Supporting Collaboration Enhancing Learning

Nikos Karacapilidis, University of Patras
karacap@upatras.gr

karacap@upatras.gr

OPATEL Project Meeting
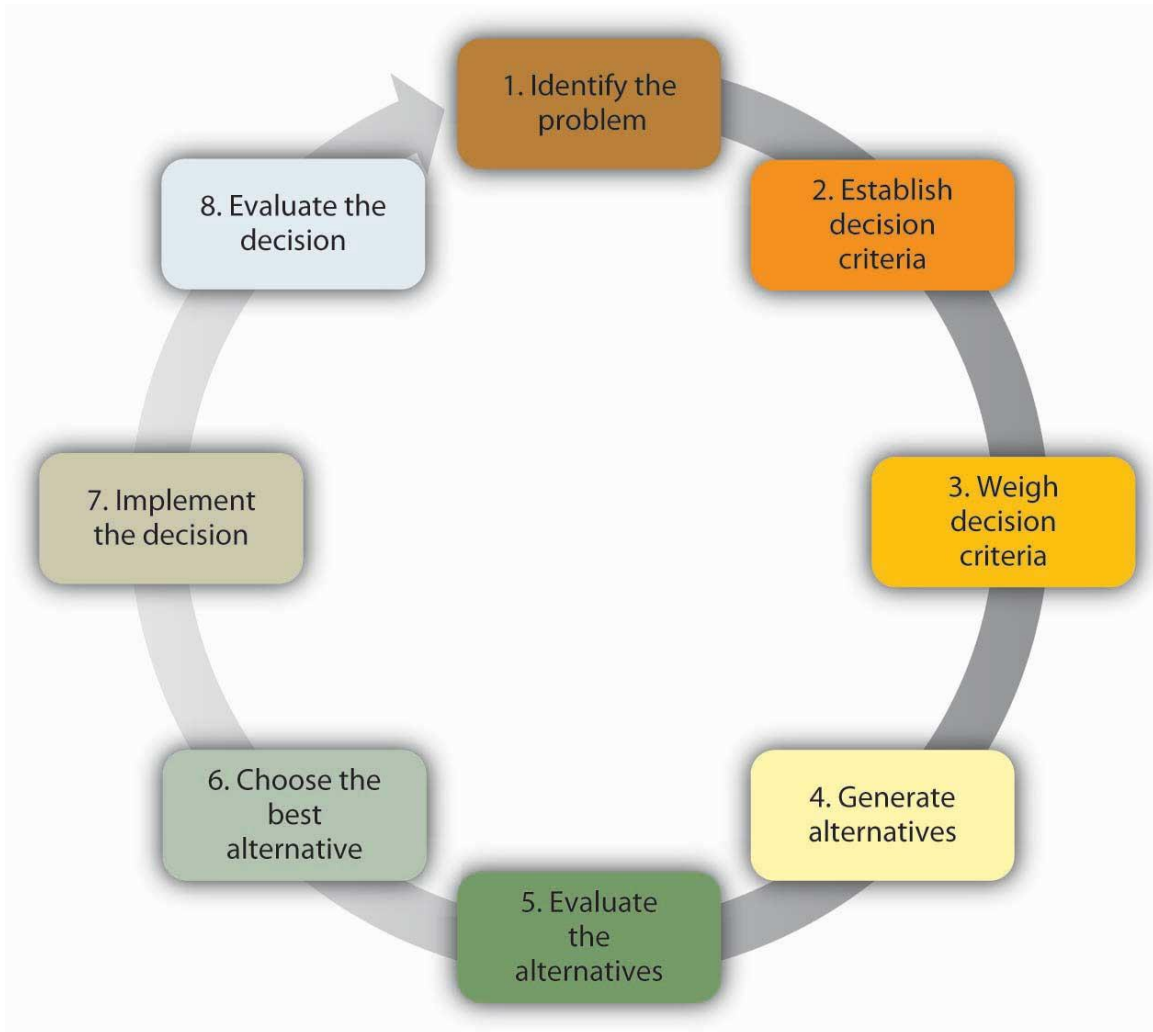November 22, 2017

OPATEL

Erasmus+

collaborative problem solving

Collaboration leads to transparency,
openness and better decision making

The Rational Decision-Making Model

Source: Principles of Management (v. 1.0), by M. Carpenter, T. Bauer and B. Erdogan

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Herbert Simon (1916-2001)

- Nobel Prize (1978) for his pioneering research in the decision-making process within economic organizations

Πηγή: post-gazette.com

- "satisficing" option
- "bounded rationality"
  – incomplete information, limits on knowledge and analytical ability, rules of thumb, making "good enough" decisions …

Basic characteristics

- Information overload & cognitive overhead
- Diverse social behavior
    - structures, relationships and interactions
- Situational differences
    - diverse collaboration modes and paradigms
- Expression of tacit knowledge
- Integration of legacy resources

→ Data processing and decision making support

Issues to be addressed

- Use of communication and information processing technology to make collaboration more efficient and effective

- Work structuring in order to improve coordination

- (Semi-) Automation of data processing
  - especially in data intensive situations

- User/group modeling

- Visualization

- Argumentation & reasoning mechanisms
  - rules and procedures for achieving consistency

Services required

- Information services
  - Information search and retrieval, interoperability, transformation, data mining, …

- Knowledge Management services
  - Knowledge management, metadata, ontologies, annotation & tagging, opinion mining, …

- Collaboration & DM services
  - Conducting of debates, argumentation, negotiations, handling of conflicts, sense-making, decision making, awareness, …

Sense-making

- A process of transformation of information into a knowledge product, including:
  - a **foraging loop** that involves seeking, filtering, and extracting information into schemas; and
  - a **sensemaking loop** that involves iterative development of a mental model from the schemas that best fit the evidence.

towards an integration of these two loops
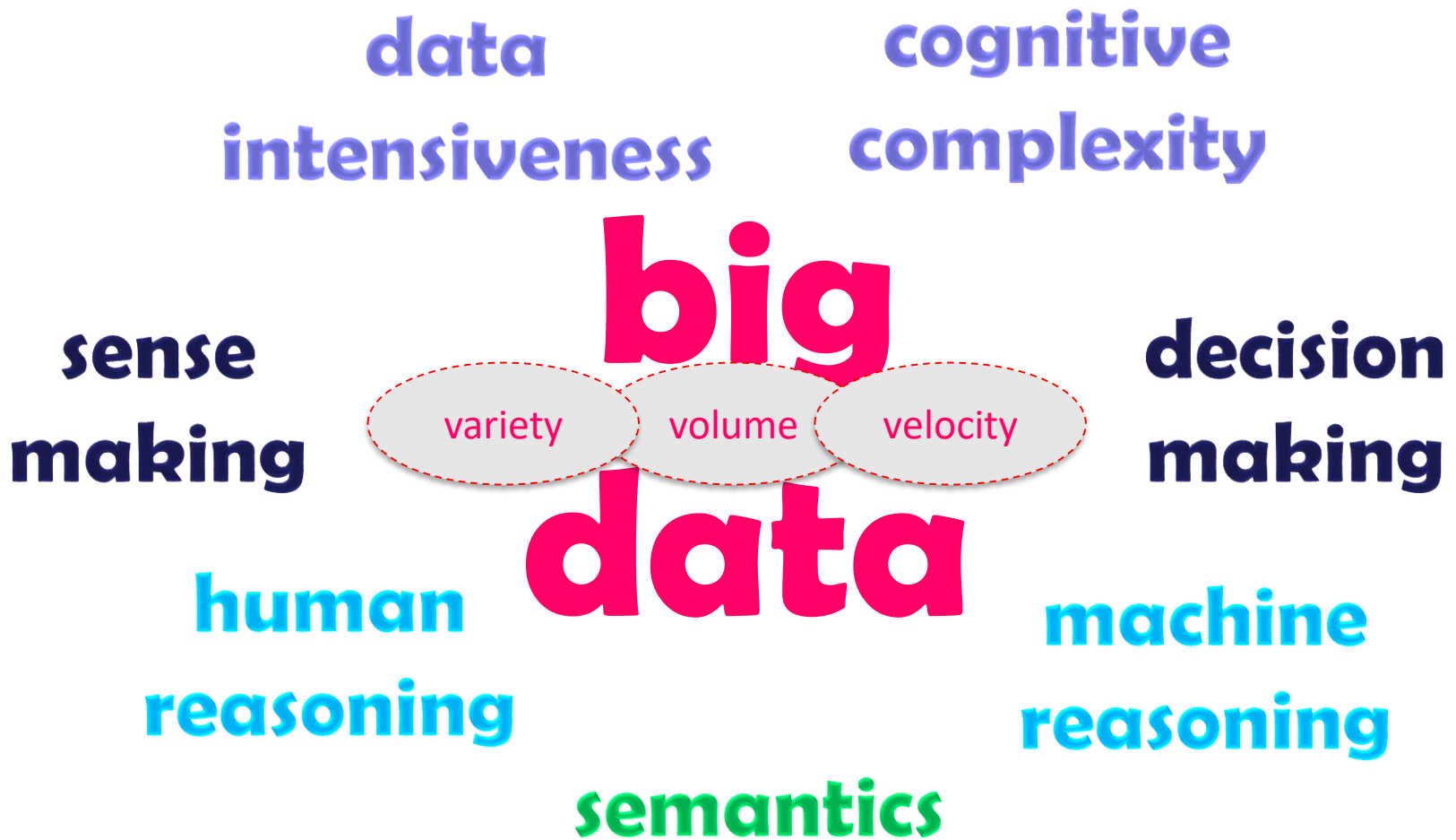
Pirolli and Card, 2005

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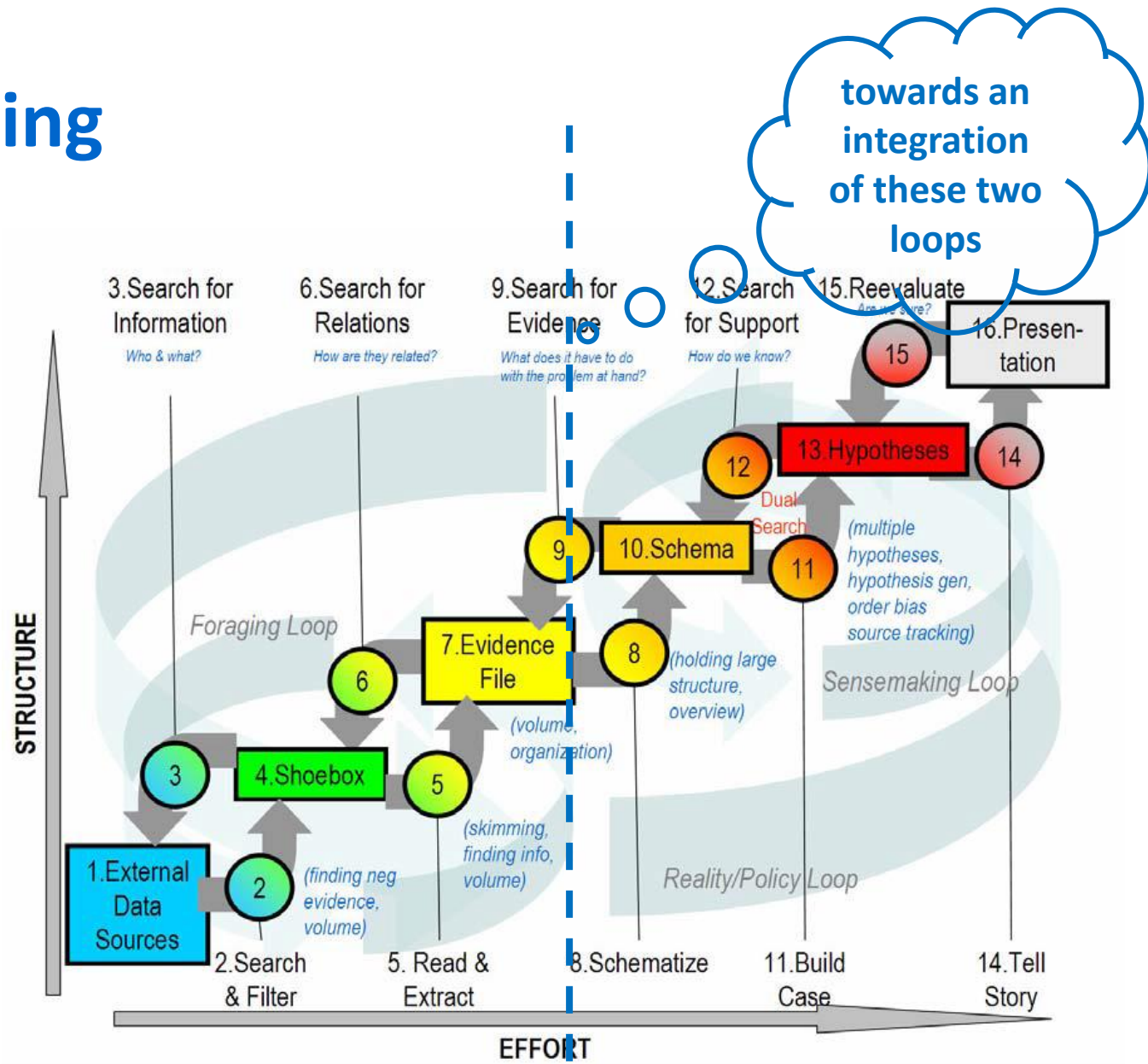
State-of-the-art and beyond (1/2)

- Collaboration support
  - Current tools are "information islands" → increased interoperability and synergy with third party tools
  - Web 2.0 collaboration tools are rather passive media → intelligent reasoning services to actively and meaningfully support collaboration
  - Web 2.0 collaboration tools cope poorly with voluminous and complex data → advanced decision making support services; building on the synergy of human and machine reasoning

State-of-the-art and beyond (2/2)

- Decision Making support
  - Problem-centric view → emphasis on human-centric view
  - No thorough exploitation of underlying knowledge → knowledge-based decision-making view; building on the synergy of human and machine reasoning
  - Little attention to dialoguing and argumentation → argumentation-based reasoning mechanisms

big
data

EXABYTE

ZETTABYTE

ZETTABYTE

PETABYTE

TERABYTE

data intensiveness

cognitive complexity

sense making

big data

variety · volume · velocity

decision making

human reasoning

machine reasoning

semantics
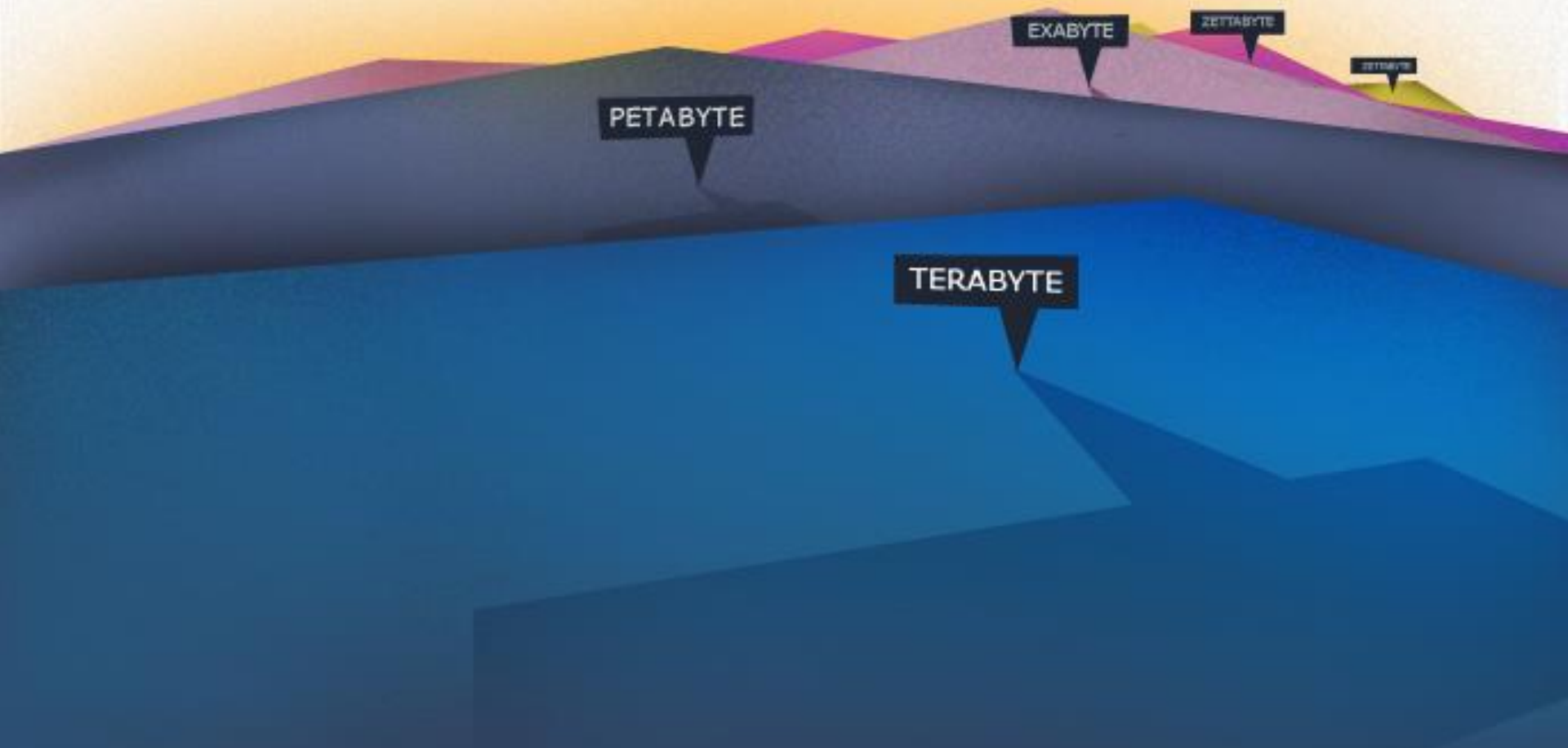
The Big Data fallacy

- More data doesn't mean you will get "*proportionately*" more information
  - In fact, the more data you have, the less information you gain as a proportion of the data

- The value of big data is often overstated
  - Its value is in the information that it can provide
  - Information is only the non-redundant portions of the data, which is a tiny and diminishing fraction of the overall data volume

The data-information inequality: information << data

Big Data white paper - Feb 2012

- "In spite of the tremendous advances made in computational analysis, there remain many patterns that humans can easily detect but computer algorithms have a hard time finding"

- "Ideally, analytics for Big Data will not be all computational – rather it will be designed explicitly to have a human in the loop"

- "With Big Data, the use of separate systems becomes prohibitively expensive … Big Data has made it necessary to run heterogeneous workloads on a single infrastructure that is sufficiently flexible to handle all these workloads".

- "It is rarely enough to provide just the results. Rather, one must provide supplementary information that explains how each result was derived, and based upon precisely what inputs. Such supplementary information is called the provenance of the (result) data".

- "Systems with a rich palette of visualizations become important in conveying to the users the results of the queries in a way that is best understood in the particular domain".

Divyakant Agrawal, UC Santa Barbara
Philip Bernstein, Microsoft
Elisa Bertino, Purdue Univ.
Susan Davidson, Univ. of Pennsylvania
Umeshwar Dayal, HP
Michael Franklin, UC Berkeley
Johannes Gehrke, Cornell Univ.
Laura Haas, IBM
Alon Halevy, Google
Jiawei Han, UIUC
H. V. Jagadish, Univ. of Michigan (Coordinator)
Alexandros Labrinidis, Univ. of Pittsburgh
Sam Madden, MIT
Yannis Papakonstantinou, UC San Diego
Jignesh M. Patel, Univ. of Wisconsin
Raghu Ramakrishnan, Yahoo!
Kenneth Ross, Columbia Univ.
Cyrus Shahabi, Univ. of Southern California
Dan Suciu, Univ. of Washington
Shiv Vaithyanathan, IBM
Jennifer Widom, Stanford Univ.

the
Dicode
roadmap

Dicode's main goal

- ## What
  - facilitate and augment collaboration and decision making in data-intensive and cognitively-complex settings

- ## How
  - by exploiting and building on the synergy of human and machine reasoning
  - by deepening our insights on the proper exploitation of Big Data and related technologies

Synergy of human & machine reasoning

proper orchestration and exploitation of each side's strengths

make decisions

make sense

collaborate

build consensus

innovate

Collaboration Support

Decision Making Support

Scalable High-Performance Data Mining
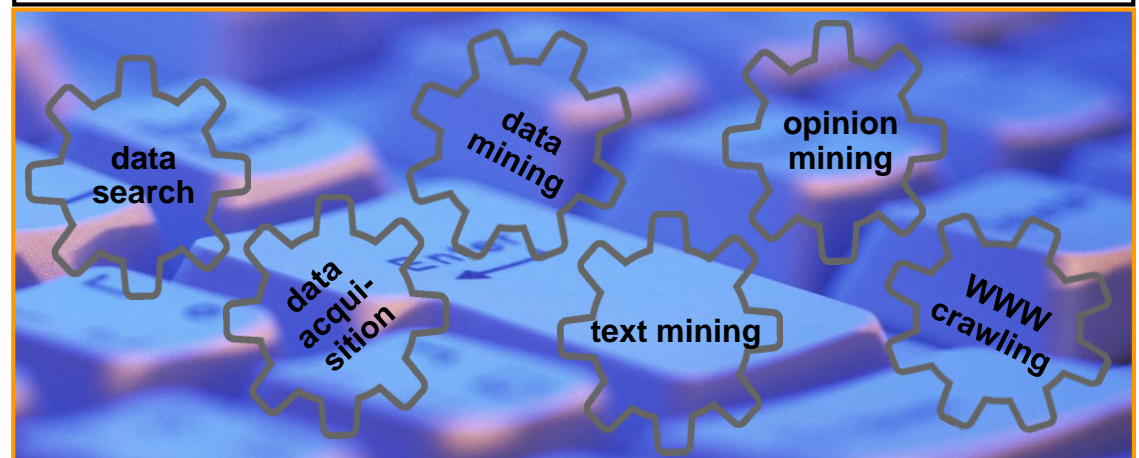
data search

data mining

opinion mining

data acqui-sition

text mining

WWW crawling

Achievements

The Dicode architecture
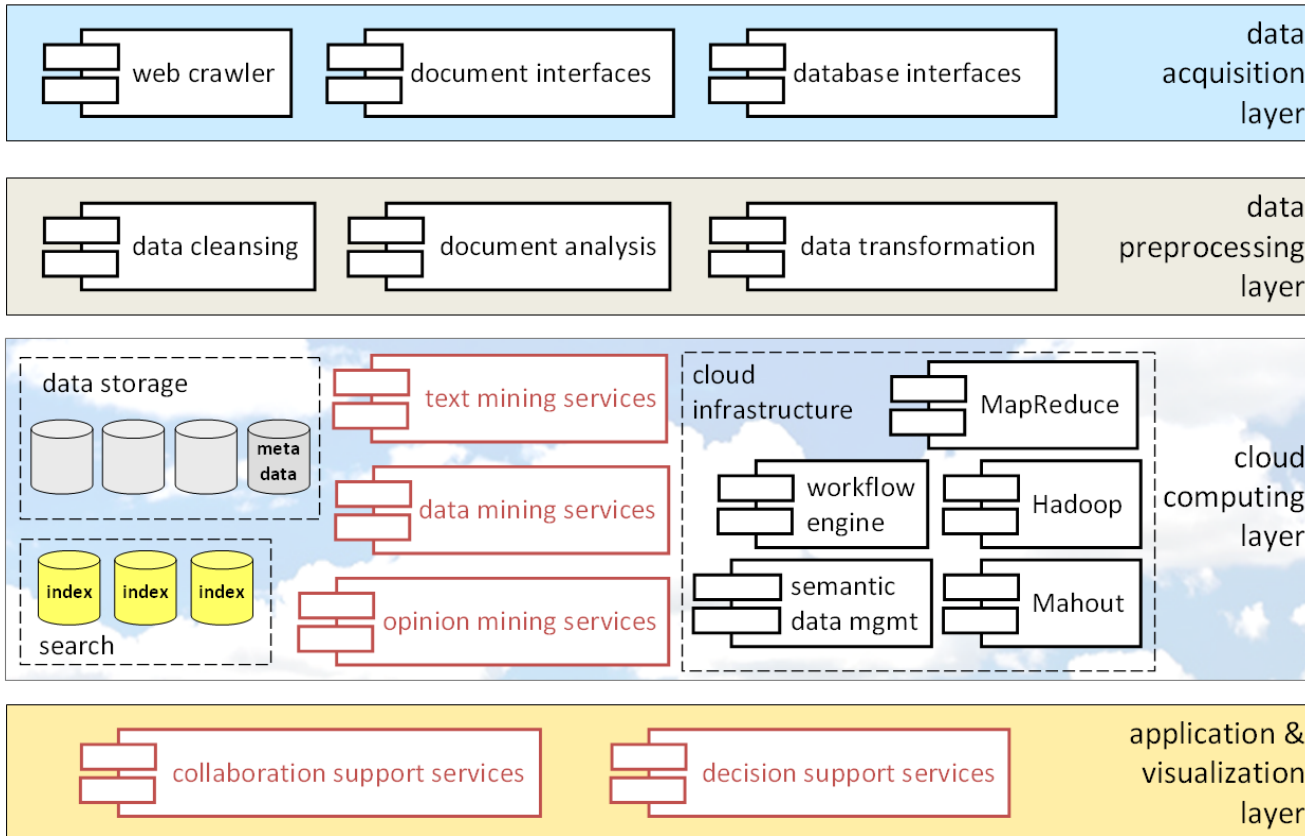
The Dicode Workbench

Collaboration workspaces

collaboration space

Informal ← - - - - - - - - - - - → Formal

collection & sharing of collaboration items

interrelation & evolution of collaboration items

informal / semiformal aggregation of collaboration items

formal exploitation of collaboration items patterns

exploitation of legacy resources

informal / semiformal argumentation

semantic annotation of collaboration items

formal argumentation and reasoning mechanisms

formality

Collaboration workspace: Forum view

Forum view of workspace: **SD service › Prostate cancer: Alternative treatment**

Post Reply | Relevant discussions

Author | **Message**

Physician (Physician)
Avoids radiation side effects from radiation
Posted on 10/23/2012 5:09 PM
"QUOTE
Avoids site effects from radiation therapy or prostatectomy

jane (Jane Monroe)
Requires close monitoring
Posted on 10/23/2012 5:11 PM
"QUOTE
Requires close monitoring (regular digital rectal exams, PSA tests, and prostate biopsy) to monitor for signs of progression

Urologist (Urolgist)
Proven solution
Posted on 10/23/2012 5:16 PM
"QUOTE
Proven to reduce prostate cancer death rates

Urologist (Urolgist)
Accurate staging
Posted on 10/23/2012 5:17 PM
"QUOTE
Removed tissue allows accurate stating. This is very important.

Collaboration workspace: Mind-map view
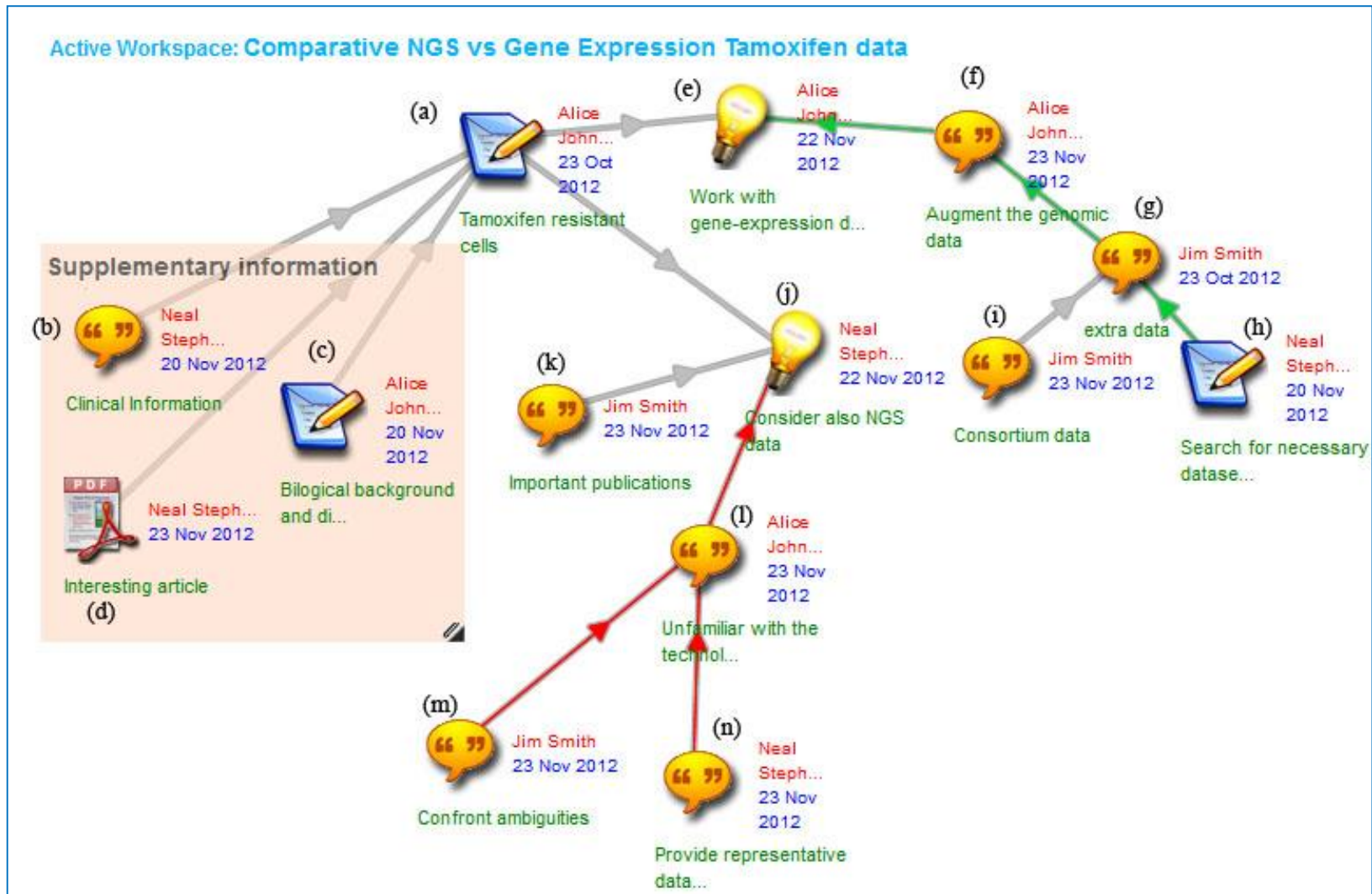
Collaboration workspace: Filtering items

Collaboration workspace: Proactive help
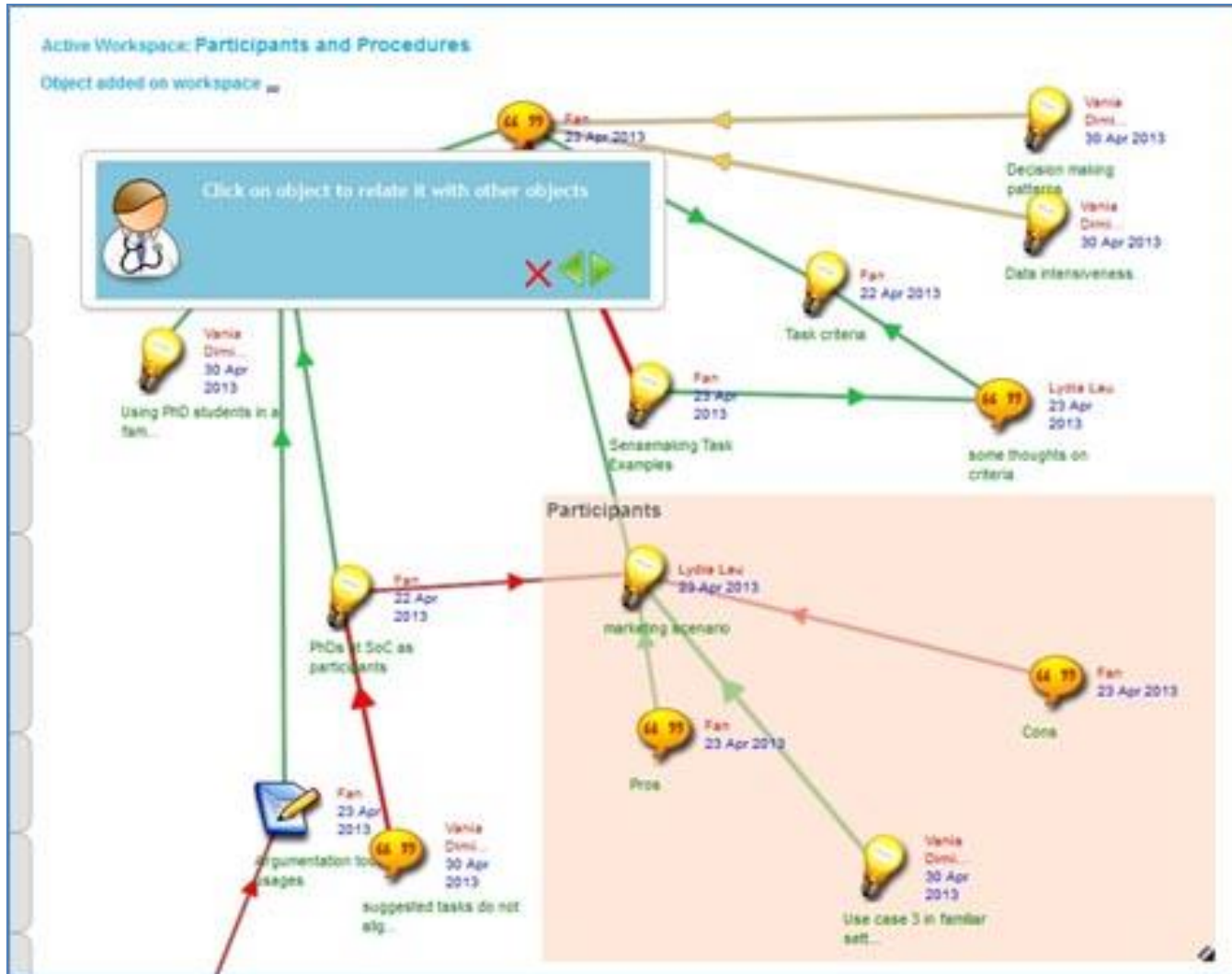
Collaboration workspace: Formal view

Decision Making view

WSM Results - Alternatives Ranking
1. Radical prostatectomy
2. Active Surveillance
3. Brachytherapy for prostate cancer

Set weights
Details
Plot

Scoring based on weights:
0.25 (Item Rating)
0.35 (Relations)
0.20 (User Score)
0.20 (Likes/Dislikes)

Lexicographic - Setting priorities

Drag to move most important factors on top

Rating

Relations

UserRating

LikesDislikes

Calculate   Close

AHP - Setting relative weights

| 1 | Features comparison |
| Comparing the features |

Step 1 - Features comparison

AHP factors comparison

	Items compared	Relative Importance
1	Score/Relations	1/5
2	Score/UserRating	1/9
3	Score/LikesDislikes	7
4	Relations/UserRating	3
5	Relations/LikesDislikes	9
6	UserRating/LikesDislikes	1/7

Page 1   of 1   1000

2	Alternative comparison wrt 'Rating'
3	Alternative comparison wrt 'Relations'
4	Alternative comparison wrt 'User Rating'
5	Alternative comparison wrt 'Likes/Dislikes'

Previous   Next   Calculate   Cancel

Workspace analytics view

Summary view of workspace "Clinico-genomic research: which public repositories to use in order to augment our gene expression datasets?"

The Dicode Workbench

Integrating services

lessons
learned

Collaboration and decision making (1/2)

- Lesson 1: Alternative views of collaboration may significantly tame the complexity of data-intensive workspaces.
  - in such environments, formality in managing collaboration should not be considered as a predefined and rigid property, but rather as an adaptable aspect that can be modified to meet the needs at hand.

- Lesson 2: Collaboration and decision making services should not be regarded as 'application islands'.
  - Seamless interoperability is a crucial factor for their adoption and success.

Collaboration and decision making (2/2)

- **Lesson 3:** Effective collaboration and decision making requires appropriate mechanisms tailored to the needs of each use case.

- **Lesson 4:** Data analytics is an iterative exploratory task which requires multi-perspective view support.

- **Lesson 5:** Integrating data mining into collaboration support services makes the collaboration discourse more understandable and greatly facilitates collective sense and decision making in data-intensive environments.

Thanks!