

# Semantic Wave 2006

Executive Guide  
to the Business Value  
of Semantic Technologies

KM.GOV  
Semantic Interoperability  
Community of Practice (SICOP)  
Whitepaper series Module-2  
Version 1.1





**WARNING!**  
**This presentation makes**  
**Forward Looking Statements**

Any statements in this presentation that are not historical facts are forward-looking statements that involve risks and uncertainties; actual results may differ from the forward-looking statements. Sentences or phrases that use such words as "believes," "anticipates," "plans," "may," "hopes," "can," "will," "expects," "is designed to," "with the intent," "potential" and others indicate forward-looking statements, but their absence does not mean that a statement is not forward-looking. Factors that could have a material and adverse impact on actual results are described in Part-2 of the Semantic Wave 2006 report. No Form 10-K has been filed with the Securities and Exchange Commission under the heading "Risk Factors." The presenter undertakes no obligation to publicly release the results of any revisions to these forward-looking statements that may be made to reflect events or circumstances after the date hereof or to reflect the occurrence of unanticipated events.



# Mills Davis

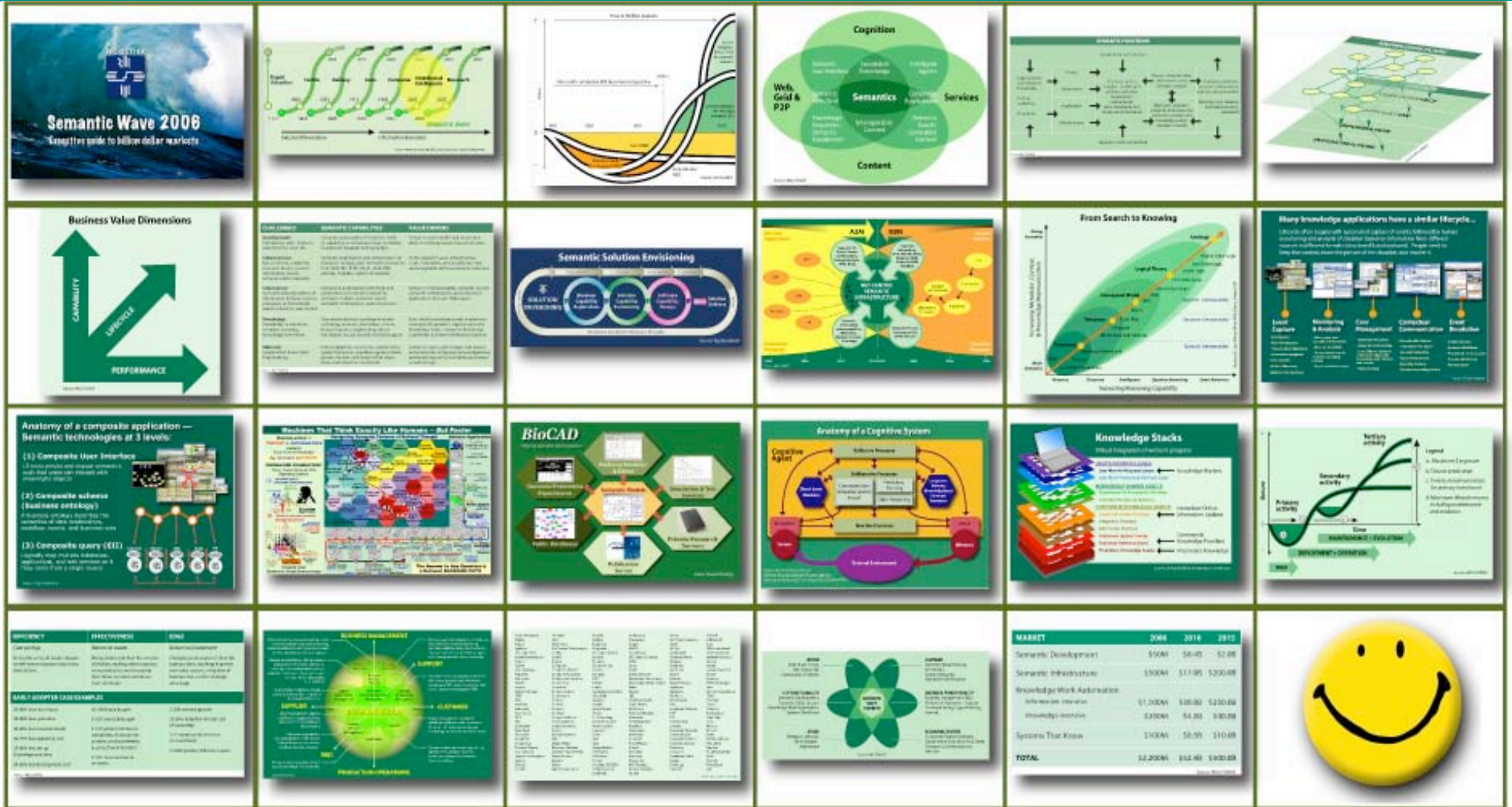


- Mills Davis is Project10X's managing director for industry research and strategic programs. He consults with technology manufacturers, global 2000 corporations, and government agencies on next-wave semantic technologies and solutions.
- Mills serves as lead for the Federal CIO council's Semantic Interoperability Community of Practice (SICoP) research into the business value of semantic technologies. Also, he is a founding member of the AIIM interoperable enterprise content management (iECM) working group, and a founding member of the National Center for Ontology Research (NCOR).
- A noted researcher and industry analyst, Mills has authored more than 100 reports, whitepapers, articles, and industry studies.

# Panelists

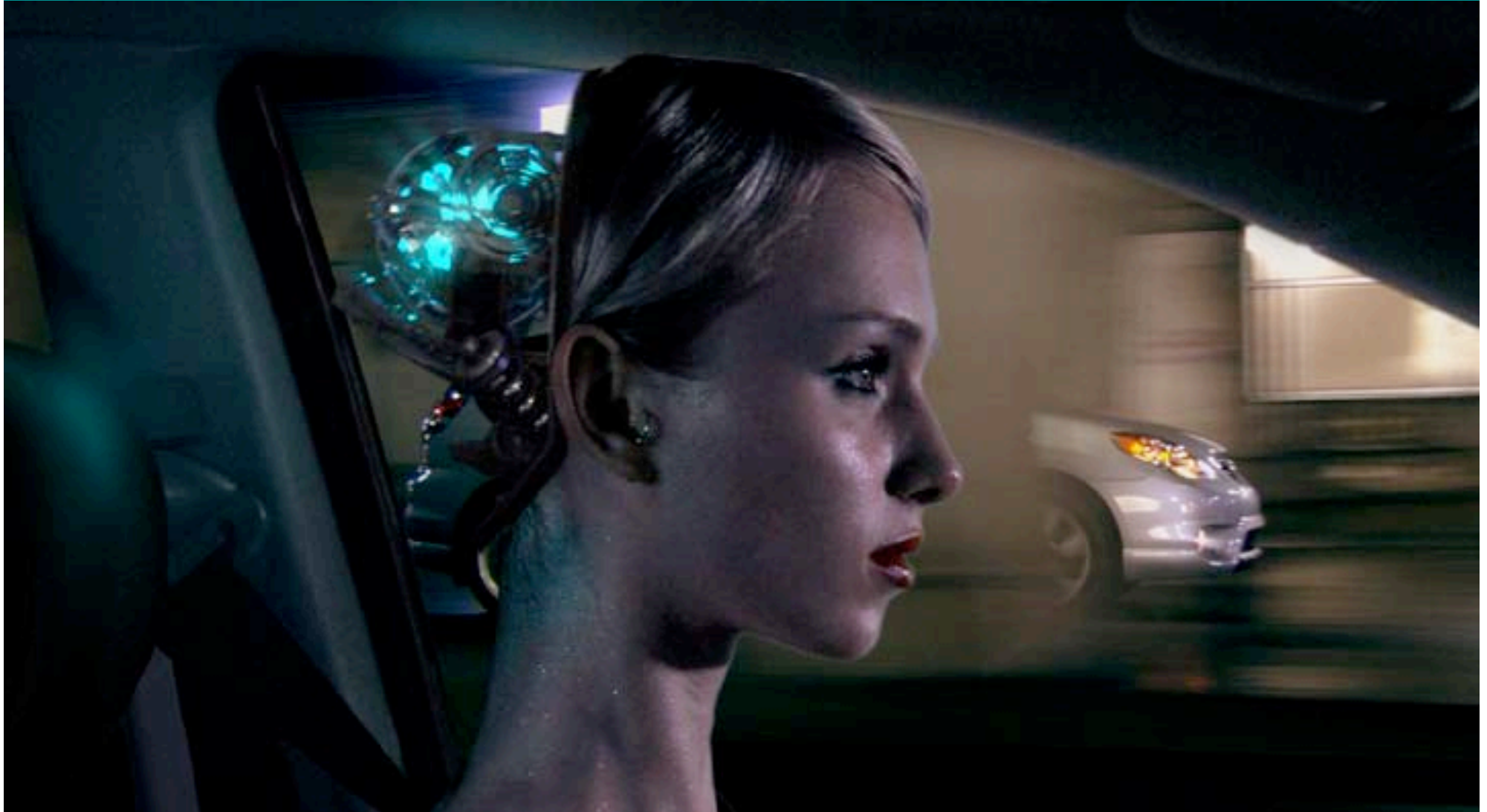
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# Semantic Wave 2006 at a glance\*



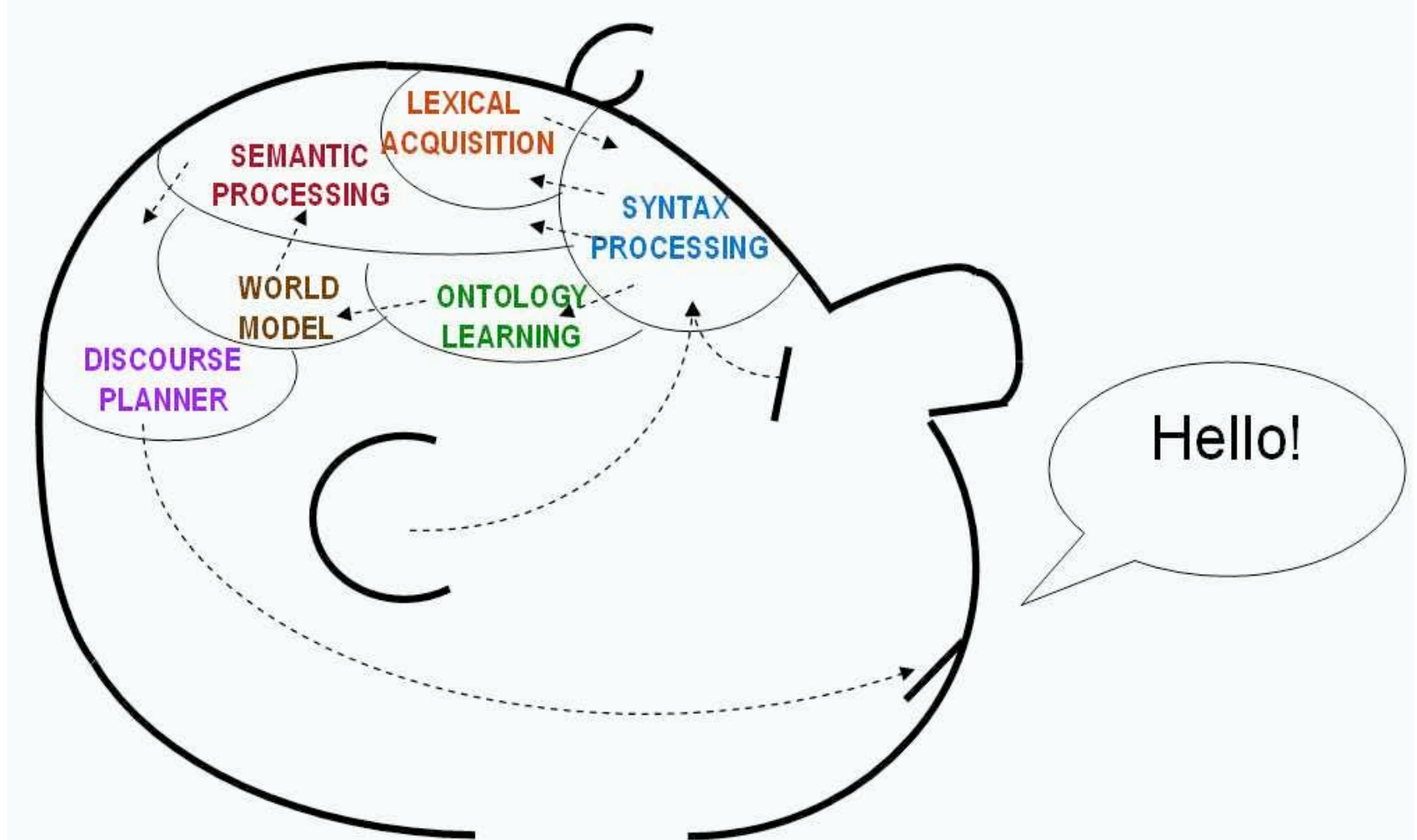
\* Portions of the material presented in this report were developed by Project10X in collaboration with TopQuadrant, Inc.  
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# Shift in paradigm, technology & economics

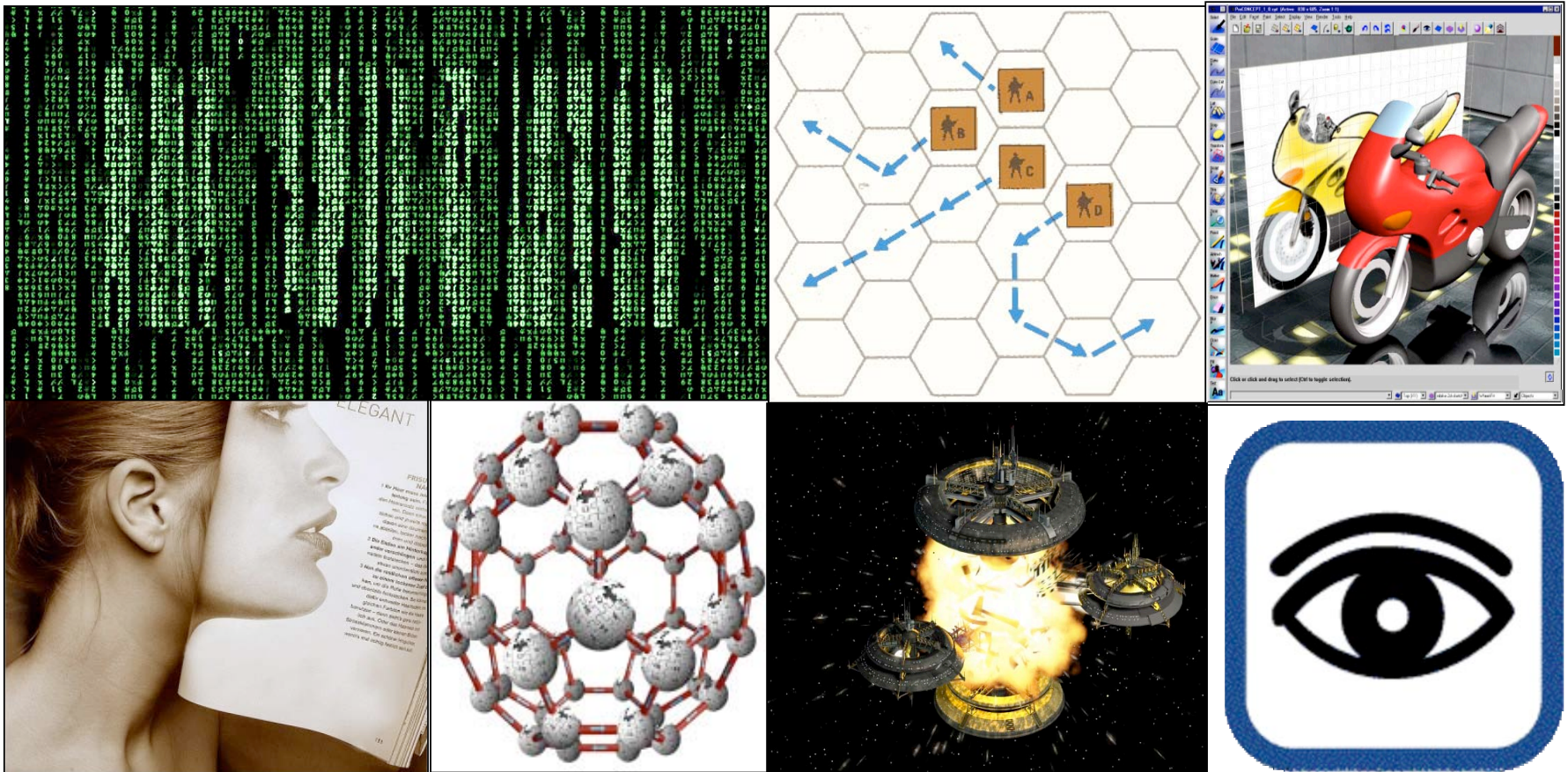




# Representing meanings & knowledge about things so both computers and people can work with it

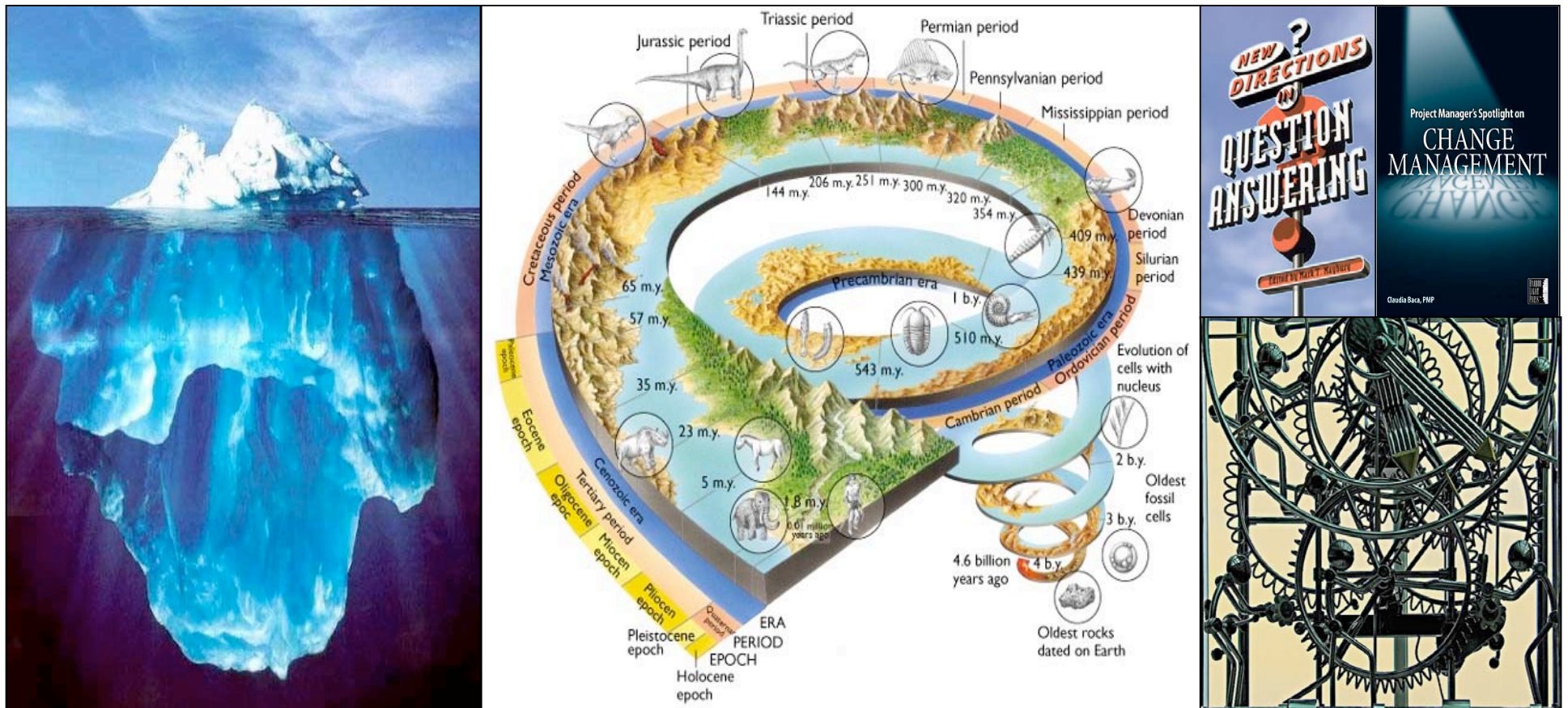


# Knowledge about infrastructure, information, behavior, & domain expertise modeled separately from programs and data...

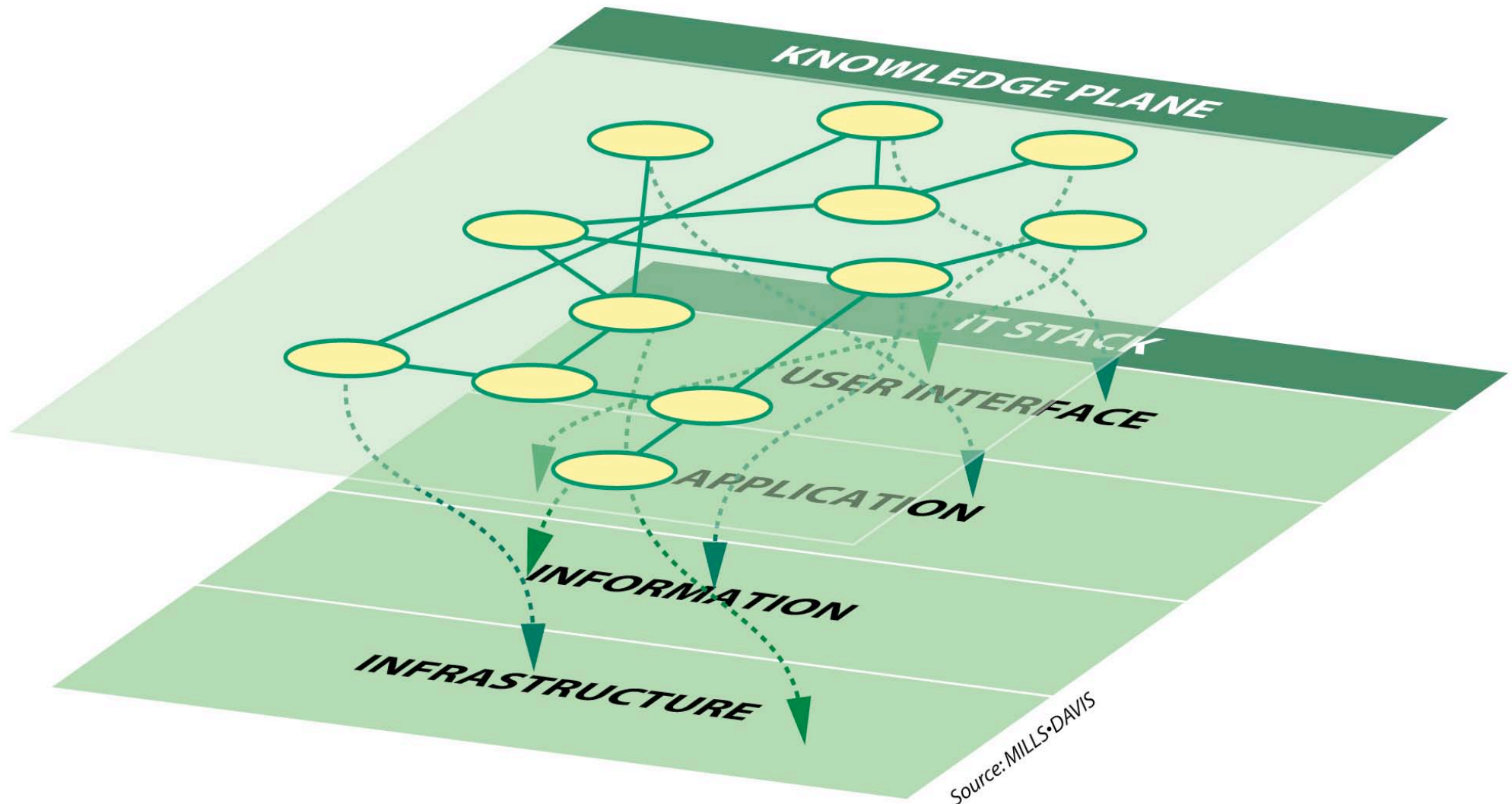




# To solve problems of scale, complexity, function, performance, and cost

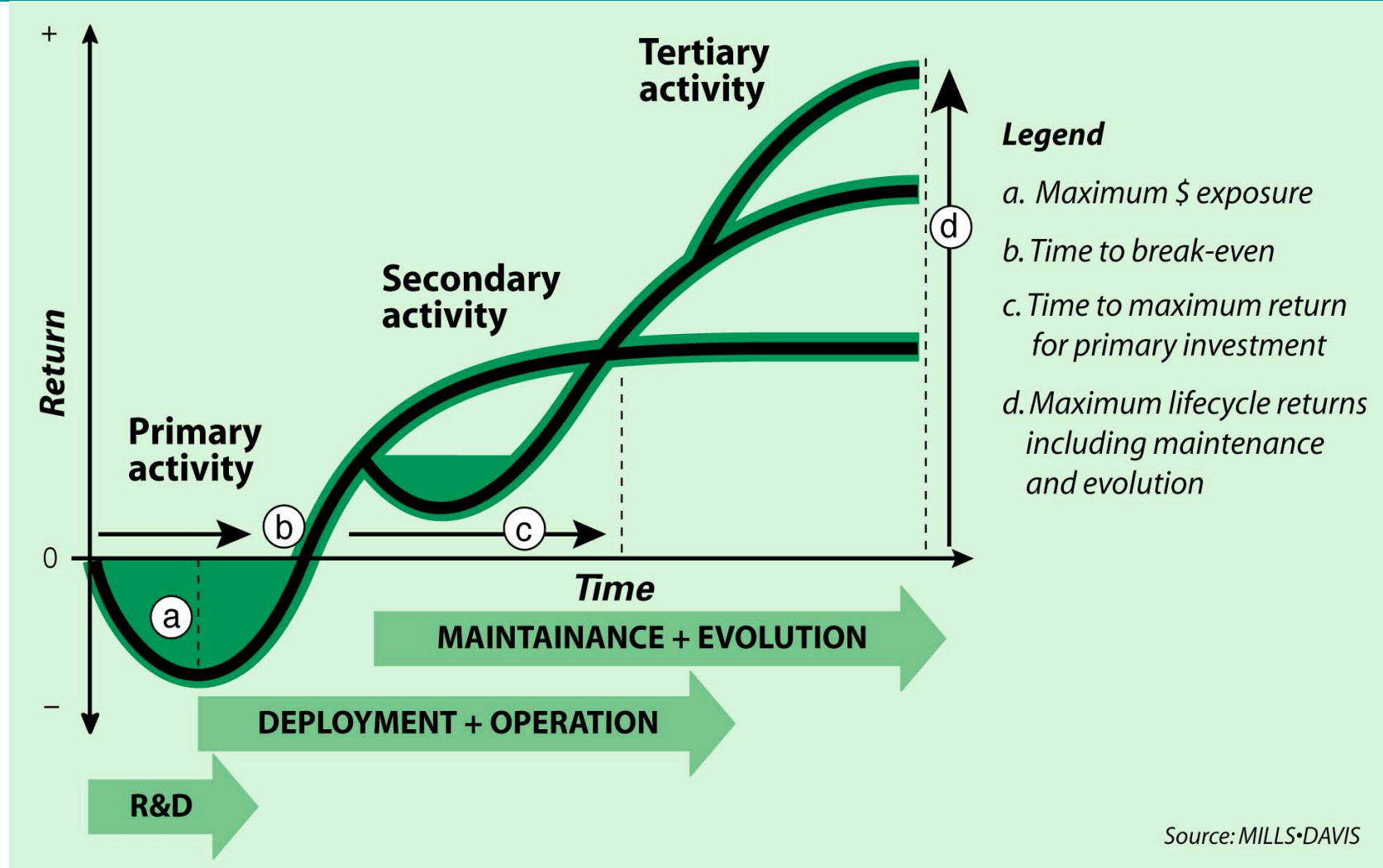


# Impacts all layers of the IT stack

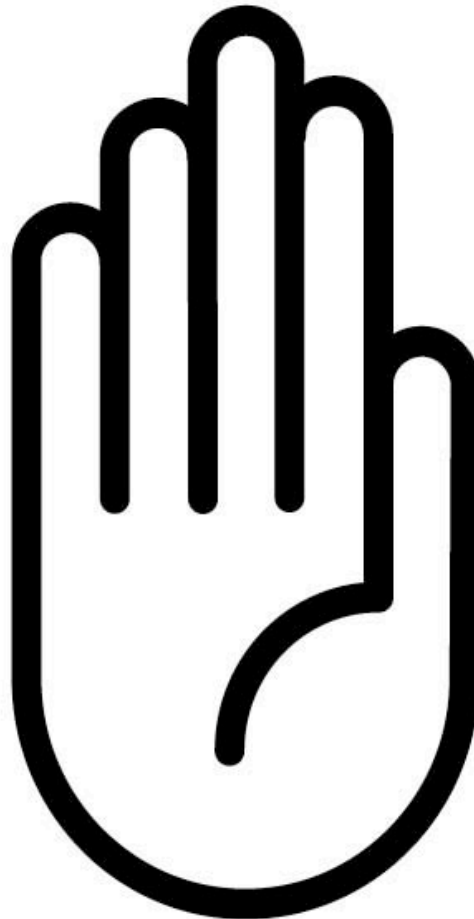




# Impacts all stages of the solution lifecycle



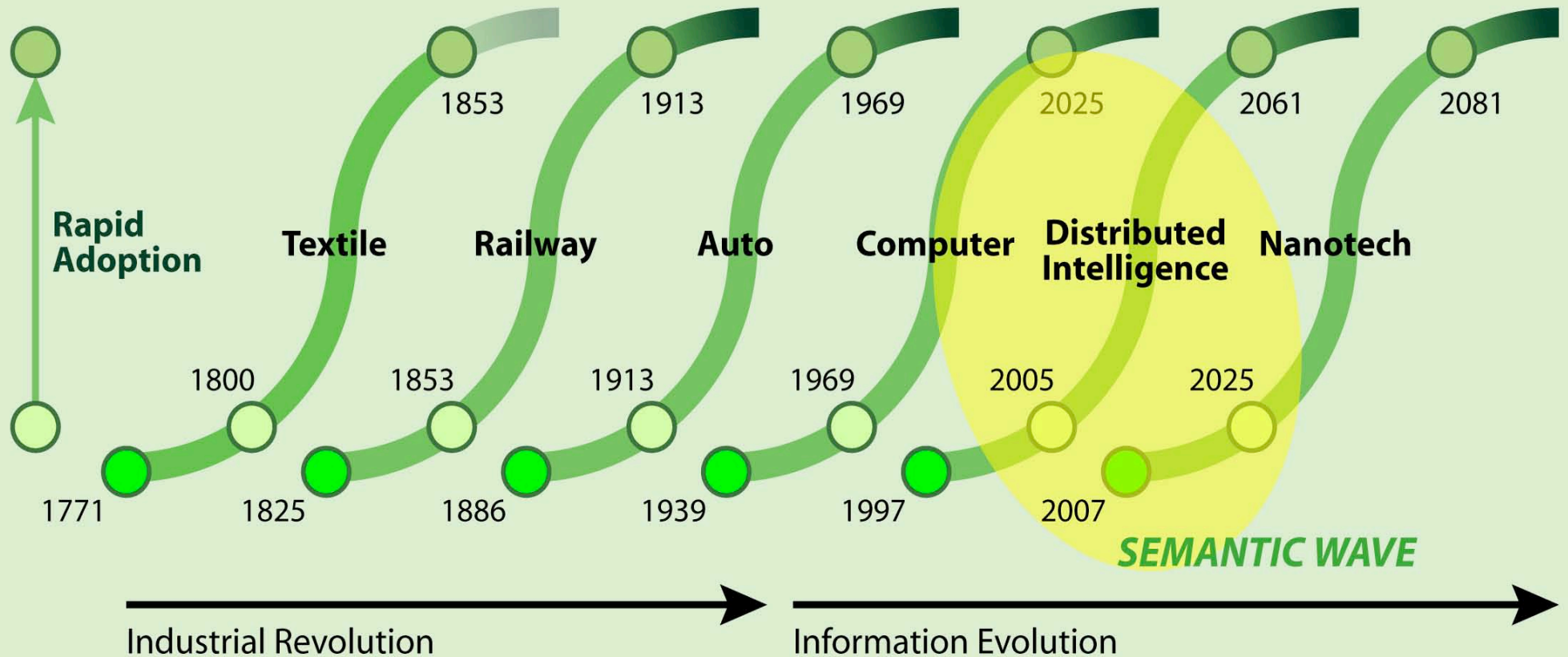
# Q&A





# Back-up Slides

# What is the semantic wave?



Source: Norman Poire, Merrill Lynch, based on Joseph Schumpeter



# Why are semantic technologies needed now?

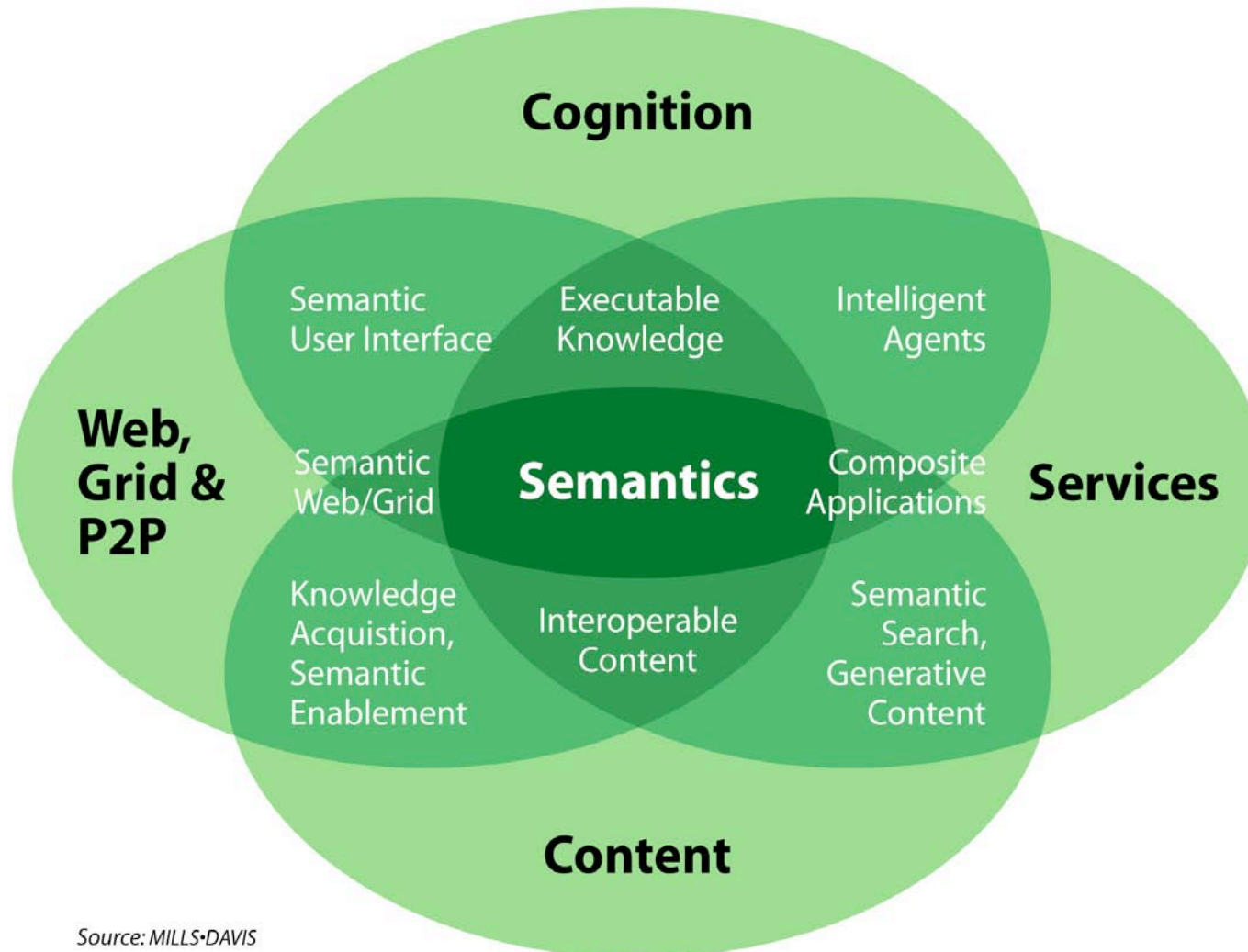
To address the challenge and opportunity of:

- Net-centric infrastructure
- Information-intensive knowledge work
- Knowledge computing
- Systems that know what they're doing

# What are semantic technologies?

- Tools that represent meanings, associations, theories, and know-how about the things and their uses separately from data and program code.
- This knowledge representation is called an ontology — a run-time semantic model of information, defined using constructs for:
  - Concepts – classes, things
  - Relationships – properties (object and data)
  - Rules – axioms and constraints
  - Instances of concepts – individuals (data, facts)

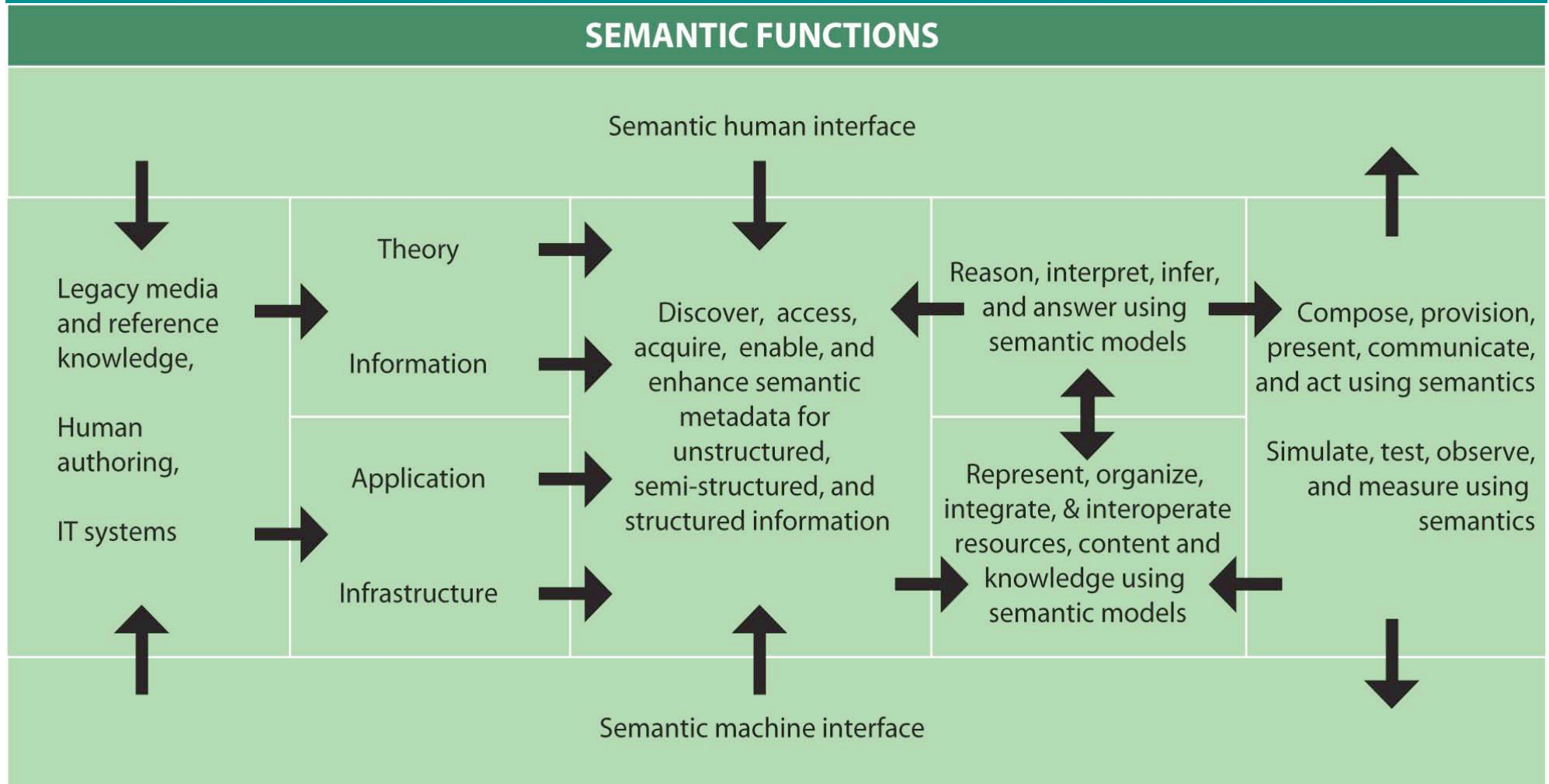
# What is the scope of semantic technology R&D?



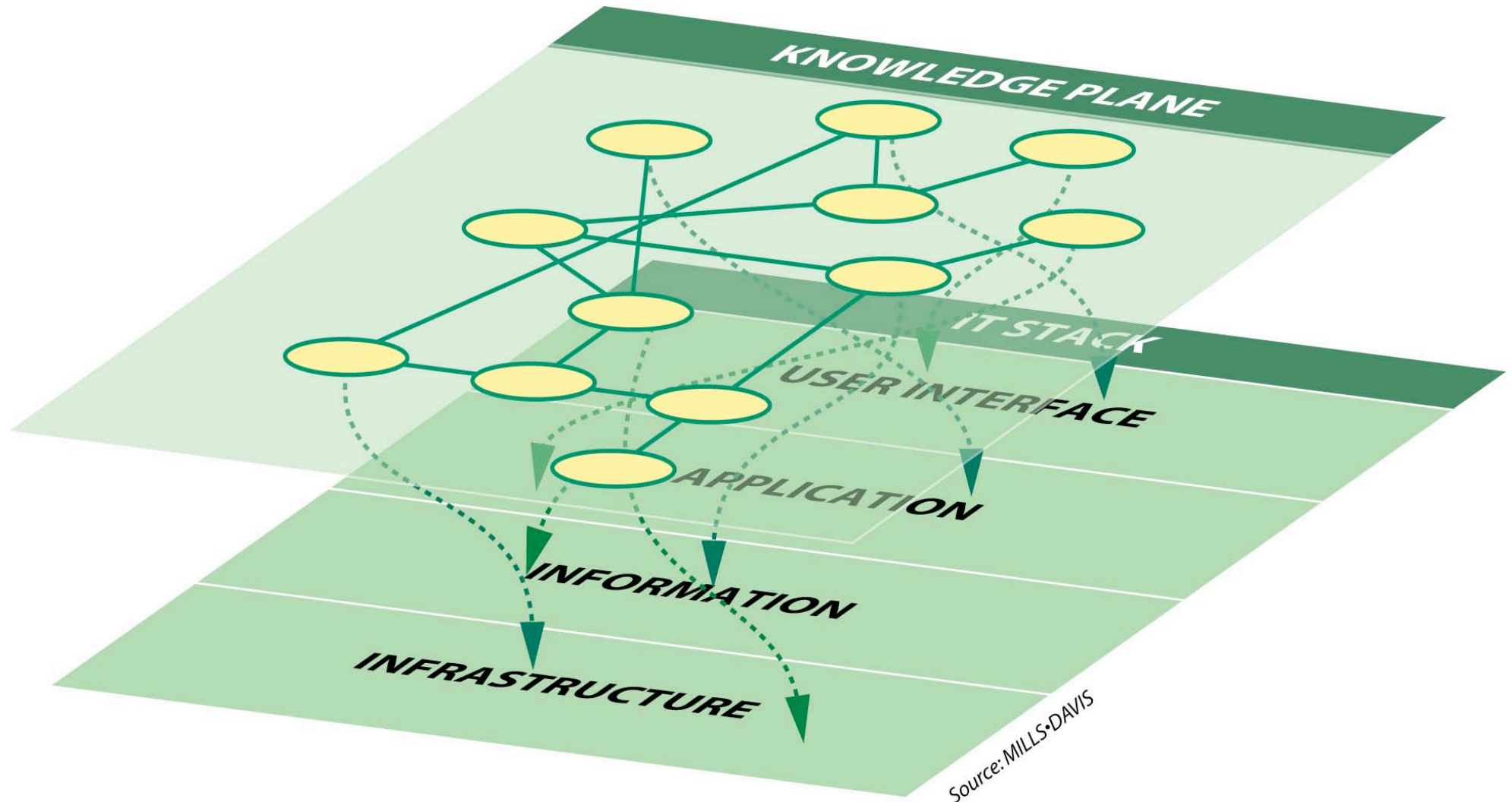
Source: MILLS•DAVIS



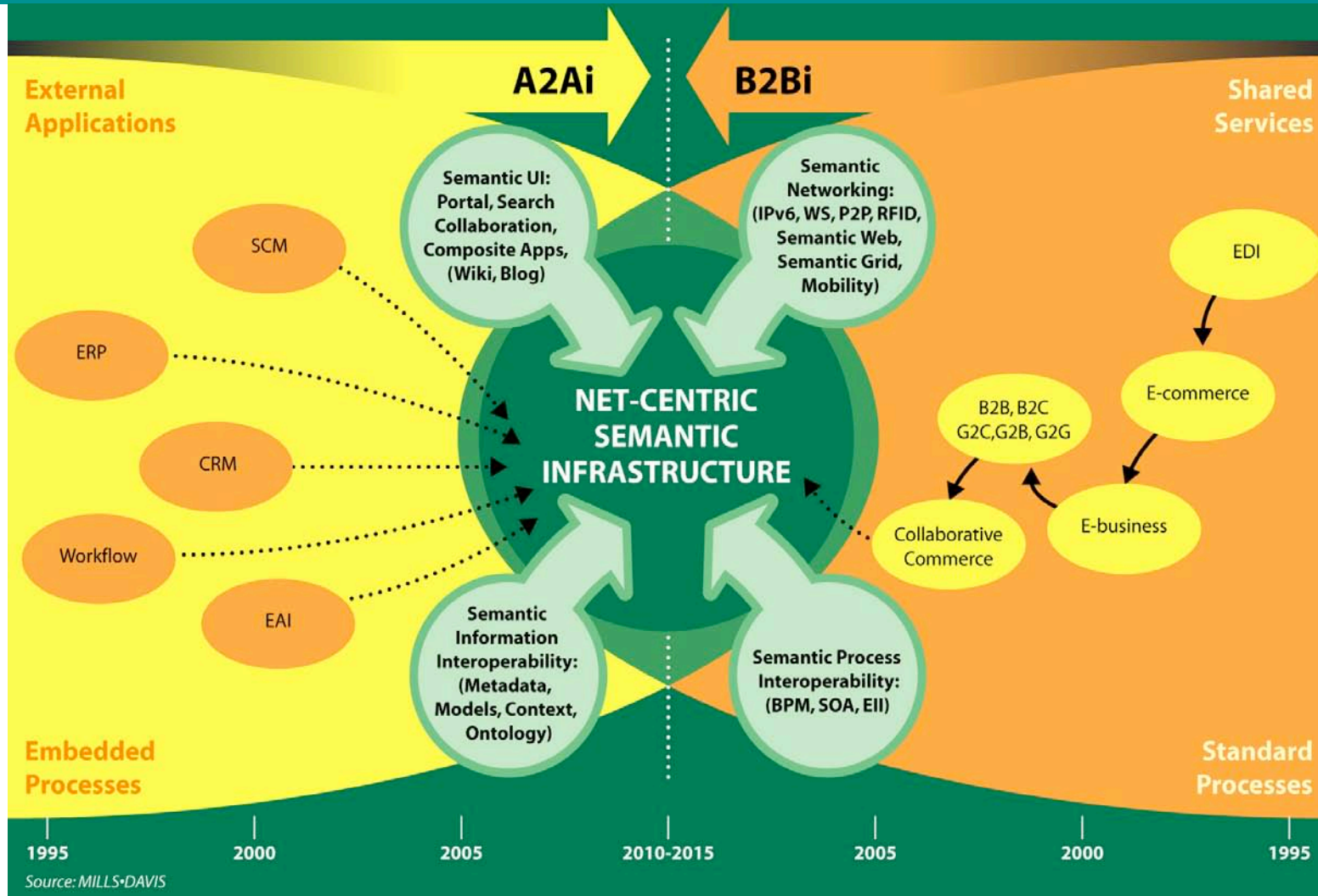
# What are the functions of semantic technologies?



# How do semantic technologies impact information and communications technologies?

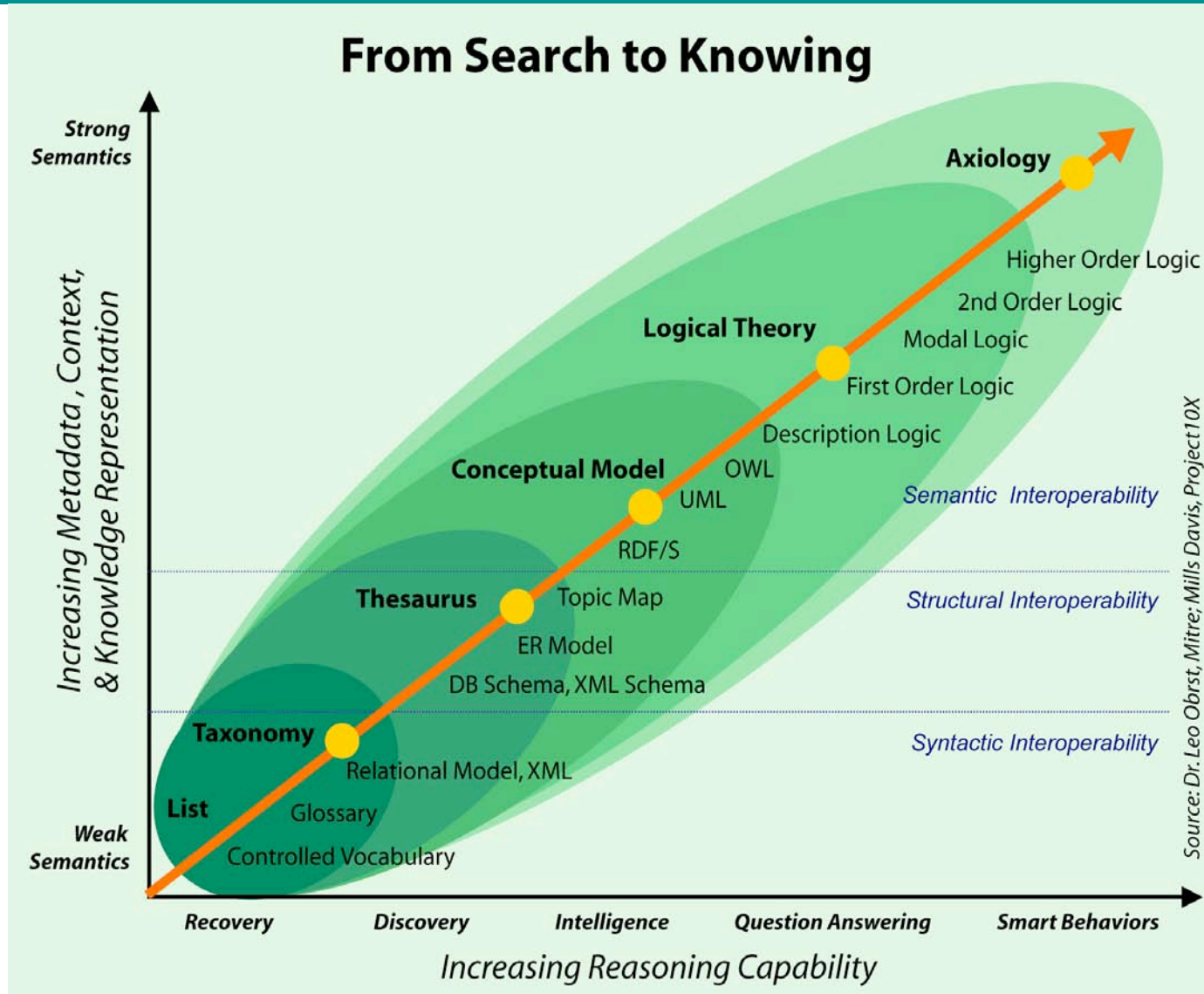


# How do semantic capabilities impact infrastructure?





# How do semantic technologies impact information and knowledge?



# How do semantic technologies impact information-intensive work?

## Many knowledge applications have a similar lifecycle...

Lifecycle often begins with automated capture of events, followed by human monitoring and analysis of situation based on information from different sources in different formats (structured & unstructured). People need to keep the context, share the picture of the situation, and resolve it.



Source: Digital Harbor

# Anatomy of a composite application powered by semantic models

## Anatomy of a composite application — Semantic technologies at 3 levels:

### (1) Composite User Interface

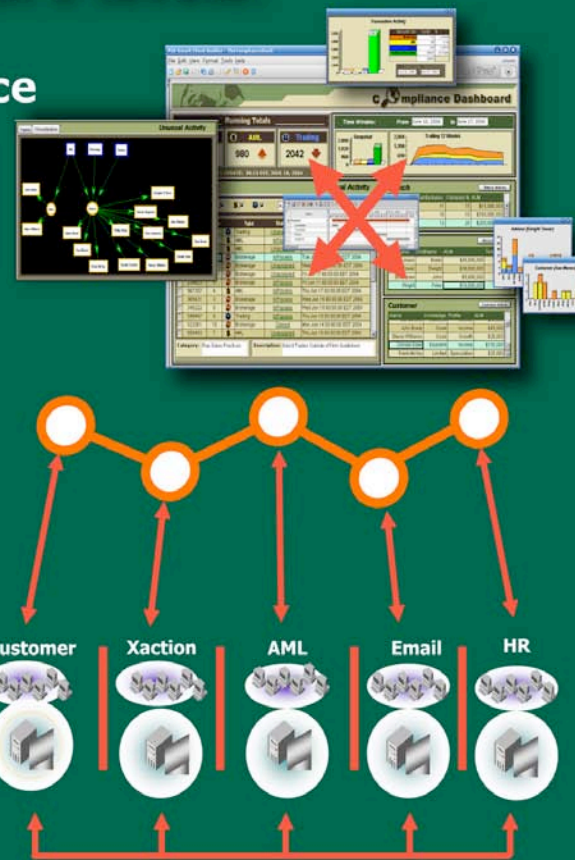
UI must persist and expose semantics such that users can interact with meaningful objects

### (2) Composite schema (business ontology)

A business ontology describes the semantics of data relationships, workflow, events, and business rules

### (3) Composite query (EII)

Logically map multiple databases, applications, and web services as if they came from a single source



Source: Digital Harbor



# How do semantic technologies impact knowledge-intensive applications?

## Machines That Think Exactly Like Humans -- But Faster

**KNOWLEDGE =**  
**THEORY + INFORMATION**  
Capturing Every Form of Knowledge  
ALL Information and THEORY

**KNOWLEDGE FOUNDATIONS**  
Theory-based Semantic Web Operating Systems

1 **INFORMATION - MATCHING YOUR SITUATION**  
Experimenting with this Choice  
Current Situation  
Expected Impacts  
UNEXPECTED IMPACT  
Desired Outcome  
**Knowledge Superiority**

2 **THEORY FOLLOWS THROUGH OPTIONS TO IMPACTS**  
N-Dimensional Situation Awareness Predicts Theory-based Decision Option Constraint Trade-offs INSTANTLY

ENTITY Independent Concept ("Ideas")  
Unconditional Theory-based ("Military") RELATIONSHIP  
Conditional, N-Degrees of Freedom THEORY-BASED ("Many") RELATIONSHIP BUNDLE N=7 or 8  
Semantic Web "Chain of Reasoning"  
**UNDERLYING SEMANTIC WEB STRUCTURES**

**Navigating Semantic Patterns of Rational Thought**

**Defense Application**

- 1 ACE CVN-77 Program Management Knowledge Base 1998
- 2 Office of the Secretary of Defense
- 3 Countries
- 4 Model: COUNTRIES Instance 7: Republic of Iraq
- 5 Rel. Model: COUNTRY/MILITARY FACILITIES
- 6 Rel. Instance 3: Country/Military Facilities
- 7 Model: MILITARY AIRFIELDS Instance 3: Balad Airfield
- 8 Rel. Model: FACILITIES/SUB-COMPONENTS Rel. Instance 2: Facilities/Sub-Components

Copyright KNOWLEDGE RESEARCH 1980-2005

20 19 18 17 16 15 14 13 12 11 10 9

Rel: Model: SYS/BAND JAM BAND JAM/FREQ CHANNELS SOURCE/FREQ FIRE CONTROL RADARS AAA GUNS AAA PLATOONS AAA BATTERIES SURFACE AIR DEFENSES  
Instance 5: Instance 5: Instance 3: Instance 8: Instance 2: Instance 4: Instance 9: Instance 4: Instance 2: Instance 2: Instance 8: Instance 8:  
Pod/Freq ALQ-99 Band 10 Jam/Freq Channel J-6 Source/Freq Gun Dish Fire Control Radar, ZSU-23 Gun ZSU-23 Platoon ZSU-23 Battery Balad Surface Air Defenses

21 22 23 24

Rel. Model: TABLE OF ORGANIZATION & EQUIPMENT  
Rel Instance 5: Rel Instance 2: Rel Instance 1: Rel Instance 4:  
Organization / Equipment Organization / Equipment Organization / Equipment Facilities/Sub-Components

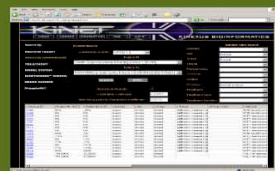
Model: JAMMER SYSTEM Instance 1: ALQ-99F  
Model: EA-6B WEAPONS Instance 5: Jammer Loadout  
Model: EA-6B Prowler Instance 2:  
Rel Model: SYSTEM/SUB-SYSTEM Instance 2: System/Sub-Sys Instance 5: System/Sub-Sys

**The Answer to Any Question is a Rational BASELINE PATH**

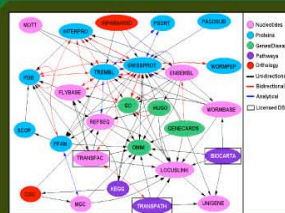
# Executable knowledge powered by semantic agents

## BioCAD

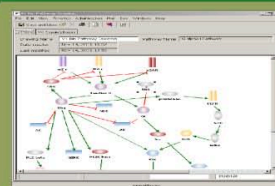
Helping scientists think together



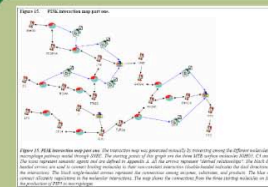
Genomic/Proteomics Experiments



Public Databases

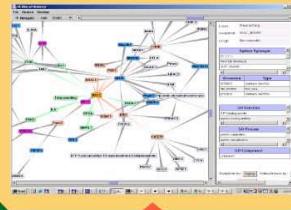


Pathway Modeler & Editor



Simulation & Test Services

Semantic Models



Publication Server

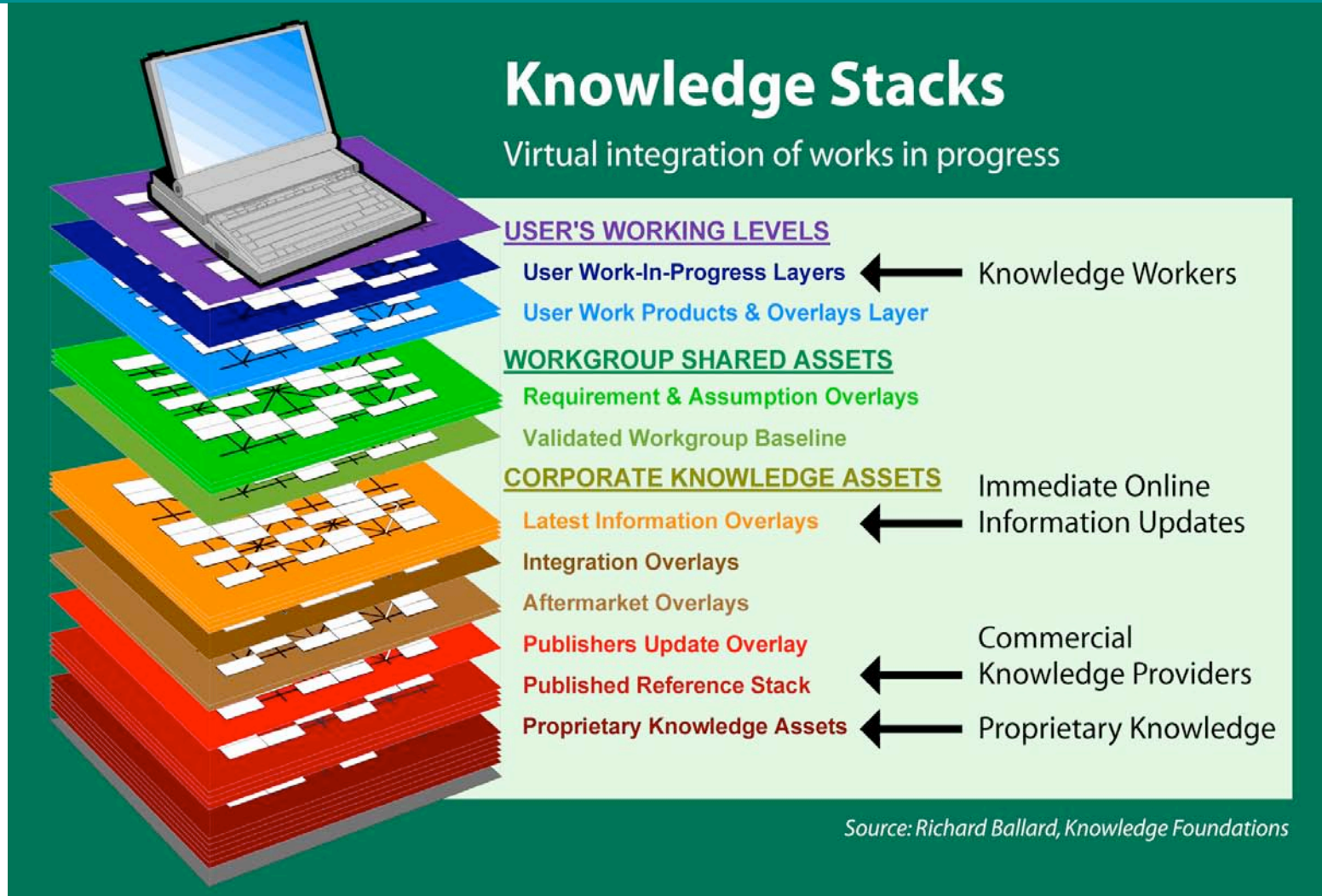


Private Research Servers

Source: Visual Knowledge

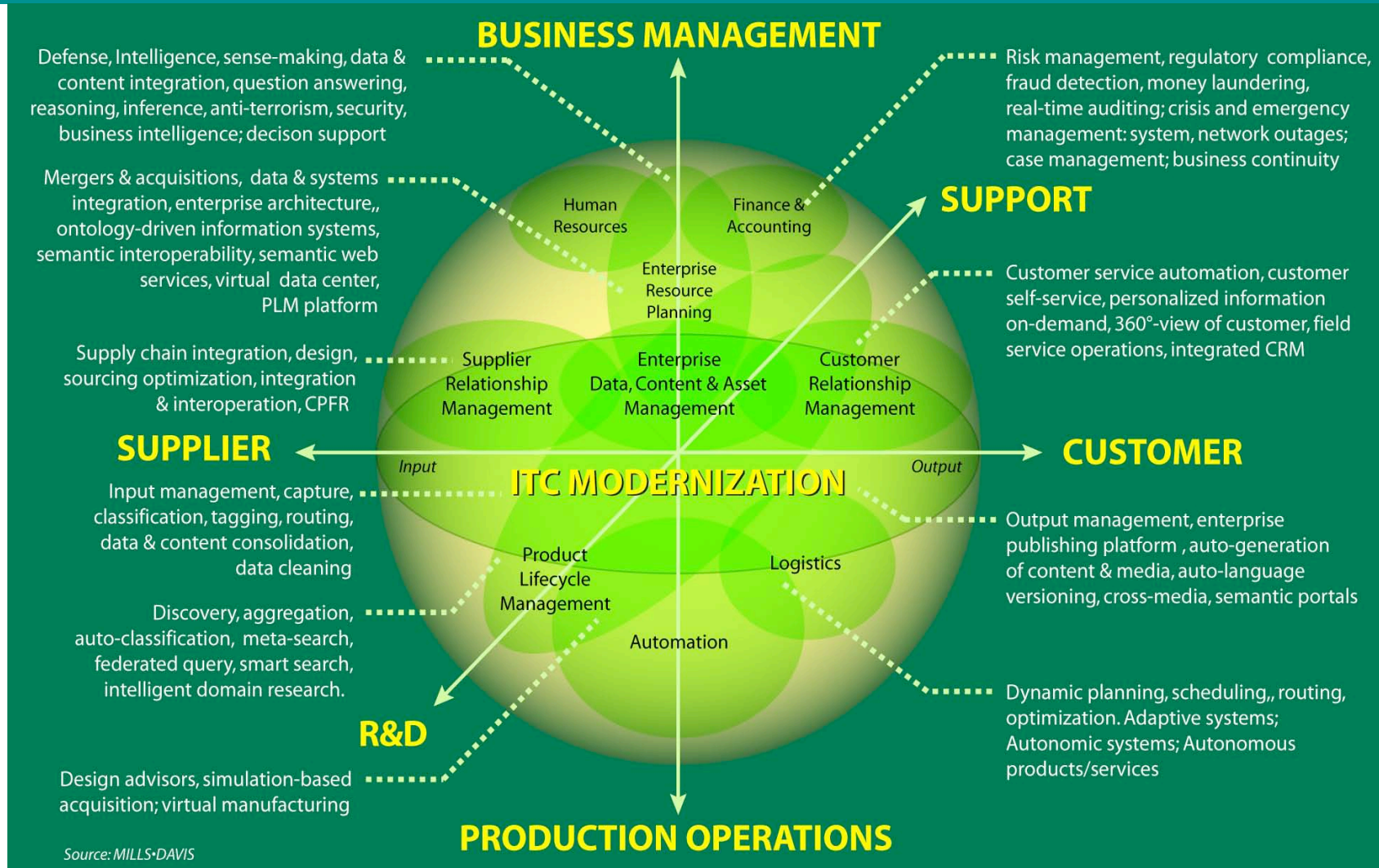


# How do semantic technologies impact intellectual property?

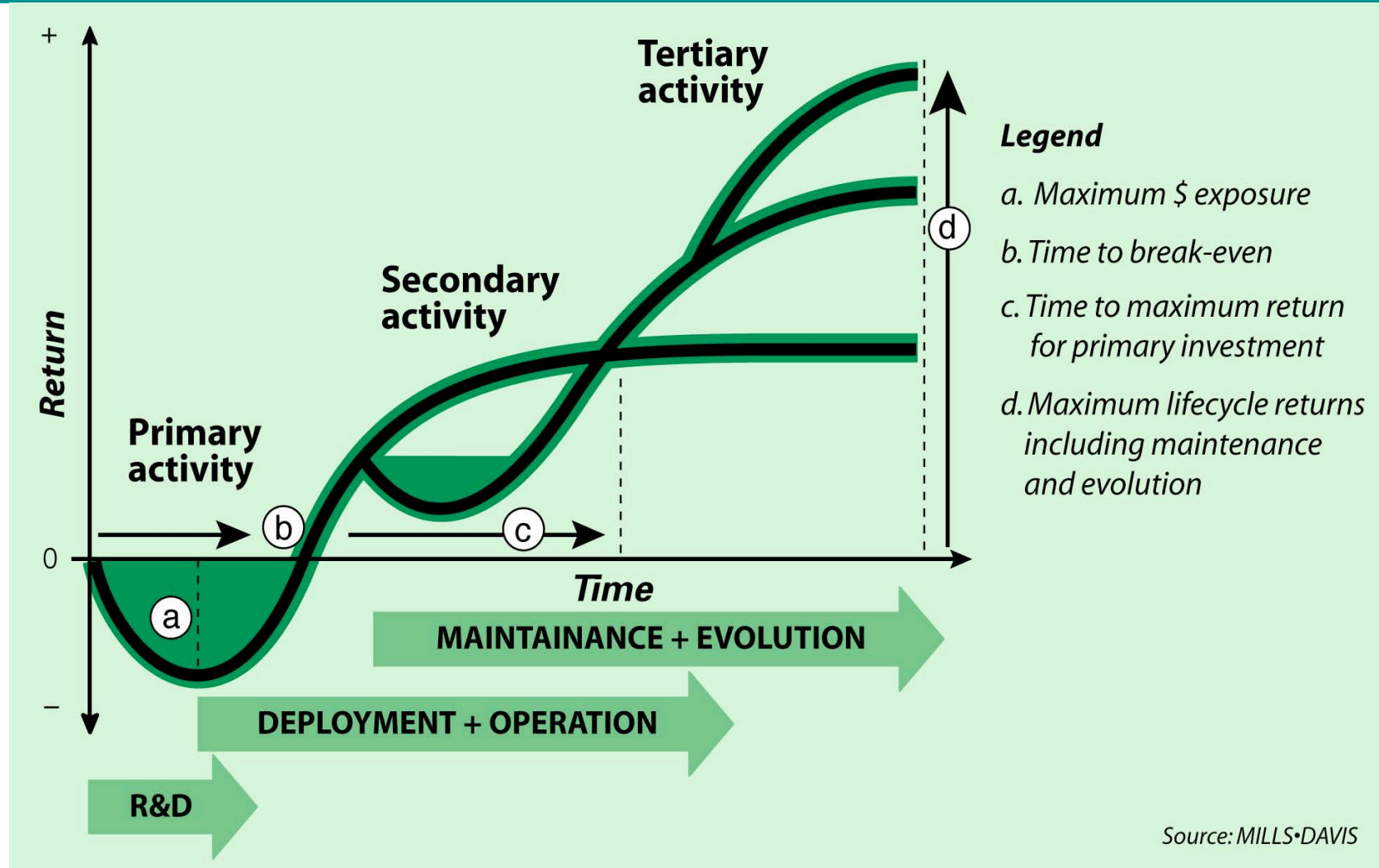




# Where, how, and in what ways do semantic technologies have application?



# How do semantic technologies maximize lifecycle ROI?



# How do semantic technologies improve performance?

EFFICIENCY	EFFECTIVENESS	EDGE
<p><i>Cost savings</i></p> <p>Doing the same job faster, cheaper, or with fewer resources than it was done before</p>	<p><i>Return on assets</i></p> <p>Doing a better job than the one you did before, making other resources more productive and increasing their return on assets and attainment of mission</p>	<p><i>Return on investment</i></p> <p>Changing some aspect of what the business does, resulting in growth, new value capture, mitigation of business risk, or other strategic advantage</p>
EARLY ADOPTER CASE EXAMPLES		
<p>20-80% less labor hours</p> <p>20-90% less cycle time</p> <p>30-60% less inventory levels</p> <p>20-75% less operating cost</p> <p>25-80% less set-up &amp; development time</p> <p>20-85% less development cost</p>	<p>50-500% quality gain</p> <p>2-50X productivity gain</p> <p>2-10X greater number or complexity of concurrent projects, product releases &amp; units of work handled</p> <p>2-25X increased return on assets.</p>	<p>2-30X revenue growth</p> <p>20-80% reduction in total cost of ownership</p> <p>3-12 month positive return on investment</p> <p>2-300X positive ROI over 3-years</p>



# Who is developing semantic solutions?

Active Navigation	CheckMi	Empolis	Intellisophic	Noetix	SilkRoad
Adobe	Cisco	Endeca	Interwoven	Northrop Grumman	Software AG
Aduna	ClearForest	Engenium	Inxight	nStein	Sony
Agilense	CoeTruman Technologies	Enigmatec	iSOCO	NuTech	SRA International
AKT Triple Store	Cogito	EnLeague Systems	ISX Software	Ontologent	SRI International
Amblit Technologies	CognIT	Entopia	ISYS Search Software	Ontology Works	Stanford University
Anteon	Cognos	Entrieva	JARG	Ontopia	Stellent
Apelon	Composite	Epistemics Ltd.	Jayna	Ontoprise	Stratify
APR Smartlogik	Compoze Software	Factiva	Kalido	OpenText	Sun Microsystems
Arbortext	Computer Associates	Fair Isaac	Kanisa Software	Oracle	Sybase
Ask Jeeves	Conformative Systems	FAST	Knowledge Foundations	Profium	Synomos
AskMe	Connecterra	FileNet	Knowledge Media Institute	Radar Networks	SYS Technologies
Aspasia	Connotate	Fujitsu	Kofax	Raytheon	Tacit
Astoria Software	Content Analyst	GeoReference Online	Kowari	Readware	Taxonomywarehouse
AT&T	Contextware	Global360	L&C	RuleBurst	TEMIS
ATG	Contivo	Gnowsis	Lockheed Martin	Reed Elsevier	The Brain
Attensity	Convera	Google	Logic Library	SAIC	Thetus
Autonomy	Copernic	Grand Central	Mark Logic	Sandpiper Software	Thomson
Axontologic	Correlate	Groxis	McDonald Bradley	SAP	TopQuadrant
BBN	Cougaar Software	H5 Technology	Metacarta	SAS	Triple Hop
BEA	Coveo Solutions	Hewlett Packard	MetalIntegration	SchemaLogic	Troux
BioWisdom	Crystal Semantics	Hummingbird	Metallett	Semagix	Ultimus
Black Pearl	Cycorp	Hyperion	Metamatrix	Semandex Networks	Unicorn
Blue Oxide	Dassault Systems	i2 Inc	Metatomix	Semantic Light	Verity
BrandSoft	DAY	IBM	Microsoft	Semantic Research	Versatile Info Sys
Broadvision	Digital Harbor	iLog	Mind Alliance	Semantic Sciences	VerticalNet
Business Objects	Discovery Machine	Image Matters	Miosoft	Semansys	Vignette
C24 Solutions	Dynamic Digital Media	Informatica	Modulant	Semaview	Visual Knowledge
Capraro Technologies	Dream Factory	InforSense	Mondeca	Semtation GmbH	Vitria
Captiva	EasyAsk	Infosys	Moresophy	Serena	Vivisimo
Celcorp	Ektron	Innodata (ISOGEN)	NCR Teradata	SiberLogic	WiredReach
Cerebra	EMC/Documentum	Intellidimension	NetMap Analytics	Siderean	XSB
		Intelliseek	Neurok		

Source: MILLS•DAVIS—1/10/2006