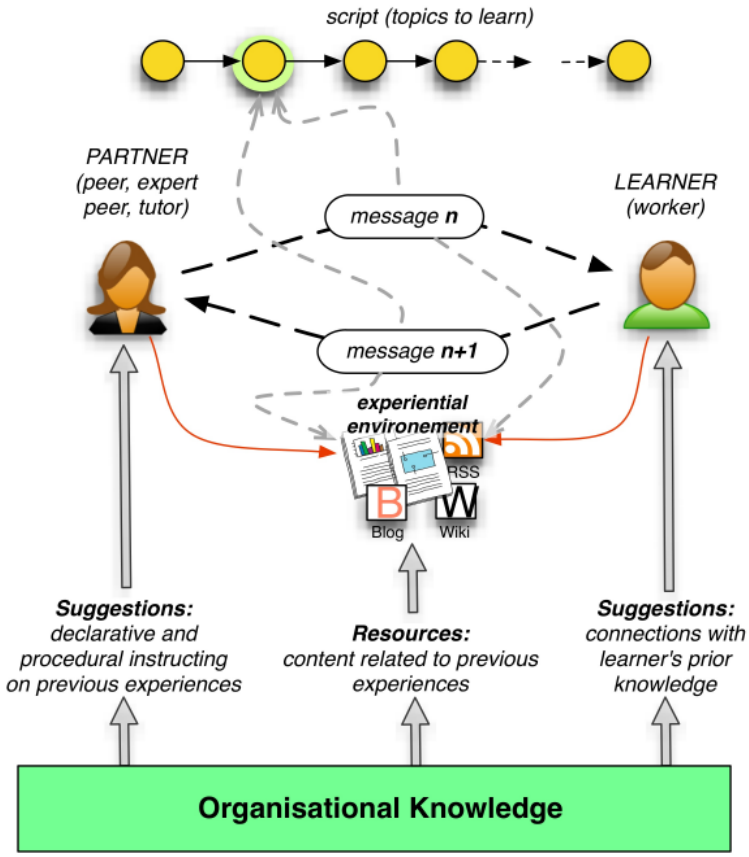
- *P. Tynjala and P. Hakkinen, "E-learning at work: Theoretical underpinnings and pedagogical challenges" Journal of Workplace Learning*
- *G. von Krogh, K. Ichijo, and I. Nonaka, "Enabling knowledge creation: How to unlock the mystery of tacit knowledge and release the power of innovation"*
- *J. van Aalst, "Distinguishing knowledge-sharing, knowledge-construction, and knowledge-creation discourses," International Journal of Computer-Supported Collaborative Learning*

Objectives

- We propose an adaptive workplace learning system implementing the conversation-based learning approach.
- This adaptive workplace learning system is able to:
  - increase the probability that meaningful learning occurs during conversations
  - optimize the use of human resources (in the organisation) involved in conversations
  - reuse knowledge elicited during conversations in next learning experiences

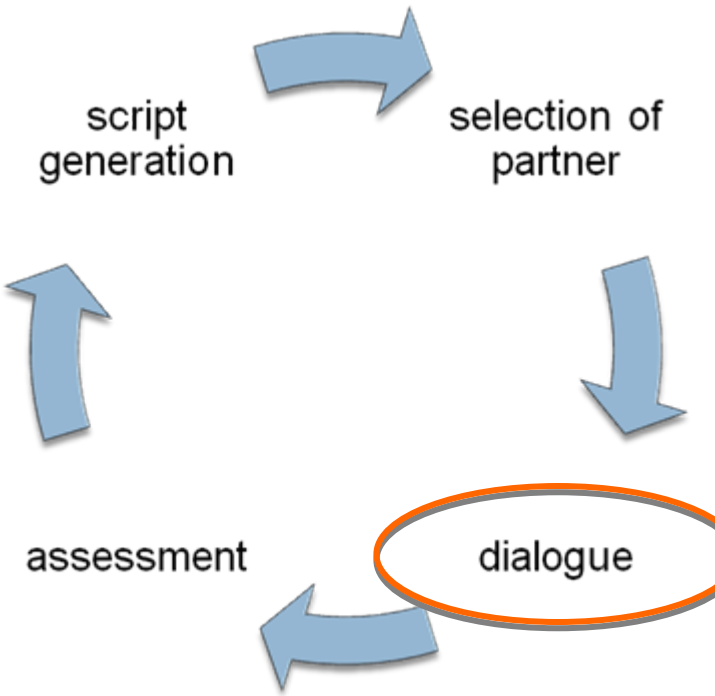
impacting positively on organisational learning and

Approach: the overall picture



- *P. Dillenbourg and P. Jermann, "Designing integrative scripts" F. Fischer, I. Kollar, J. Mandl, and J. Haake, Eds. New York: Springer, 2007*

Approach: the process



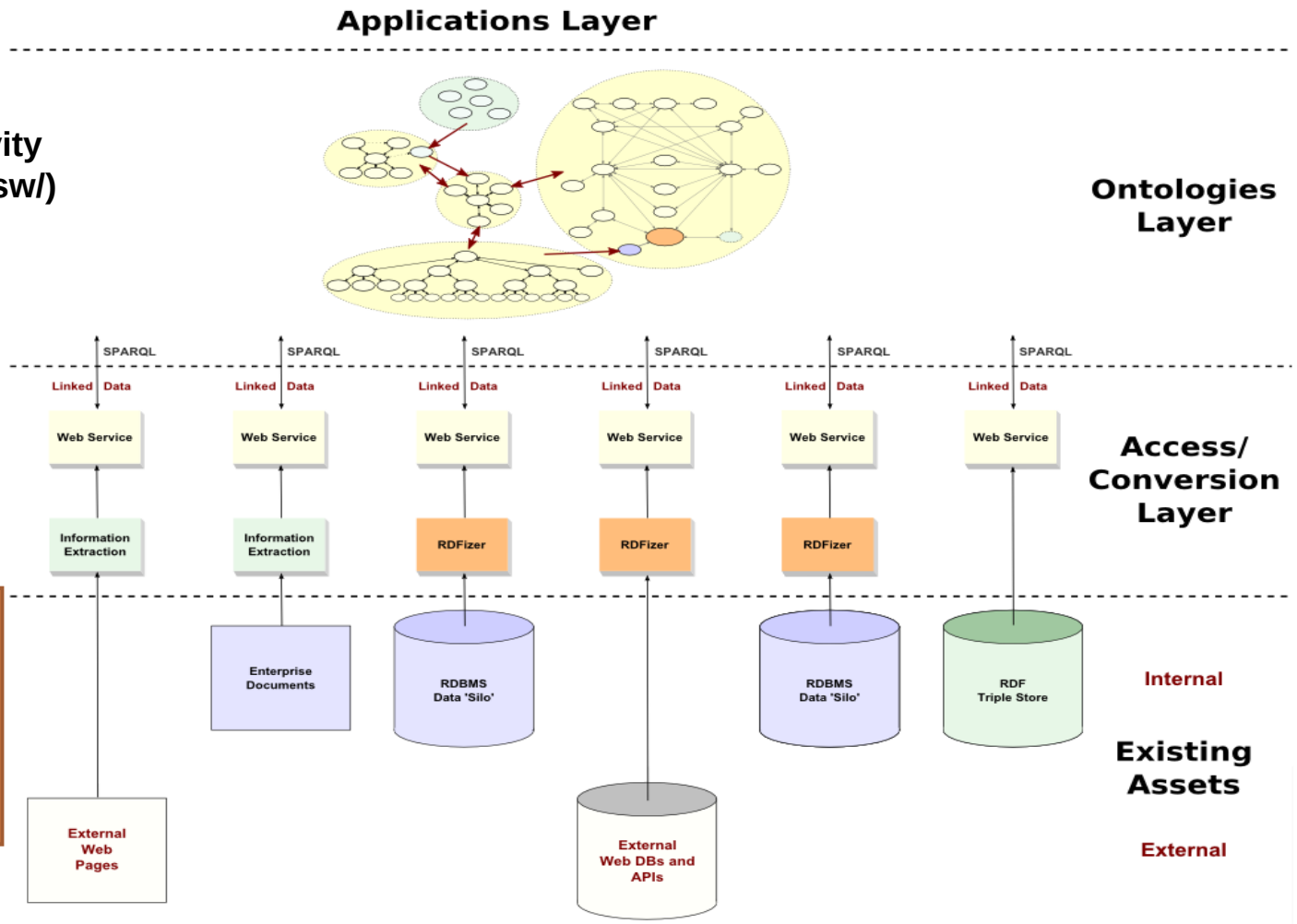
- A script is a sequence of topics conducting to the learning objective
- A partner is selected by analysing workers' knowledge, skills and experiences
- Dialogue is divided in subsets of topics
- At the end of a subset, an assessment is executed
- Assessment results are used to adapt the script and to find a more suitable partner

- Dialogues are executed topic by topic
- At the end of the discussion for a given topic, a text message analysis is executed to evaluate the referenced concepts
- Suggestions are provided to learner and partner to adapt the conversation
- Additional discussion is performed for the same topic

Organizational knowledge model

W3C Semantic Web Activity (http://www.w3.org/2001/sw/)

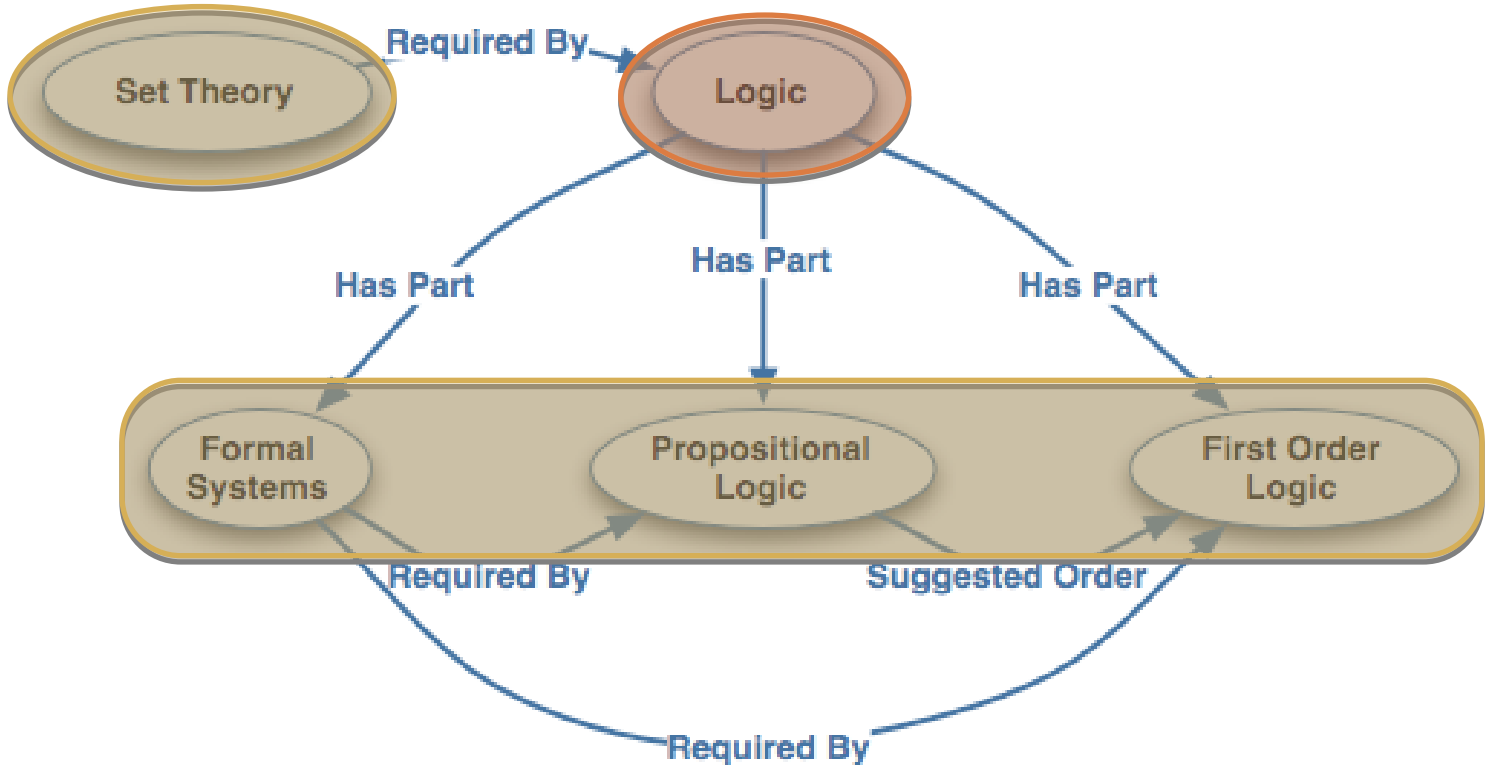
RDF
RDFS
OWL/OWL2



A solution fo the problem of information fragmentation

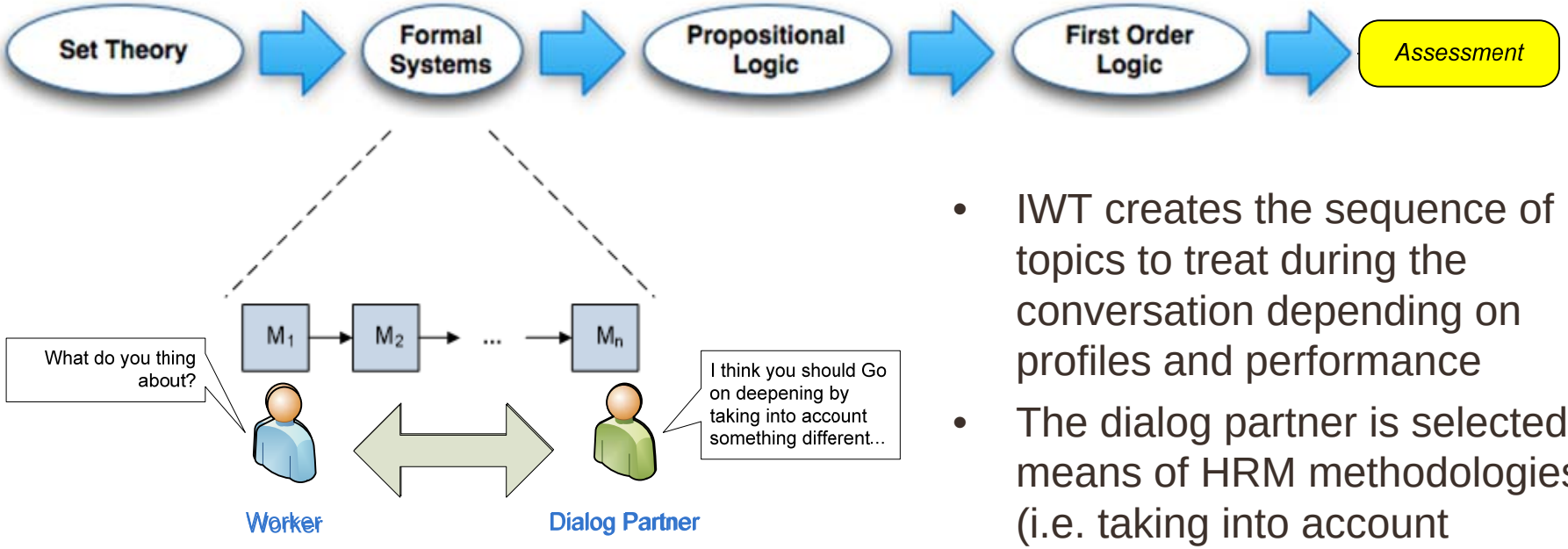
** from MIKE2.0 Web Site*

Script generation from training ontologies



- *N. Capuano, M. Gaeta, A. Marengo, S. Miranda, F. Orciuoli, and P. Ritrovato, "Lia: an intelligent advisor for e-learning," Interactive Learning Environments,*

Macro adaptation during conversation



- *Peer*: a colleague with knowledge but no work experience
- *Expert Peer*: a colleague with knowledge and work experience
- *Tutor*: a colleague with

- IWT creates the sequence of topics to treat during the conversation depending on profiles and performance
- The dialog partner is selected by means of HRM methodologies (i.e. taking into account competences, availability, costs, etc.)
- The participants exchange messages $\{M_1,\ldots M_n\}$ on each topic
- The conversation system changes the participant by applying *Fading* or *Scaffolding*

Selection of a conversation partner

macro adaptation with “scaffolding and fading”

Profile	Description
Peer	A worker who has already acquired the knowledge related to the learning objective. With respect to the Organisational Knowledge, it is possible to find a peer by using *Worker*, *Competency*, *Knowledge* and *LearningTopic* classes.
Expert Peer	A worker having the characteristics of *Peer* and who has carried out work activities related to knowledge linked to the learning objective. With respect to the Organisational Knowledge, it is possible to find an expert peer by using *Worker*, *Task*,*Competency*, *Knowledge* and *Content* classes.
Tutor	A worker having the characteristics of *Expert Peer* and who has teaching and/or tutoring competencies. With respect to the Organisational Knowledge, it is possible to find a tutor by using *Worker* and *Competency* classes.

Partners’ profiles

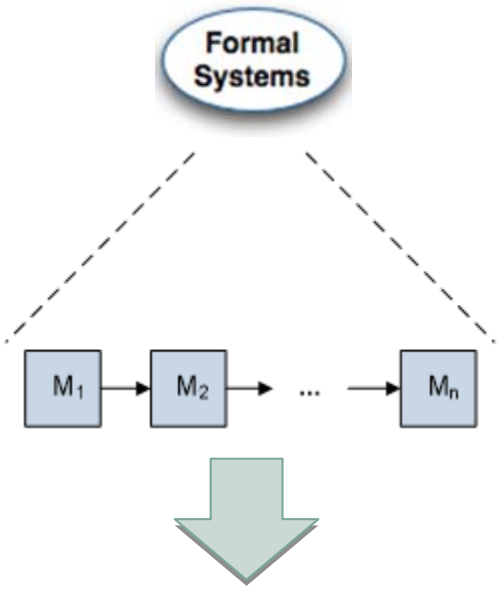
Macro adaptation rules

- When the conversation starts, a PEER is selected to play the partner role and support the learner
- At the end of each subset of topic an assessment phase is executed
- Basing on the assessment results a new partner could be selected with the rules below

ASSESSMENT Results	Rule	Current Partner	Action	Next partner
<	1.1	*Peer*	Scaffolding	*Expert peer*
	1.2	*Expert peer*	Scaffolding	*Tutor*
	1.3	*Tutor*	#	*Tutor*
≅	2.1	*Peer*	#	*Peer*
	2.2	*Expert peer*	#	*Expert peer*
	2.3	*Tutor*	#	*Tutor*
>	3.1	*Peer*	#	*Peer*
	3.2	*Expert peer*	Fading	*Peer*
	3.3	*Tutor*	Fading	*Expert peer*

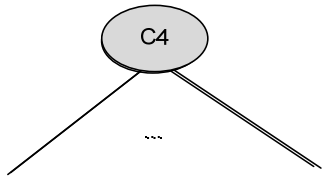
Micro adaptation during conversation

RULE	PRE-CONDITION	TARGET	SUGGESTION
1	The Learner has own tasks or contents on concepts that are prerequisite of the concepts to treat	Learner	**Reflect/Ask on connections between and task executed and/or content produced by the learner**
2	The prior knowledge of the Peer is not empty	Peer	**Prompt on connections between and the prior knowledge of the peer**
3	The Expert Peer executed tasks or produced content on topics related to the topics to treat	Expert peer	**Instruct on by using task executed and/or content produced by the expert peer**
4	There are content in the organizational knowledge on topics related to the topics to treat	Tutor	**Instruct on by using content produced by any workers in the organisation**



Analysis of the conversation

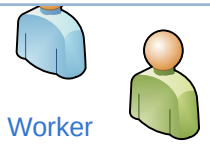
$concept_1, concept_2, \ldots, concept_r$



$concept_{41}, concept_{42}, \ldots, concept_{4m}$

to foster interactions

Storing for reuse



Worker

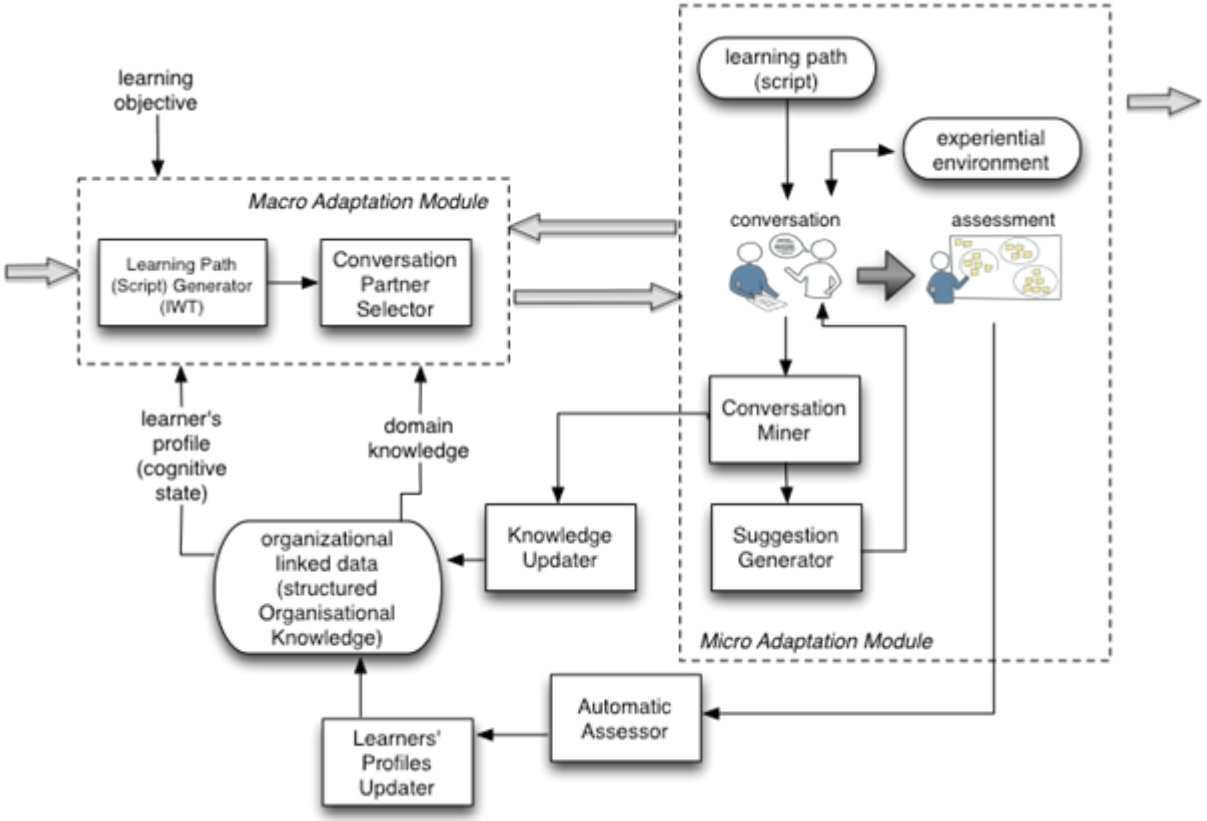
Dialog Partner

Linked Data Layer (LDL)

Advantages of this approach

- As depicted in (Mayer, 2010), a best learning approach should:
  - Reduce ***Extraneous processing*** (coherence, signaling, spatial contiguity, temporal contiguity, expectation)
  - Manage ***Essential processing*** (segmenting, pre-training, modality)
  - Foster ***Generative processing*** (multimedia, personalization, concretizing, anchoring)
- Our approach tried to do this by means of adaptive scripts that give to:
  - A good pathway to follow during dialogs
  - Alternative dialog and assessment sessions
  - No knowledge overload
  - References to their prior knowledge
  - High interaction on dialog and suggestions
  - Connections to concepts and visual material
  - Adaptation and personalization
  - Access to available familiar tasks and material

Overall architecture



- *N. Capuano, S. Miranda, and F. Orciuoli, "IWT: A semantic web-based educational system"*
- *SIOC initiative (Semantically-Interlinked Online Communities) - http://sioc-project.org/*

State of the work and next activities

- This work is realized in the context of the research activities of FP7 EU Project **ARISTOTELE**
- At the moment **we are developing** the Adaptive Conversation System for Workplace Learning in the ARISTOTELE activities
- In the next months **we will start experimentation and evaluation** phases for the System

THANKS FOR YOUR ATTENTION

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