THE BUSINESS VALUE OF SEMANTIC TECHNOLOGY

A TopConnexion Research Initiative

Semantic Technologies for E-Government
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MITRE-1 Building
McLean, VA

Mills Davis
Managing Director
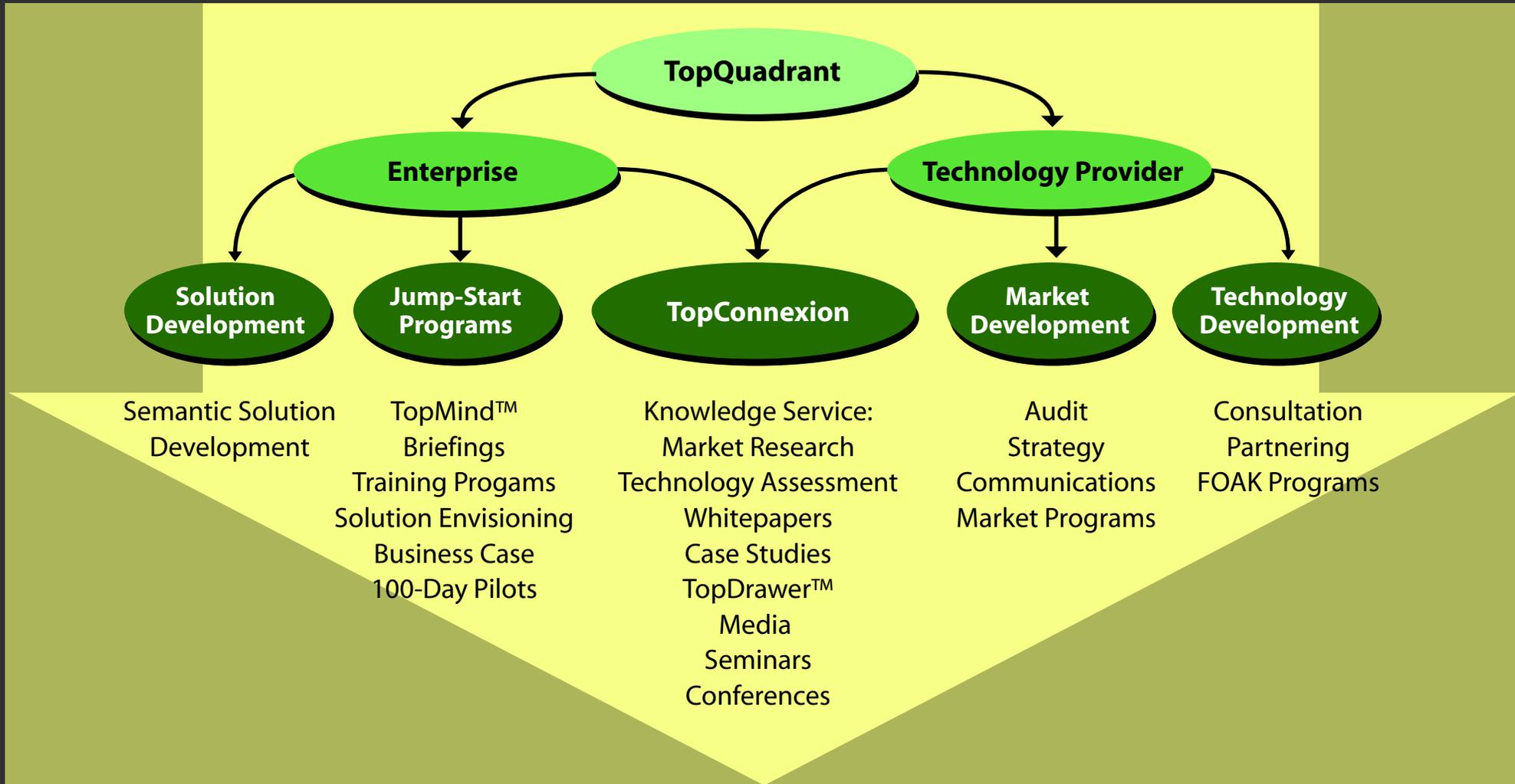TopQuadrant
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MILLS DAVIS

Mills Davis is TopQuadrant's managing director for strategic development. He directs the TopConnexion program and consults with leading technology manufacturers, global 2000 corporations, and government agencies on on next-wave semantic technologies and solutions.

As a researcher and industry analyst, Mills has authored more than 100 reports, whitepapers, articles, and industry studies. Previously, he directed landmark multi-company market development and R&D initiatives in the graphic communications and media industries including the Digital Roadmaps Project, and the HiFi Color Project.

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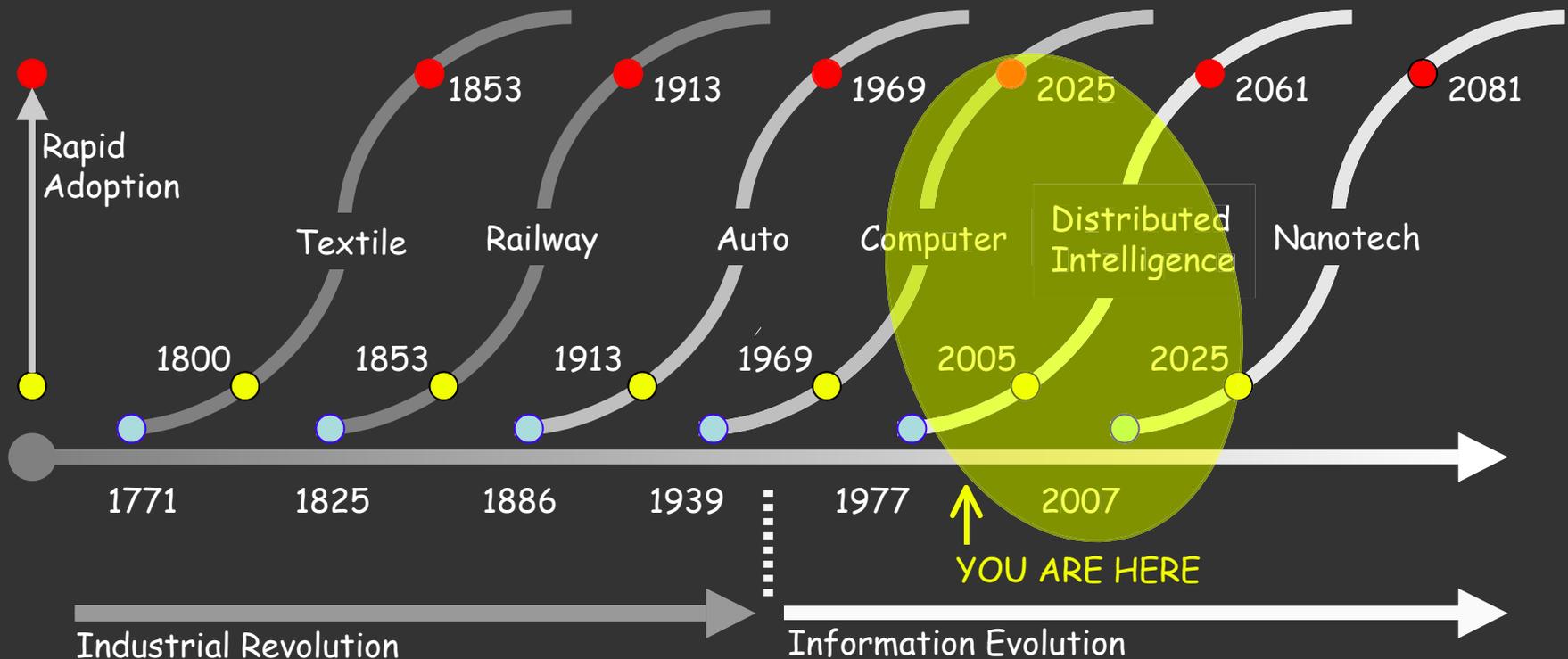# BUSINESS VALUE OF SEMANTIC TECHNOLOGY

Research:

- Semantic technologies

- How semantic technologies differ from information technologies

- How semantic technologies improve efficiency, effectiveness, and business edge

- Where semantic technologies are being used today and delivering strong ROI

- Semantic technology marketplace

FUELED BY INVESTMENT CYCLES...

Next wave investment will dwarf previous cycles!

2005

est. $6-15T
network services
rich media
knowledge

1996

$3T
WWW
web sites
ASP

1988

$650B
client/server
DBMS
component software

1981

$150B
micros
GUI
digital output

1975

$25B
minis
VLSI
UNIX
ethernet
TCP/IP

1969

$5B
time sharing
digital nets
disk storage

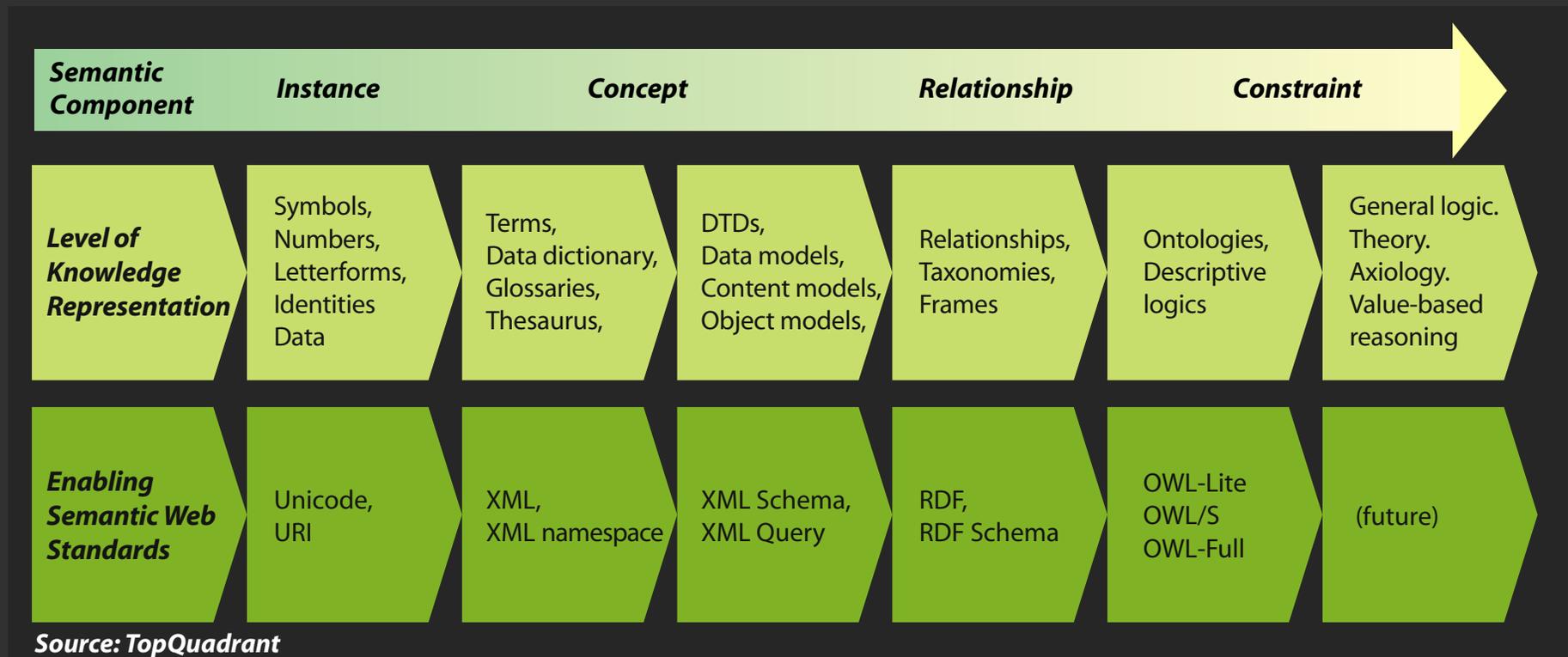**1963**

$1B
ICs, RAM
tape, mainframes
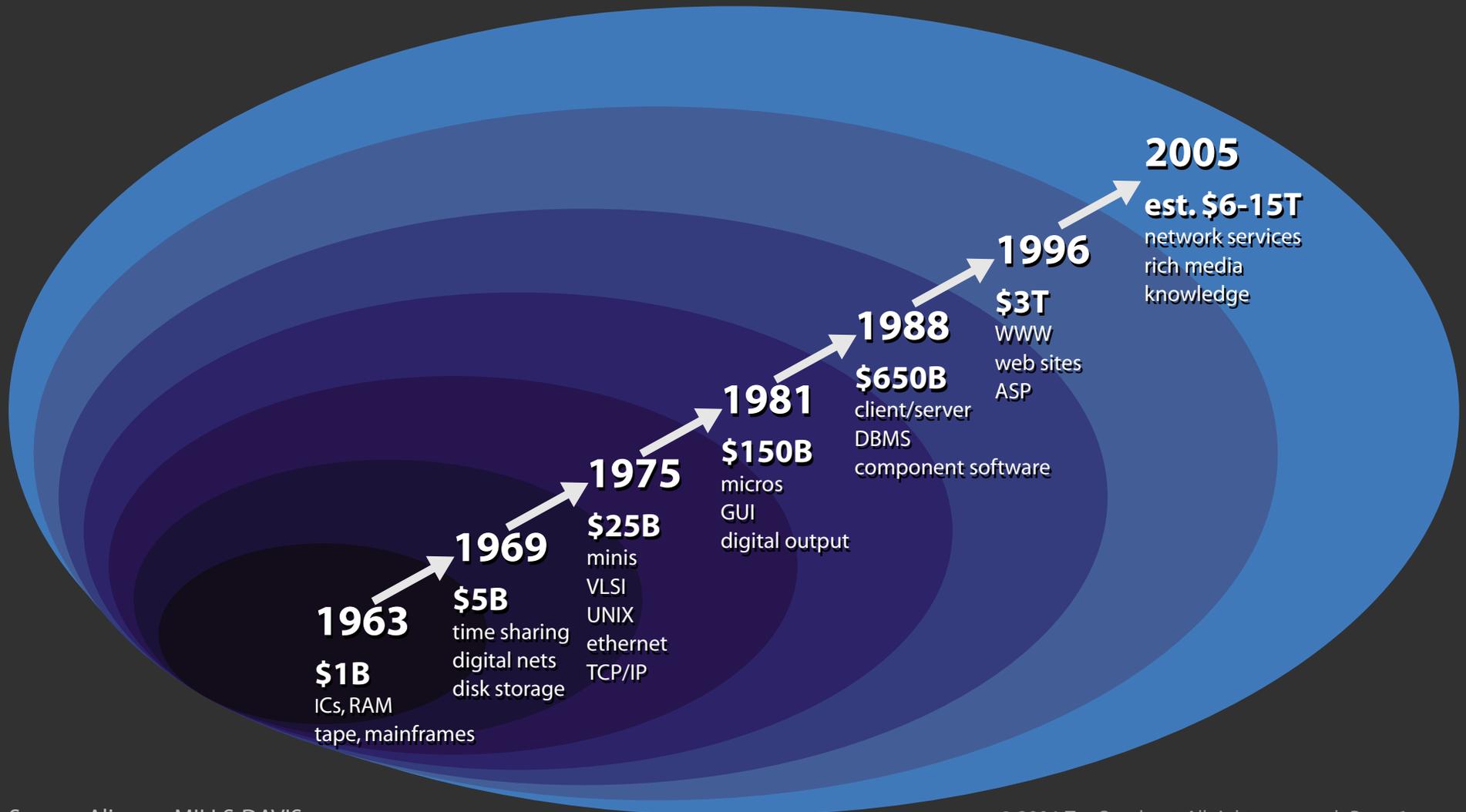
SEMANTIC TECHNOLOGIES

- Semantics are shared meanings, associations, and know-how about the uses of things.

- In a computer, what has meaning is what we can represent.

- Semantic technologies represent meanings separately from data, content, or program code, using the open standards for the semantic web.
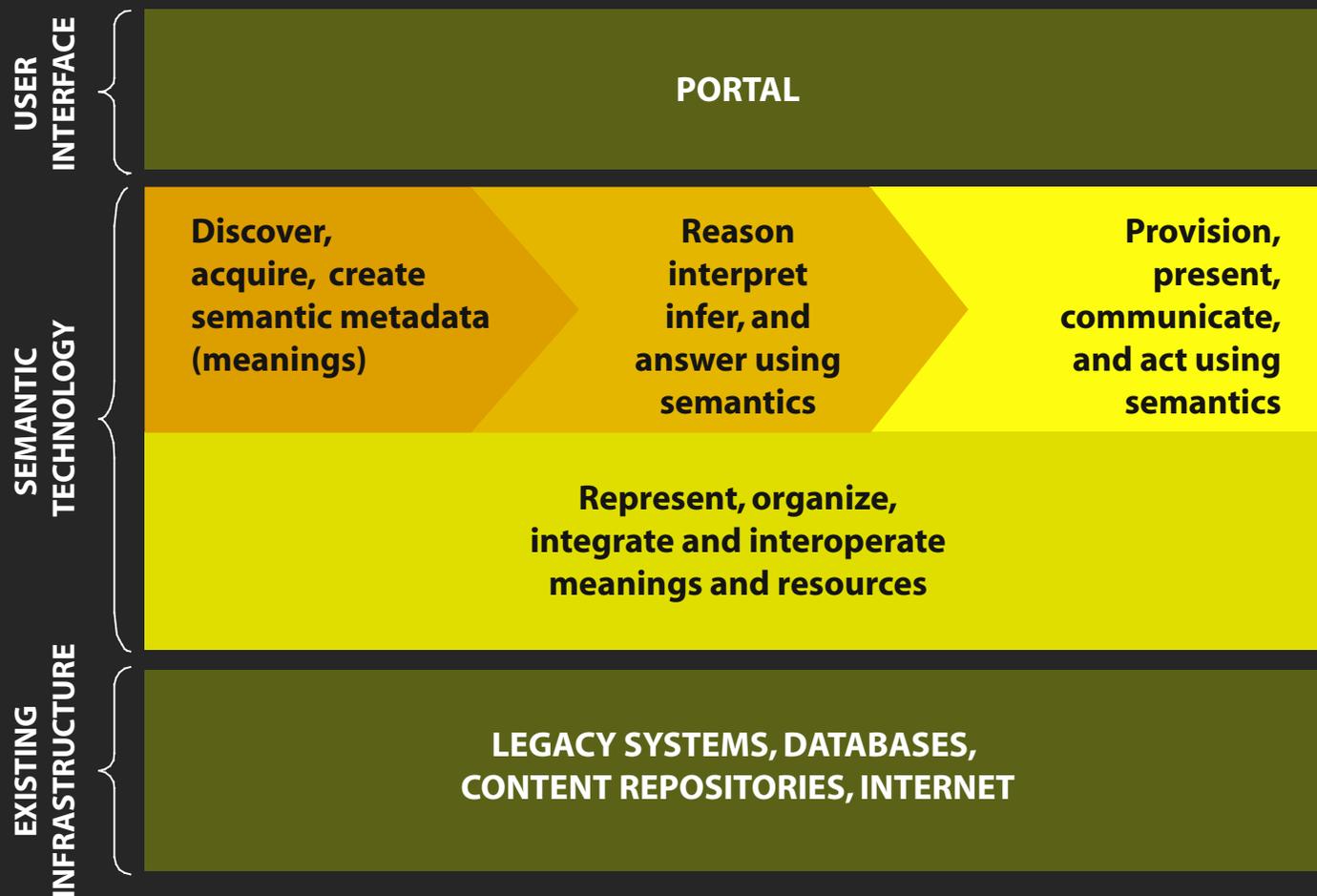
SEMANTIC BUILDING BLOCKS

Progressing from lower to higher knowledge value

Semantic Component	Instance	Concept		Relationship	Constraint	
Level of Knowledge Representation	Symbols, Numbers, Letterforms, Identities Data	Terms, Data dictionary, Glossaries, Thesaurus,	DTDs, Data models, Content models, Object models,	Relationships, Taxonomies, Frames	Ontologies, Descriptive logics	General logic. Theory. Axiology. Value-based reasoning
Enabling Semantic Web Standards	Unicode, URI	XML, XML namespace	XML Schema, XML Query	RDF, RDF Schema	OWL-Lite OWL/S OWL-Full	(future)

Source: TopQuadrant

FUNCTIONS OF SEMANTIC TECHNOLOGY

Discover, manage, reason with, and utilize meanings

USER INTERFACE

PORTAL

SEMANTIC TECHNOLOGY

Discover, acquire, create semantic metadata (meanings)

Reason interpret infer, and answer using semantics

Provision, present, communicate, and act using semantics

Represent, organize, integrate and interoperate meanings and resources

EXISTING INFRASTRUCTURE

LEGACY SYSTEMS, DATABASES, CONTENT REPOSITORIES, INTERNET

Source: TopQuadrant

SEMANTIC VS. INFORMATION TECHNOLOGY

1. How do they represent meanings?

SEMANTIC TECHNOLOGY	INFORMATION TECHNOLOGY
• Semantic web standards	• Data format; program language
• Language-neutral	• Language-based
• Machine interpretable	• Human knowledge required
• Semantic metadata	• Syntax/structure metadata
• External to system (sharable)	• Internal to system
• Knowable at run time	• Predefined at design time

SEMANTIC VS. INFORMATION TECHNOLOGY

2. How do they discover, acquire, access meanings?

SEMANTIC TECHNOLOGY	INFORMATION TECHNOLOGY
• Meaning-centered. • Auto-recognition, information extraction, and categorization • Topic and concept-based search with enhanced recall and precision (relevance)	• Message, file, page, and document-centered • Manual, full-text & statistical categorization • Data, word, & document search with limited re-call and precision

SEMANTIC VS. INFORMATION TECHNOLOGY

3. *How do they manage, integrate meanings & resources?*

SEMANTIC TECHNOLOGY	INFORMATION TECHNOLOGY
• Taxonomy, ontology, knowledge base • Knowledgebase easily modified for new concepts, relationships, properties, constraints and in-stances. • Integrate data, content, applications, and processes via shared ontology	• RDBMS, OODBMS, flat file. • Database structure difficult to modify to change /add new relationships (e.g., requires coding, reorganization) • Integrate data, content, applications, and processes via point-to-point interfaces

SEMANTIC VS. INFORMATION TECHNOLOGY

4. *How do they reason, infer, interpret & answer questions?*

SEMANTIC TECHNOLOGY	INFORMATION TECHNOLOGY
• Application reasons via logic constraints, rules, axioms separate from code • Knowledge answers questions about how, why, and what-if, as well as facts • Machine can learn (infer new knowledge) simulate, test and adapt based on experience.	• Application reasons via fixed algorithm that is embedded in the application code. • Information processing provides situation awareness, e.g.,: what, where, when, and how much • Responses are preprogrammed (like instinct). Logic updated off-line (new version) Program does not learn or adapt

SEMANTIC VS. INFORMATION TECHNOLOGY

5. How do they provision, present, communicate & act using semantics?

SEMANTIC TECHNOLOGY	INFORMATION TECHNOLOGY
• Auto-discover, provision, semantic web services • Ontology-linked composite applications give 360-view of relevant data in context. • Auto-generate text, documents, graphics, drawings & dialogs from knowledgebase. • Auto-personalize, customize, version (e.g. languages, different media) • Autonomics: systems with self-knowledge can self-configure, self-optimize, self-protect, self-heal, and self-manage. • Services & products that know, learn, & reason as humans do	• Manually discover and implement data and application connections & interfaces • Human search to find data & information and then put it into useful context for decisions • Computers as "electronic pencils" for humans to author and develop content, visuals, and media formats

SEMANTIC TECHNOLOGY PROVIDERS

A representative list of around 50 companies.
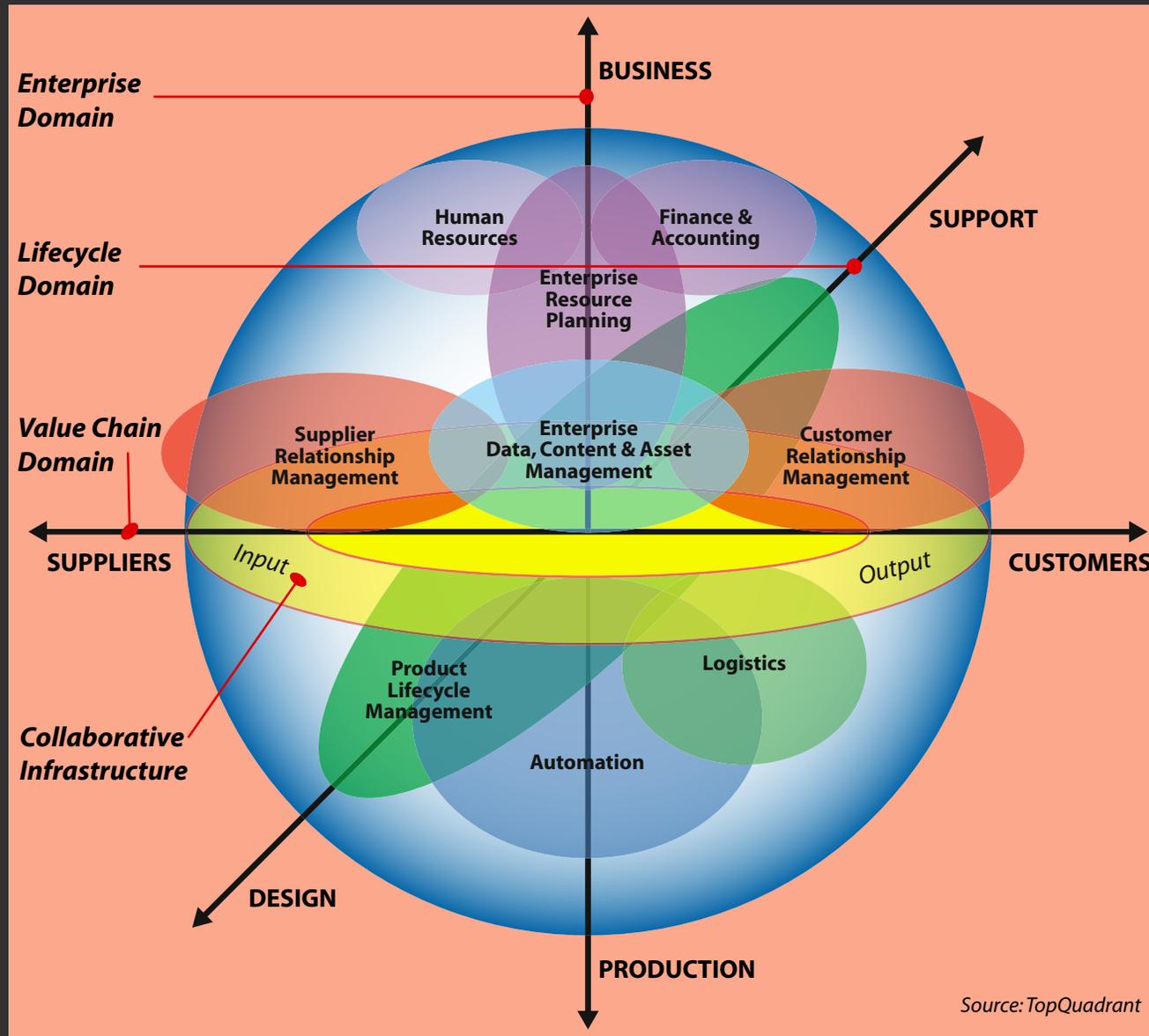*Vendor compliance with semantic web standards varies.*

Autonomy	Enigmatec	Merant	Profium
Captiva	Entrieva	Metamatrix	Protogé
Celcorp	Factiva	Miosoft	SAP
ClearForest	FAST	Modulant	SchemaLogic
Cogito	Grand Central	Network Inference	Semagix
CognIT	H5 Technology	NuTech	Stratify
Connecterra	HP	OntologyWorks	Sybase
Contivo	IBM	Ontoprise	Triple Hop
Convera	Intellidimension	Open Cyc	Tucana
Copernic	Interwoven	Oracle	Unicorn
Digital Harbor	Inxight	PeopleSoft	Verity
Empolis	KFI	Pinnacor	Vignette
Endeca	L&C	Primus	Vitria

WHERE DO SEMANTIC TECHNOLOGIES APPLY?

Source: TopQuadrant

EVERYWHERE YOU LOOK …

INTELLIGENCE

INFRASTRUCTURE & INTEGRATION

RISK MANAGEMENT

SUPPLIER-FACING PROCESSES

CUSTOMER-FACING SERVICES

RESEARCH

DESIGN ENGINEERING MANUFACTURE

SMART PRODUCTS, SERVICES & LOGISTICS

INPUT OUTPUT

BUSINESS

SUPPORT

SUPPLIERS CUSTOMERS

PRODUCTION

Enterprise Domain

Lifecycle Domain

Value Chain Domain

Collaborative Infrastructure

DESIGN

Input Output

Human Resources Finance & Accounting

Enterprise Resource Planning

Supplier Relationship Management Enterprise Data, Content & Asset Management Customer Relationship Management

Product Lifecycle Management Logistics

Automation

Source: TopQuadrant

WHAT DO CASE EXAMPLES SHOW?

Semantic technologies drive core measures of business performance.

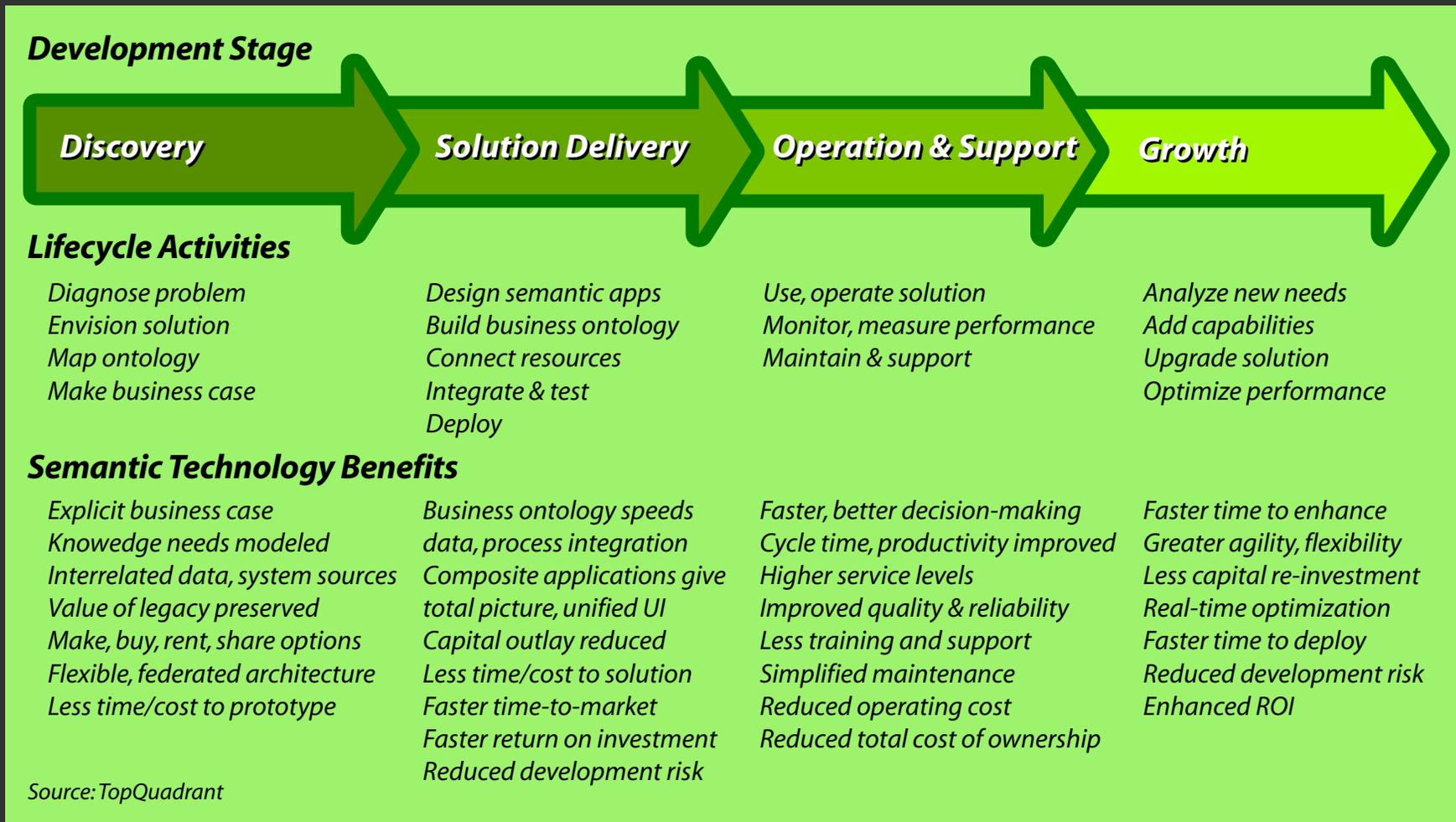| EFFICIENCY	EFFECTIVENESS	EDGE
Cost savings	*Return on assets*	*Return on investment*
Doing the same job faster, cheaper, or with fewer resources than it was done before.	Doing a better job than the one you did before, making other resources more productive, increasing their return on assets and attainment of mission.	Changing some aspect of what the business does, resulting in growth, new value capture, mitigation of business risk, or other strategic advantage.

WHAT DO CASE EXAMPLES SHOW?

Gains in efficiency, effectiveness, and edge.

EFFICIENCY	EFFECTIVENESS	EDGE
• 20-80% less labor hours • 20-90% less cycle time • 30-60% less inventory levels • 20-75% less operating cost • 25-80% less set-up & development time • 20-85% less development cost	• 50-500% quality gain • 2-50X productivity gain • 2-10X greater number or complexity of concurrent projects, product releases, & units of work handled • 2-25X increased return on assets.	• 2-30X revenue growth • 20-80% reduction in total cost of ownership • 3-12 month positive return on investment • 3-300X positive ROI over 3-years

WHAT DO CASE EXAMPLES SHOW?

Gains in lifecycle value and return on investment

Development Stage

Discovery	Solution Delivery	Operation & Support	Growth

Lifecycle Activities

Diagnose problem	Design semantic apps	Use, operate solution	Analyze new needs
Envision solution	Build business ontology	Monitor, measure performance	Add capabilities
Map ontology	Connect resources	Maintain & support	Upgrade solution
Make business case	Integrate & test		Optimize performance
	Deploy		

Semantic Technology Benefits

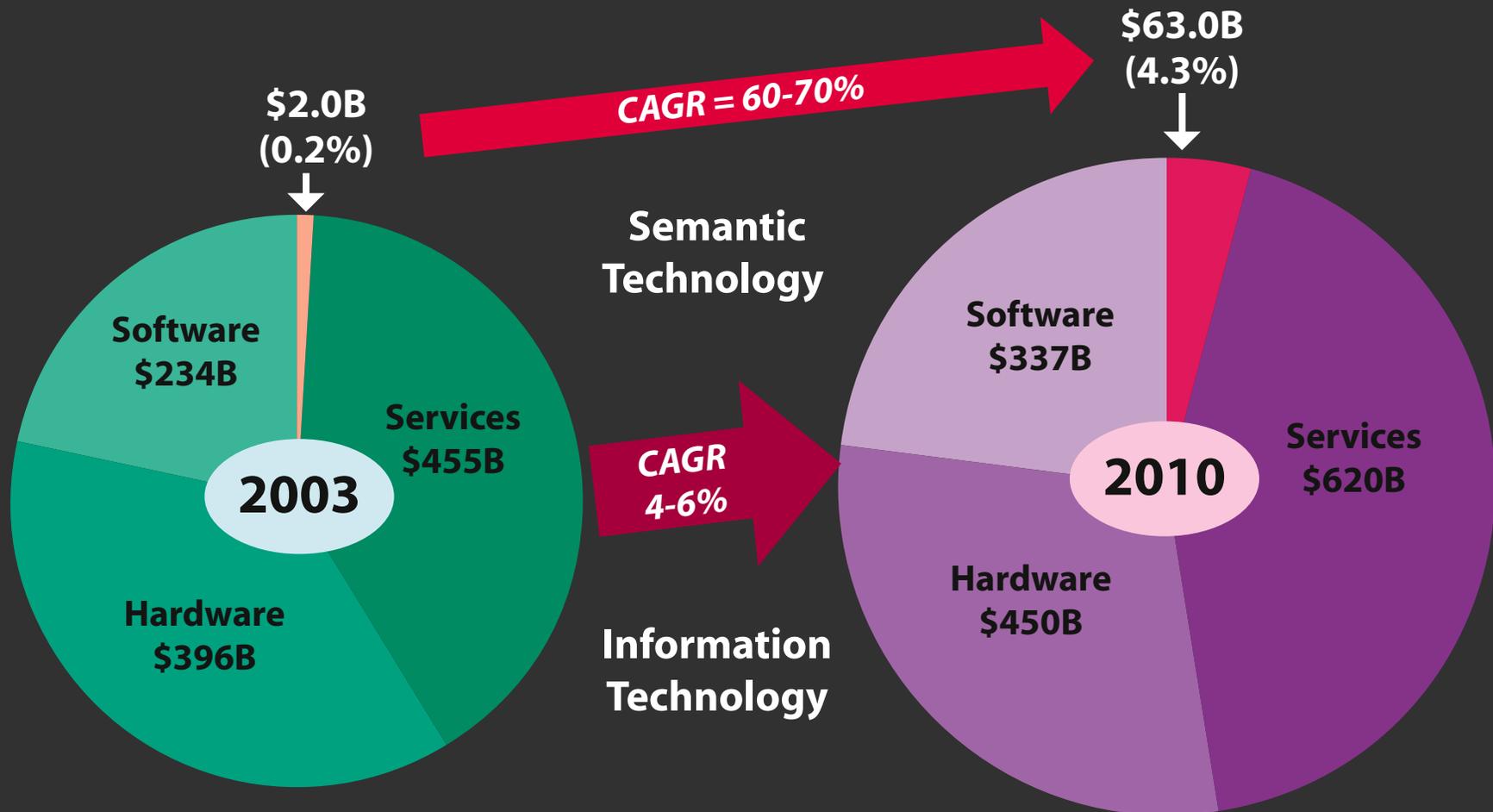|			
Explicit business case	Business ontology speeds	Faster, better decision-making	Faster time to enhance
Knowledge needs modeled	data, process integration	Cycle time, productivity improved	Greater agility, flexibility
Interrelated data, system sources	Composite applications give	Higher service levels	Less capital re-investment
Value of legacy preserved	total picture, unified UI	Improved quality & reliability	Real-time optimization
Make, buy, rent, share options	Capital outlay reduced	Less training and support	Faster time to deploy
Flexible, federated architecture	Less time/cost to solution	Simplified maintenance	Reduced development risk
Less time/cost to prototype	Faster time-to-market	Reduced operating cost	Enhanced ROI
	Faster return on investment	Reduced total cost of ownership	
	Reduced development risk		

Source: TopQuadrant

APPRECIATING THE VALUE OF MEANING

- The true test of whether semantic technologies deliver business value is if the benefits exceed the cost and risks.

- Our preliminary research documents 2–10 times improvements in key measures of performance across the solution lifecycle.

- Given the compelling nature of the business value proposition, we expect the market for semantic technologies to develop rapidly.
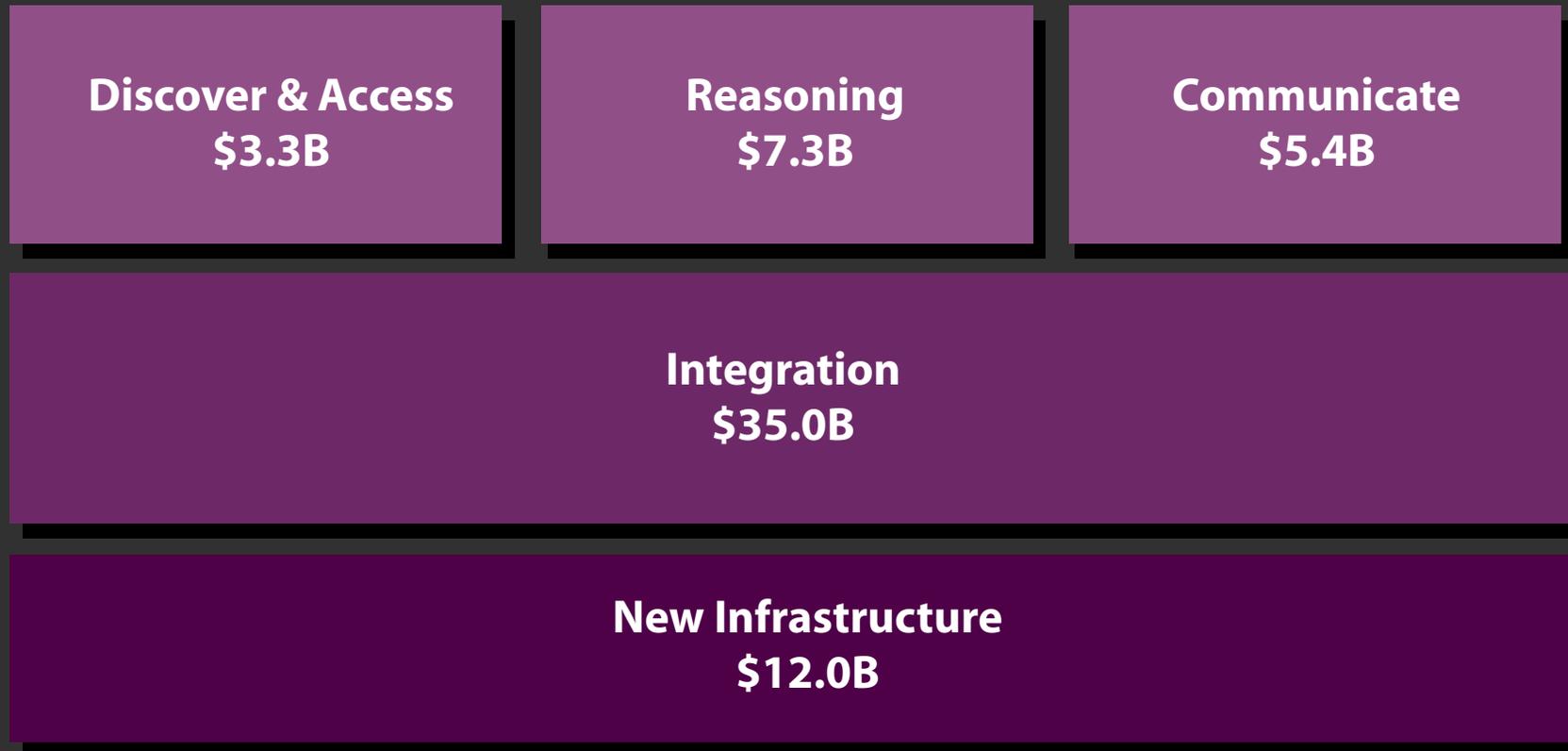
SEMANTIC TECHNOLOGY IN 2010

Horizontal market segments

Discover & Access **$3.3B**	**Reasoning** **$7.3B**	**Communicate** **$5.4B**

Integration
$35.0B

New Infrastructure
$12.0B

Source: TopQuadrant   Our projection of horizontal markets for semantic technologies is based on analysisof twelve studies by IT analysts and vendors. These examined: knolwedge management access, infrastructure, and ontology-based solutions; enterprise & commercial publishing; enterprise-class applications such as ERP, CRM, BI, PLM, help desks, and portals; web services, grid computing, and pervasive computing (e.g. RFID); and the largest category, integration software and services. Ratios of services, to software, to hardware revenues are assumed to be much the same as for IT .

A CALL TO ACTION

For businesses and government agencies:

- Research shows semantic technologies have compelling business benefits.

- Lifecycle value is already being proven with operational solutions , not just in R&D.

- No need to wait. Take steps to prove the value of semantic technologies for your enterprise in as few as 100-days.

CALL TO ACTION

For semantic technology solution providers:

- Semantic technology is ready to "cross the chasm" to mainstream adoption.

- Semantic solution, services & software markets will grow rapidly, topping $60B by 2010.

- To win, focus on mainstream markets. Help educate and sell business value and ROI in ways that mainstream enterprises can understand.

CALL TO ACTION

For members of the investment community:

- Semantic technologies are building blocks of the next mega-wave of economic development, "distributed intelligence."

- Markets for semantic technologies are poised for a period of sustained rapid growth.

- Now is the time for semantic technology investments to strengthen portfolios.

CALL TO ACTION

For businesses and government agencies that want to jump-start their organization to harness the benefits of semantic technologies...

TopConnexion provides an affordable (fixed cost) knowledge service that provides:

- *Research* — proving the business and technical value of semantic solutions through case studies, technology assessment, market studies.

- *Publications and events* — educating key decision-makers, and making the case for semantic solutions.

- *Tools* — to envision solutions, plan projects, pick sources

- Expertise — best-of-the-best talent on call.