

Supporting Collaboration Enhancing Learning

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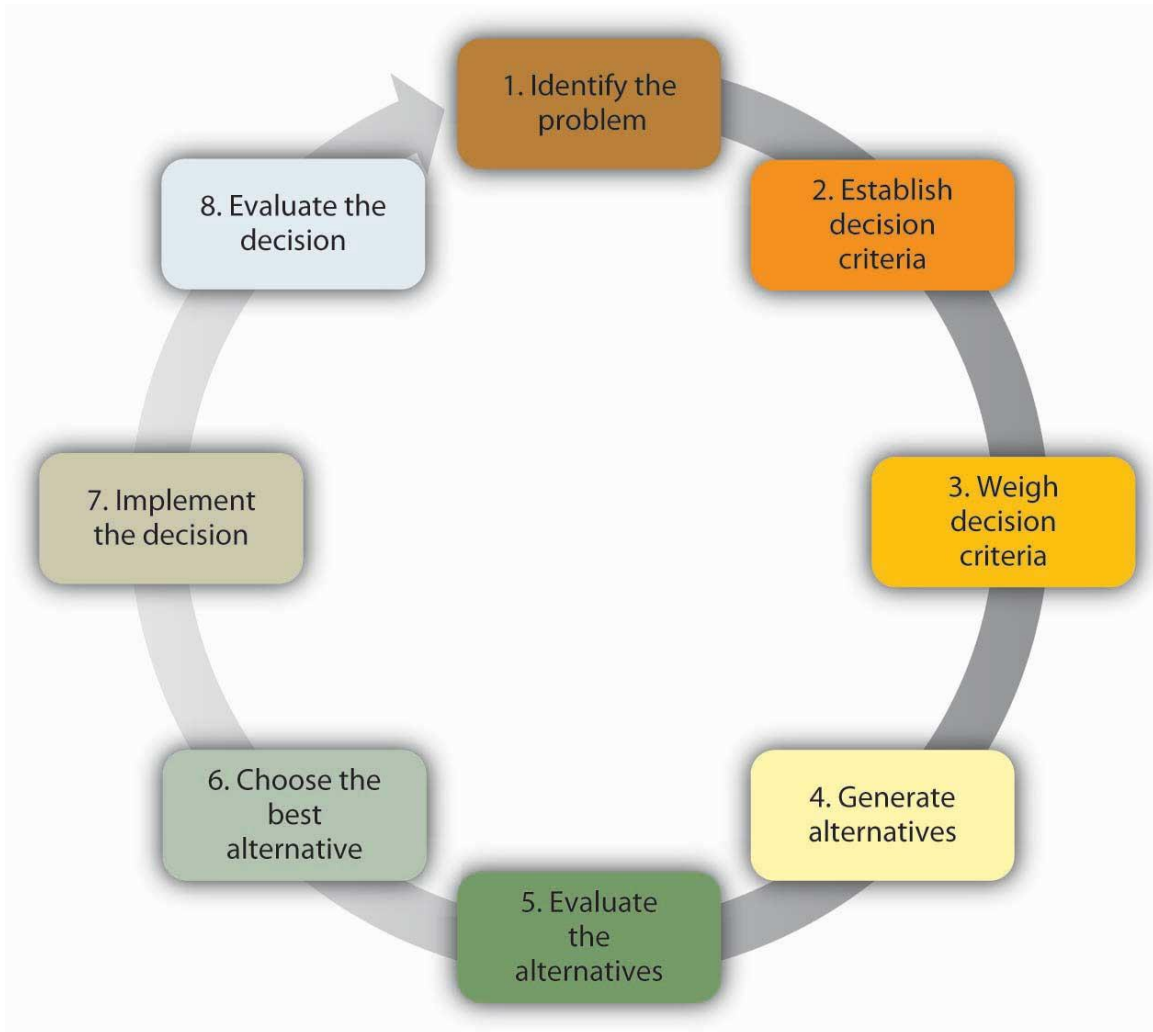
Dicode (dicode-project.eu) was funded by the European Commission, Information Society and Media Directorate General, under the FP7 Cooperation Programme

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

Herbert Simon (1916-2001)

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



- “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

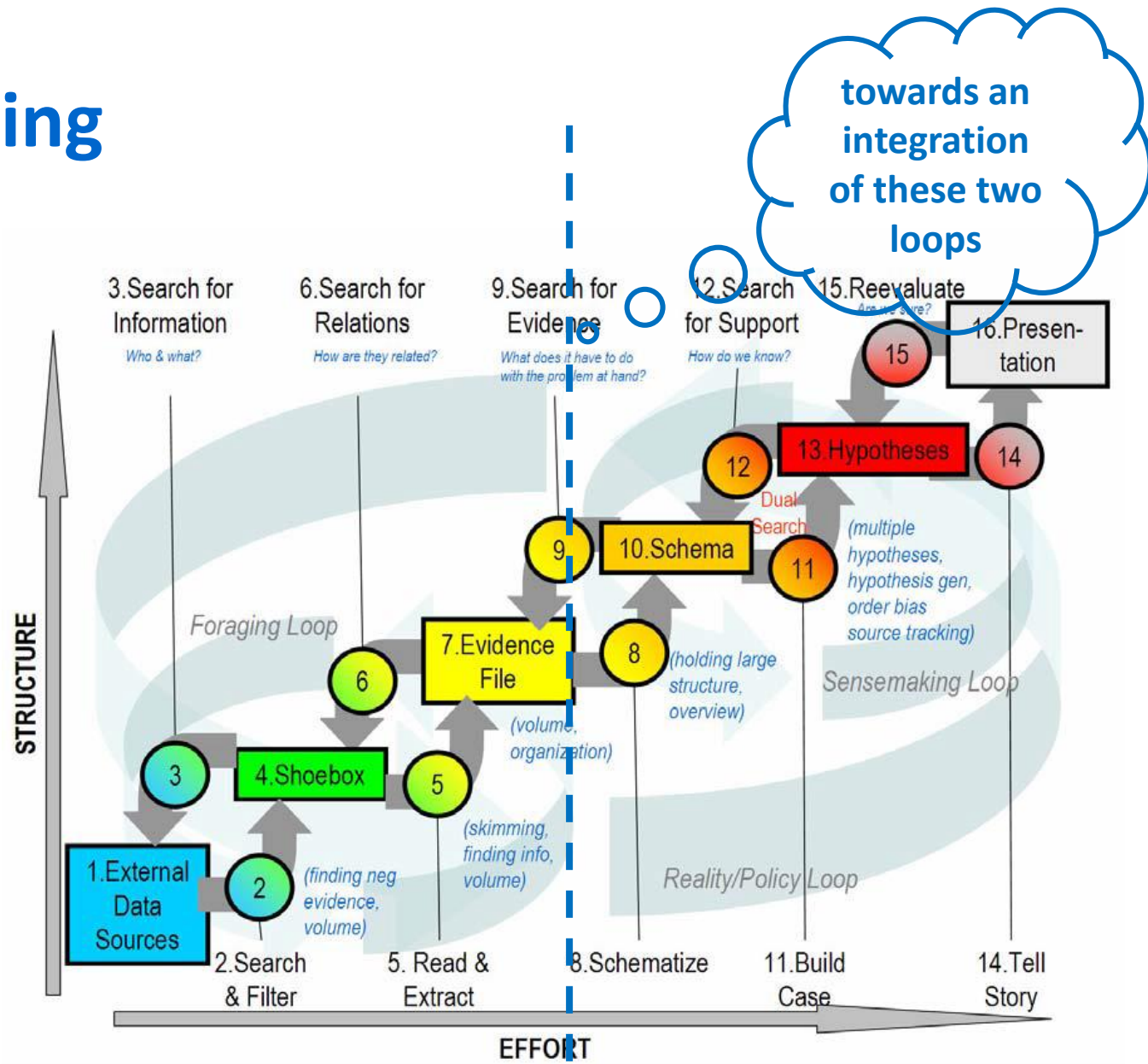
- Use of communication and information processing technology to make collaboration more efficient and effective
- Work structuring in order to improve coordination
- (Semi-) Automation of data processing
 - especially in data intensive situations
- User/group modeling
- Visualization
- Argumentation & 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.



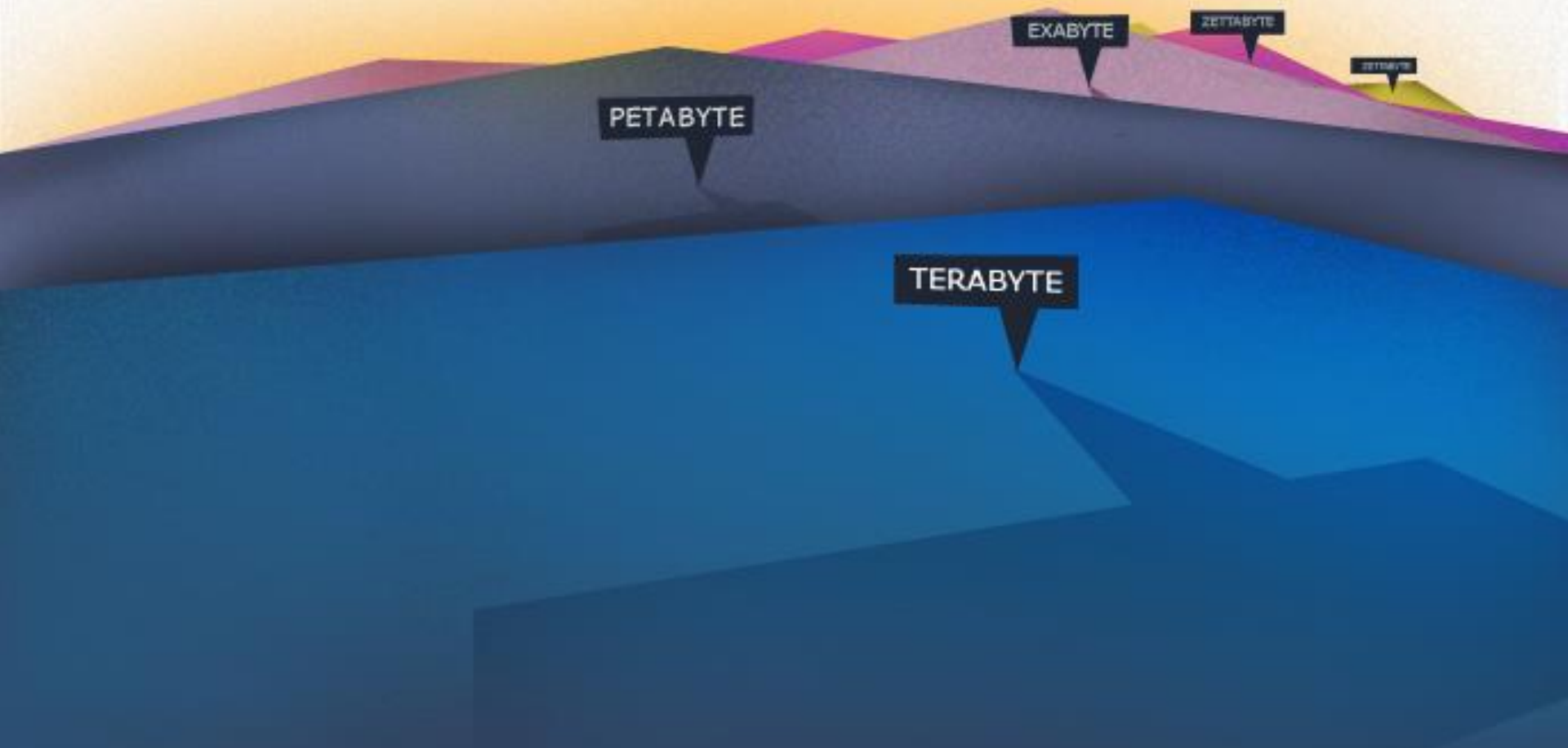
State-of-the-art and beyond (1/2)

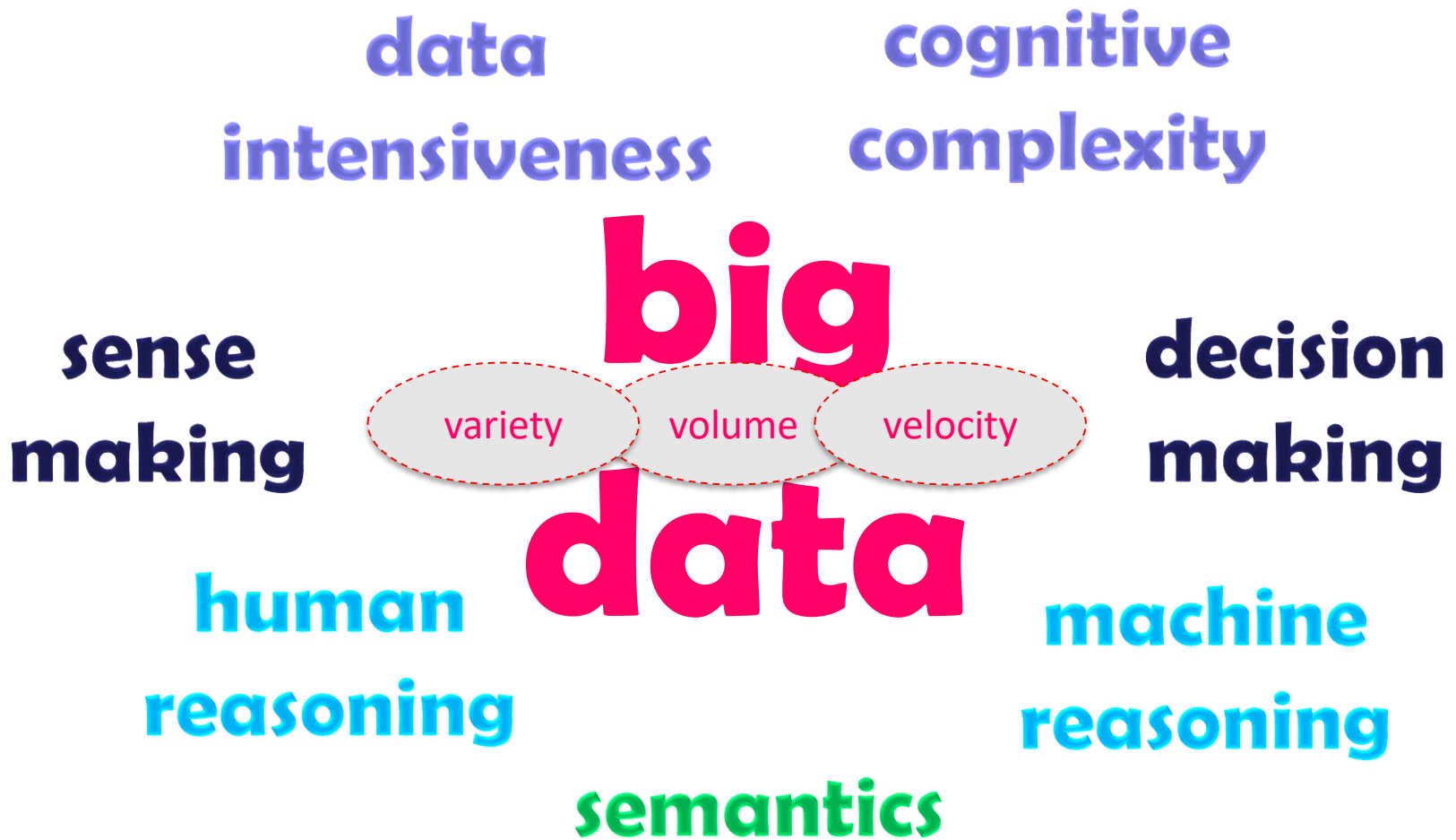
- Collaboration support
 - Current tools are “information islands” → increased interoperability and synergy with third party tools
 - Web 2.0 collaboration tools are rather passive media → intelligent reasoning services to actively and meaningfully support collaboration
 - Web 2.0 collaboration tools 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





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 overestimated
 - Its value is in the information that can be extracted from it
 - Information is only the predominant portions of the data, which is a 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

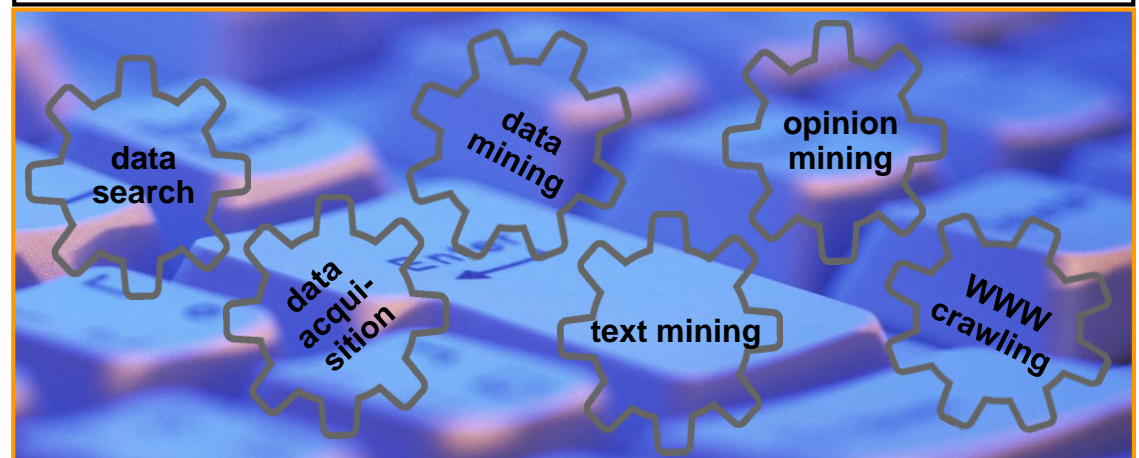
Synergy of human & machine reasoning

proper
orchestration
and exploitation
of each side's
strengths



Collaboration Support Decision Making Support

Scalable High-Performance Data Mining



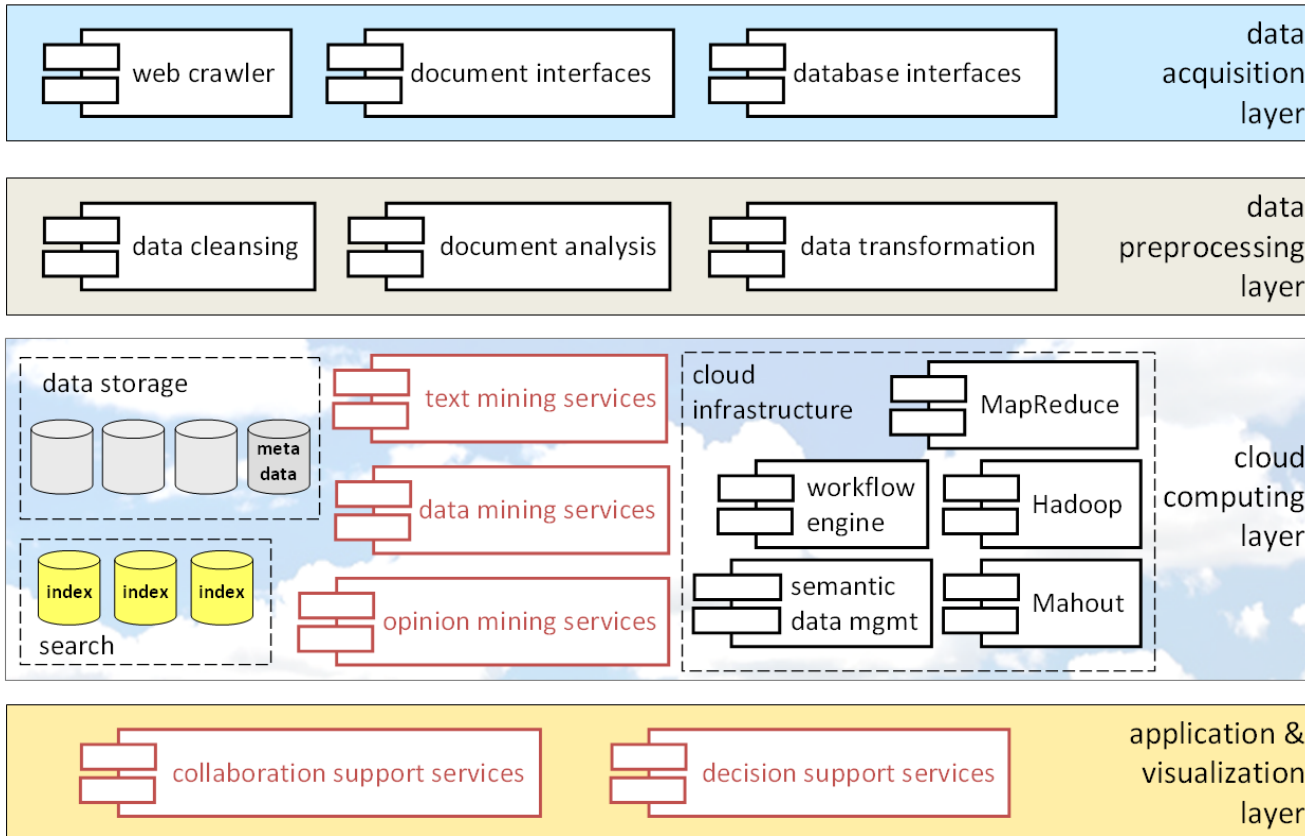
Achievements

A close-up, low-angle shot of a red brick wall. The bricks are arranged in a traditional pattern, with some showing signs of wear and discoloration. The mortar is a light grey color. The wall recedes into the distance, creating a sense of depth. The word "Achievements" is overlaid in white, sans-serif font on the left side of the image.

The Dicode architecture



data sources
(documents,
databases,
world wide web)



The Dicode Workbench

The screenshot displays the Dicode Workbench interface, which is a collaborative workspace for medical research. The main workspace is titled "Prostate cancer: Alternative treatment" and is divided into four colored panels, each representing a different aspect of the treatment:

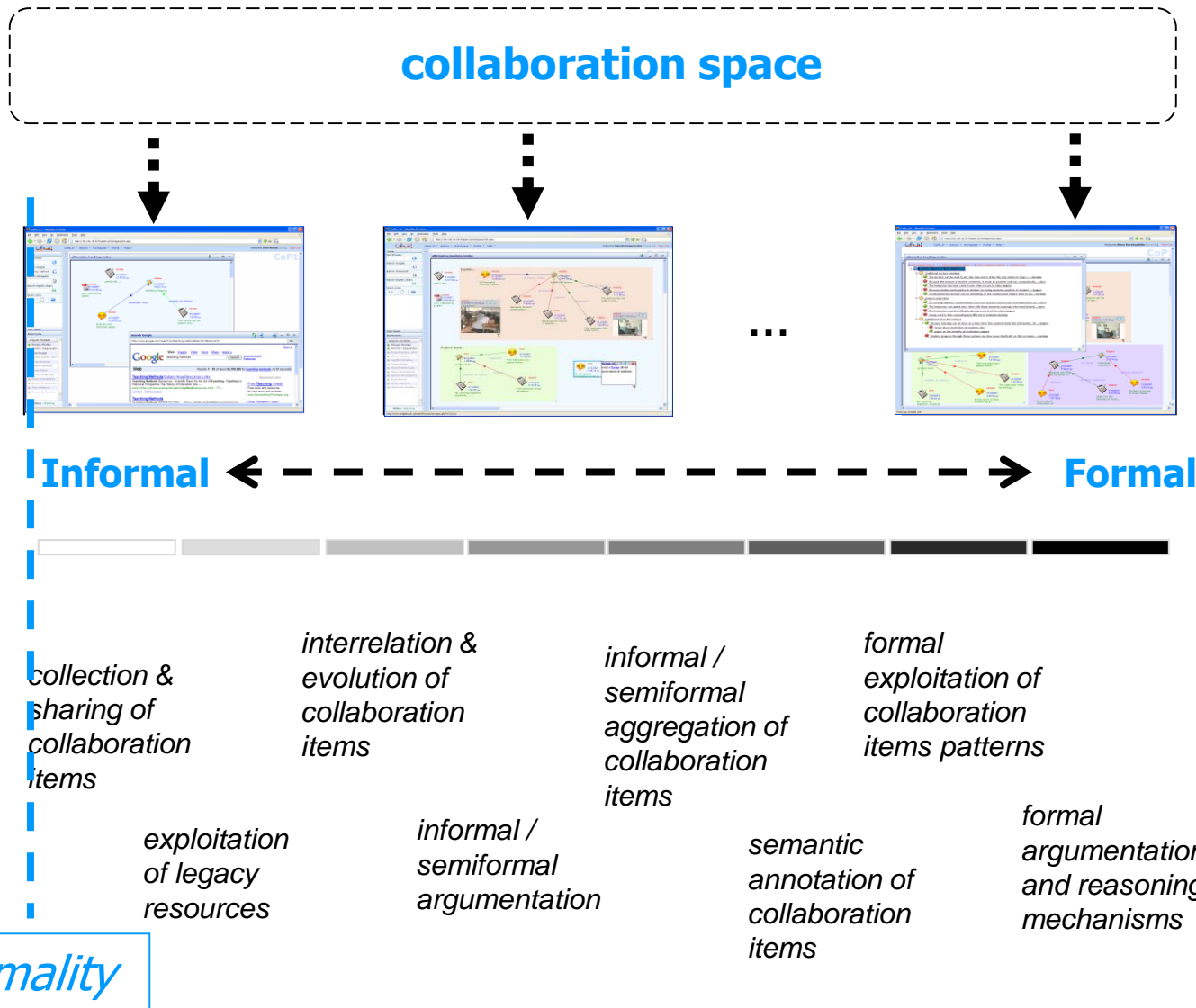
- Relevant resources (Pink):** Lists two PDF documents: "RadicalProstatectomy-Survey" by a Urologist and "RandomizedTrialsForActiveSu..." by a Physician.
- Active Surveillance (Orange):** A network diagram showing a central node "Active Surveillance" connected to "Physician" (avoiding radiation side effects) and "Jane Monro..." (requiring close monitoring).
- Radical Prostatectomy (Yellow):** A network diagram showing "Radical prostatectomy" connected to "Jane Monro..." (erectile dysfunction), "Urologist" (prevention of solution), "Urologist" (accurate staging), and "Urologist" (PSA levels predict recurrence).
- Brachytherapy (Blue):** A network diagram showing "Brachytherapy for prostate..." connected to "Jane Monro..." (no post-treatment) and "Urologist" (mini map).

Surrounding the main workspace are several utility panels:

- Storage Service:** Shows "Users files" and options for "Upload", "Config.", and "About".
- Locations:** Displays "Locations of Twitter users" for the date 2012-10-28 with a map.
- Forum Summariz:** Includes a "Main Menu" and "All Questions" section, and a "Cross Validated Statistics Forum - Topic Clouds" visualization.
- Pubmed:** A search interface with a search bar and a "Search" button.
- Doc. Viewer:** A document viewer area with a "Drag the document you want to view here or Open Document" instruction and a downward arrow.
- Entity Prominence:** A "Prominence Graph" showing entities like "Mercedes-Benz", "Audi", and "BMW".

The interface includes a top navigation bar with "Add Services", "Save Config", "Workspace Info", "Help", and "Exit". A "Hello, alice" greeting is visible in the top right. The bottom of the screen contains a copyright notice: "Copyright © 2010 Dicode project * About DICODE * Contact" and a "VSC" logo.





Collaboration workspaces



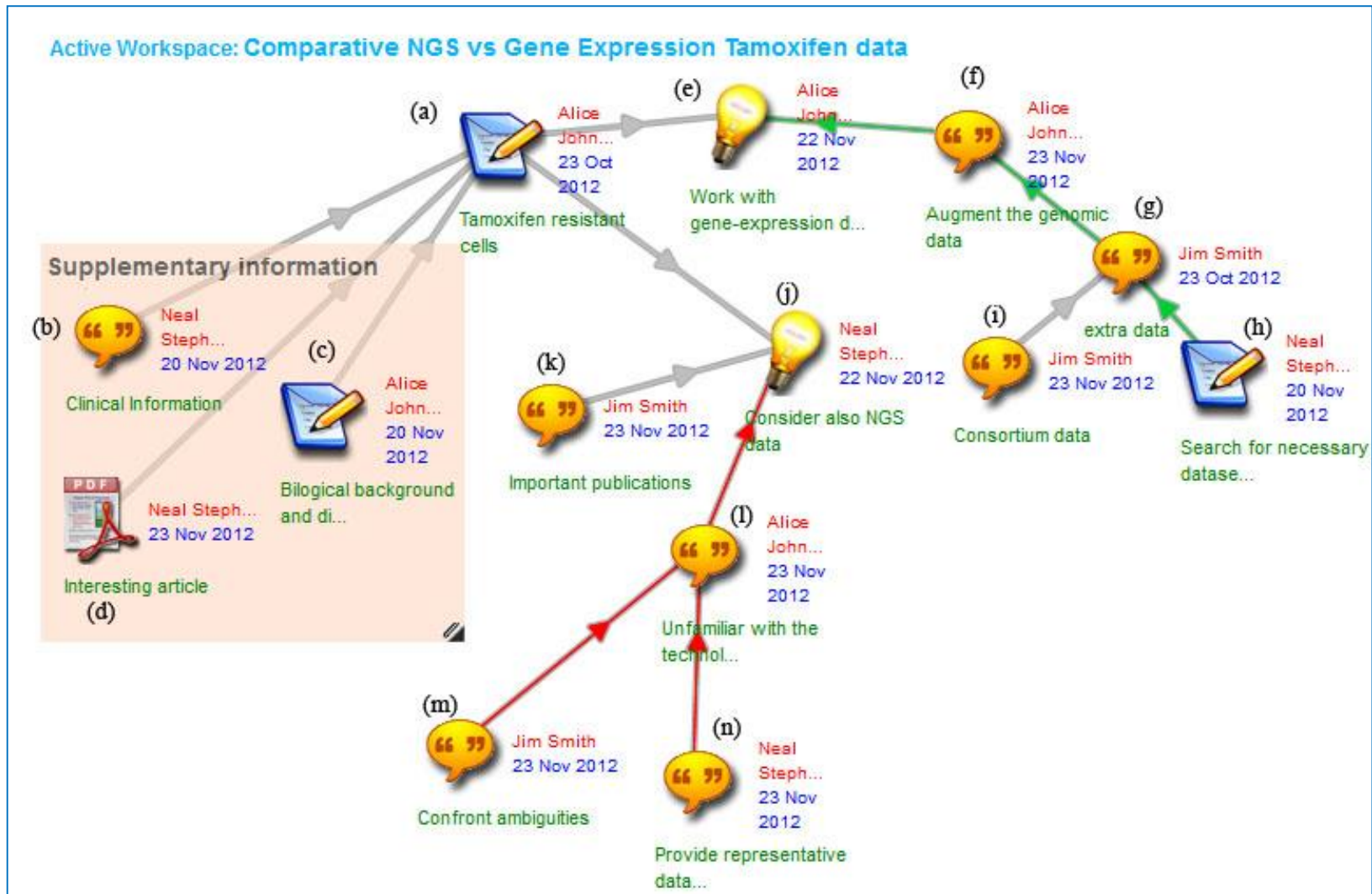
Collaboration workspace: Forum view

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

[Post Reply](#) [Relevant discussions](#)

Author	Message
 Physician Physician	<h3>Avoids radiation side effects from radiation</h3> <p>Posted on 10/23/2012 5:09 PM</p> <p>QUOTE</p> <p>Avoids site effects from radiation therapy or prostatectomy</p>
 jane Jane Monroe	<h3>Requires close monitoring</h3> <p>Posted on 10/23/2012 5:11 PM</p> <p>QUOTE</p> <p>Requires close monitoring (regular digital rectal exams, PSA tests, and prostate biopsy) to monitor for signs of progression</p>
 Urologist Urologist	<h3>Proven solution</h3> <p>Posted on 10/23/2012 5:16 PM</p> <p>QUOTE</p> <p>Proven to reduce prostate cancer death rates</p>
 Urologist Urologist	<h3>Accurate staging</h3> <p>Posted on 10/23/2012 5:17 PM</p> <p>QUOTE</p> <p>Removed tissue allows accurate staging. This is very important.</p>

Collaboration workspace: Mind-map view



Collaboration workspace: Filtering items

Get items created by users:

<input type="checkbox"/>	Login	Full name
<input type="checkbox"/>	sysadmin	Dicode Administrator





Get items modified by users:

<input type="checkbox"/>	Login	Full name
<input type="checkbox"/>	neal	Neal Stephenson
<input type="checkbox"/>	tzagara	Manolis Tzagarakis
<input type="checkbox"/>	alice	Alice Johnson
<input type="checkbox"/>	jsmith	Jim Smith
<input type="checkbox"/>	goldin	

Select mime types:

<input type="checkbox"/>	Mime type
<input type="checkbox"/>	html

Select ktypes:

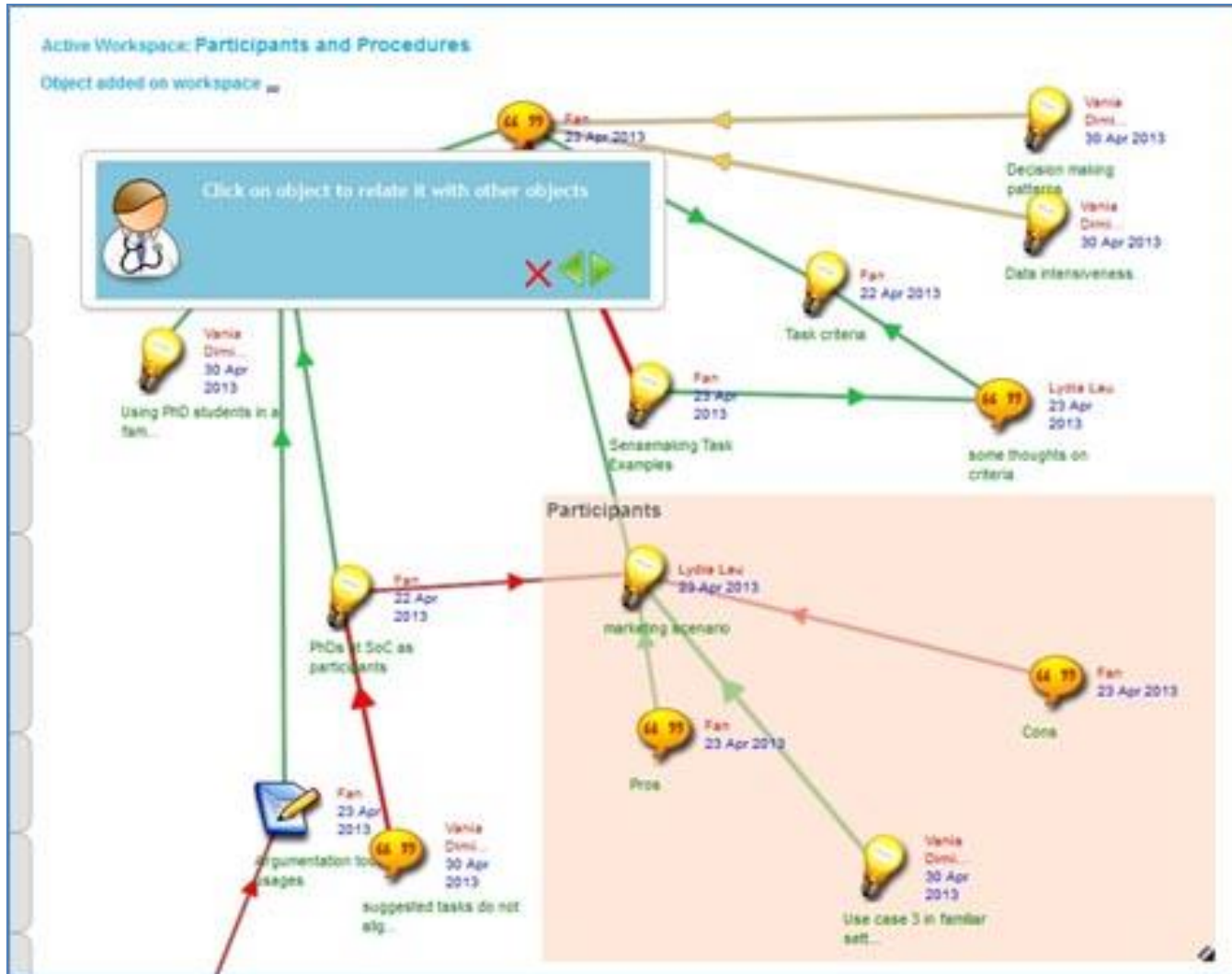
<input type="checkbox"/>	Ktype
<input type="checkbox"/>	 unknown
<input type="checkbox"/>	 comment
<input type="checkbox"/>	 note
<input type="checkbox"/>	 data_mining

Item creation date: 20/10/2011 - 14/2/2012

Argumentation level: 3

Title:

Collaboration workspace: Proactive help



Collaboration workspace: Formal view

The screenshot shows a Firefox browser window with two tabs: "http://dicodedev....tml?SpaceID=28224" and "RecalculateDiscussion". The address bar displays "dicodedev.cti.gr/workspace/formal/agora.aspx?ID=28224#". The page features a navigation bar with the following options: [View detail window](#), [View submission dates](#), [View message creators](#), and [Generate Report](#).

The main content is a hierarchical tree structure representing a collaboration workspace. The root node is "Comparative NGS vs Gene Expression Tamoxifen data :: *neal*". It has several child nodes:

- [Work with gene-expression data :: *alice*](#)
 - [Augment the genomic data :: *alice*](#)
- [Consider also NGS data :: *neal*](#)
 - [Unfamiliar with the technology :: *alice*](#)
 - [Provide representative dataset :: *neal*](#)
 - [Confront ambiguities :: *ismith*](#)
 - [Notable agreement between NGS and GE analyses :: *alice*](#)
 - [SD for Tam data :: *alice*](#)
 - [SD for Tam RNA-Seq :: *neal*](#)
 - [Important publications :: *ismith*](#)

Decision Making view

WSM Results - Alternatives Ranking

- 1. Radical prostatectomy
- 2. Active Surveillance
- 3. Brachytherapy for prostate cancer

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

AHP - Setting relative weights

- 1 Features comparison
Comparing the features
- 2 Alternative comparison
wrt 'Rating'
- 3 Alternative comparison
wrt 'Relations'
- 4 Alternative comparison
wrt 'User Rating'
- 5 Alternative comparison
wrt 'Likes/Dislikes'

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

Workspace analytics view



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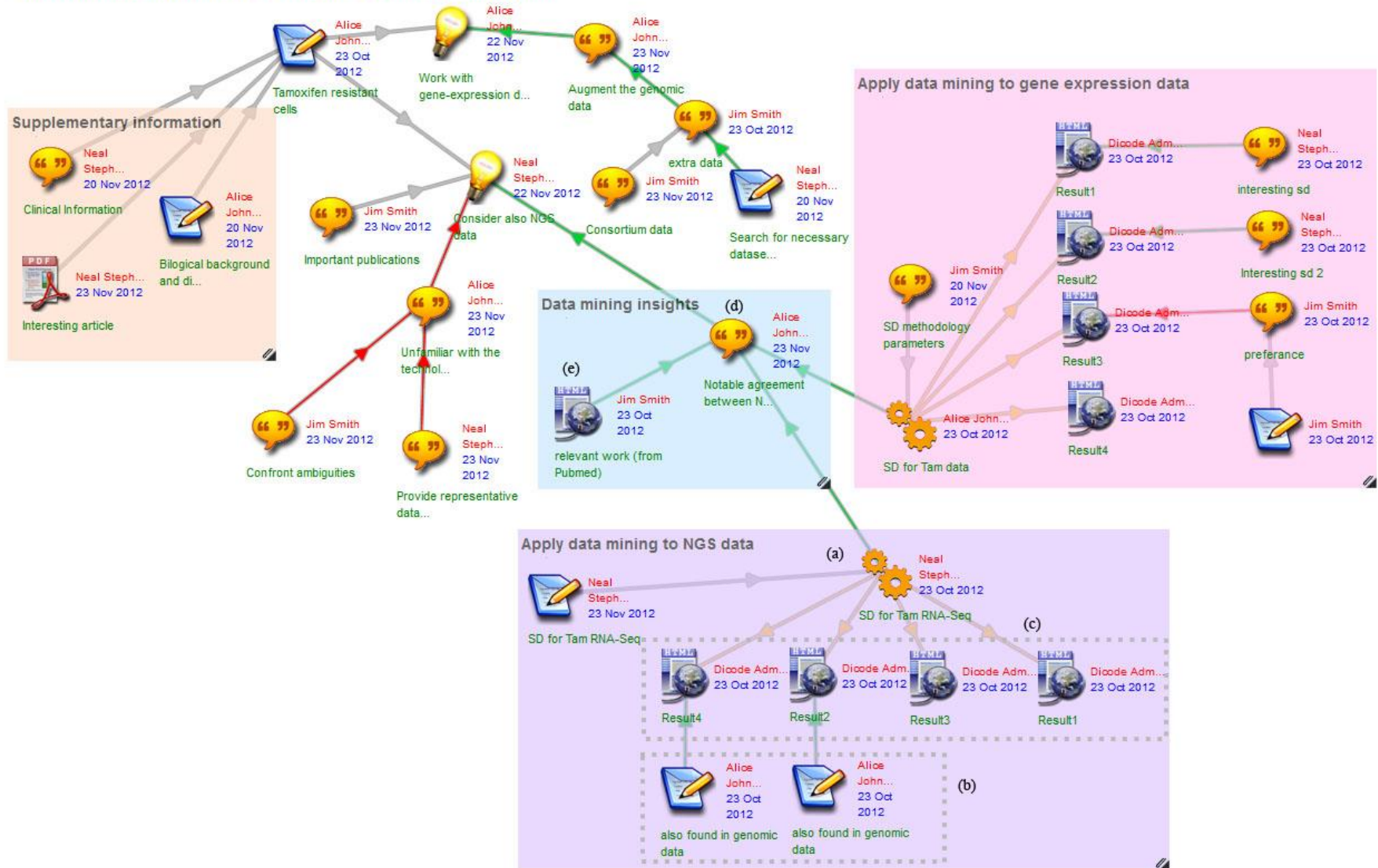
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Integrating services

Active Workspace: Comparative NGS vs Gene Expression Tamoxifen data



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!

