What IBM is doing

INCOSE – Intelligent Enterprise Working Group

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Subjects covered

- IBM Services Research – SSME
- IBM Academy of Technology perspective
- Business Transformation Architect role
- Impact of Future Technology
- ISSS
  - http://www.isss.org/
IBM Research Worldwide
What Physicists Do At IBM Research…

This achievement is a major milestone toward creating a microscope that can make three-dimensional images of molecules with atomic resolution.
IBM Computer Scientists build bigger, faster computers

Blue Gene, as its name suggests, is aimed at the drug-development market. Scientists hope eventually to model how proteins fold – a process that is important in designing drugs that can block cancer cells and other diseases.

70.72 teraflops on 11/2004
183.5 teraflops on 3/2004
(Linpack benchmark)
What you may not know... IBM helped start computer science; not out of altruism, but to meet a business need.

The biggest costs were in changing the organization. One way to think about these changes is to treat the Organizational costs as an investment in a new asset. Firms make investments over time in developing anew process, rebuilding their staff or designing a new organizational structure, and the benefits from these Investments are realized over a long period of time.” Eric Brynjolfsson, “Beyond the Productivity Paradox”
The IBM Academy of Technology has reached a tipping point with its recent agenda items.

- Enterprise Architecture in an Era of On Demand
- Business Architecture & On Demand Models – Going from Business Intent to IT Systems
- Accelerating On Demand Transformation Through Business and IT Linkages
- Meeting the Need for IT Architects
- Assessing and Managing Technical Risk in Client Solutions
- An Inclusive Approach to the Use of ISV Packages in On Demand Solution Design and Delivery
- What Differentiates IBM in Strategic Business Consulting
- Adaptive Business Process Nets
- Business Level Agreements
- Applying Innovation
- Envisioning IT in 2010: Disruptive Technologies in Hardware, Software and Services
- Human Impact and Application of Autonomic Computing Systems (CHIACS2)
- New Wave of Healthcare
- Programming Models: Improving Software Productivity
- Traceability IT Architecture
- Security and Privacy Technology Symposium
- Collaboration Best Practices Conference
- The Future Impact of WikiWebs and Weblogs on the Enterprise
- The Second Proactive Problem Prediction, Avoidance and Diagnosis Conference
- Performance Engineering 'Best Practices' Topical Conference V
- High Availability 'Best Practices' Topical Conference III
- Future Opportunities for IBM in Technology and Infrastructure for Online Games
- Design for Variability
- Evaluation of Signalling Approaches for Interconnections Within CEC e-servers
- Qualification of Safety-Sensitive Components
- I/O and Storage Control Virtualization for On Demand Environments
NASA recognizes that space exploration is a highly complex system of systems.
NASA has recently recognized a very important additional system within the system of systems.
There is still another type of system that needs to be recognized.

The problem is that this type of system is intrinsically invisible and intangible.
Human social systems permeate all operations and marketplace relationships within NASA’s System of Systems
This business of on demand business services isn't exactly rocket science …
... it's brain surgery!

Most pictures from: The History of Psychosurgery, Renato M.E. Sabbatini, PhD
http://www.epub.org.br/cm/n02/historia/psicocirg_1.htm
The IT industry has a disappointing record of failure

Rating by CEOs of Their Organizations’ Past Record for Managing Change
CEO Survey 2004

Very Successful 10%
Successful 47%
Somewhat Successful 47%
Unsuccessful 43%

The high failure rate – up to 75% is pervasive belief

Only 29% of CEOs say their IT projects typically come in on time and on budget
IBM Institute of Business Value – CEO Survey 2004

43% of CEOs rate their business’ past record of managing change as unsuccessful
Forrester 2004, Survey of 1,100 CEOs
One challenge of the business transformation architect is to make sense of business …

This is what a business looks like

Business is largely a human social system that is intangible and invisible.
… while the other BTA challenge is to link business to IT.

Software is also intrinsically complex, malleable, abstract and invisible.

This is what software looks like
Information technology can be a jumbled mess, but architectures and patterns can help make sense of it.
Business can be a jumbled mess too, but architectures and patterns can help make sense of it as well.
The job of the BTA is to focus on how these architectural viewpoints come together.
There are many useful architectural views

**Business views**
- Business components
- Business services
- Value creating networks
- Outcomes - result, product, service, output
- Value - economic, prestige; present, future
- Capabilities – skills, tangibles, intangibles
- Roles – scope, functions, players
- Commitments – agreements, accountabilities
- Processes – events, procedures
- Work practices
- Relationships – cooperative, contentious
- Decisions
- Measures – Indicators, metrics, characteristics
- Resources
- Organizations – firms, departments, teams, …
- Boundaries and boundary objects
- Motivations
- Intentions - purpose, mission, goal, objective
- Attitudes - trust, transparency, suspicion
- Beliefs - truth conditions, evidence
- Experiences - expected, actual, perception, reaction
- Communications - branding, advertising negotiating

**IT views**
- Functional components
- IT services
- IT networks
- Data
- Hardware systems
- Middleware
- Applications
- Interfaces
- Operating environment
- Security
- Measures – NFRs
An architectural view of business attempts to make invisible living social systems accessible to study.

- **Macro-architecture** of functional business components (strategic, operational, normative, etc.)
- **Eco-architecture** of functions and interactions among enterprises in a marketplace
- **Micro-architecture** of conversations, commitments, contracts, and transactions
- **Semantic architecture** to reconcile terminology across disciplines, professions, and businesses
A business macro-architecture in terms of interrelated capabilities of a living system

A business organization

- direction setter
- arbiter
- commander
- producer
- resource maintainer
- locator
- business relationship maintainer
- perceiver
- expresser
- memory maintainer
- transmitter

Another organization
Component Business Model (CBM) gives input on making decisions on the odT business model and role to play in the value network.
Eco-architecture provides a rigorous view of marketplace interactions among enterprises.
Firms must identify differentiating competencies and define what role to play in which value network(s)

The marketplace is an ecosystem of various kinds of enterprise players. What is the role of LynchPin?

Value Network
(internally and/or externally)

Source: On Demand Transformation, BCS Strategy & Change July, 2004
A business micro-architecture is based on communication.
S=13R is a way to help remember the architectural elements of a business service

Role-players: Two or more involved parties

- Results: The intended outcome of the service being provided.
- Revelations: Intentions of role-players are revealed to each other.
- Requests: Orders or other forms of service buying behavior.
- Requirements: Needs, desires, expectations of all role-players.
- Rewards: Payments and other value-realizations by role-players.
- Responsibilities: Commitments and accountabilities of all parties.
- Resources: Capabilities of all kinds – tangible and intangible.
- Routines: Process or procedures that can be optimized for efficiency.
- Renegotiations: Accommodation of changing conditions of satisfaction.
- Redesigns: Adaptation of services in response to market conditions.
- Recordings: Physical or electronic record of transactions and results.

Relationship: A complex set of interactions over time
A semantic architecture disambiguates meaning between business terminology and IT manifestations.
A high-level view of a semantic architecture

Establish Technology Landscapes

- Establish a specific set of technology measures and indices unique to the client.
- Secure access to content sources.
- Develop text miners to extract specific entities from content.
- Continually update measures from authoritative content sources.
- Create technology landscapes for each domain.

Provide tools to enable the client to monitor for signposts and refresh landscapes.

**Biotechnology and Pharmaceuticals Landscape**

<table>
<thead>
<tr>
<th>Technology Maturity</th>
<th>Innovation Results</th>
<th>Sustainability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
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*Qualitative Estimates*

- GMO Crops
- Edible Vaccines
- Biologically Derived Therapeutics
- Nanomaterials in Research
- Biologically Derived Therapeutics
- Optical Detectors
- Photovoltaics
- Edible Vaccines
- Photovoltaics

- Protein-based Tissue Engineering
- Protein-based Tissue Engineering
- Protein-based Tissue Engineering
- Tissue Engineering

- Stem Cells
- Computational Models of Biological Systems
- Studies of Disease
- Gene/Environment Studies of Disease

- Biologically Derived Therapeutics
- Biologically Derived Therapeutics
- Biologically Derived Therapeutics
- Biologically Derived Therapeutics

- Functional Foods
- Currently Marketed Foods
- Currently Marketed Foods
- Currently Marketed Foods

- Vaccines
- Vaccines
- Vaccines
- Vaccines

- 0 to 2 years
- 2 to 5 years
- 5 to 10 years
- 5 to 10 years

- Key: Change over last 12 months
- Key: Time to production

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Unique Approach to Developing Forecasts

IoFT analyzes the future with methods that go beyond extrapolation of current trends to focus on potential technical breakthroughs and other potential economic, political, and social events that could dramatically change a technical landscape.
Enterprise ecosystems arise from signpost realization.

IoFT analyzes the future with methods that go beyond extrapolation of current trends to focus on potential technical breakthroughs and other potential economic, political, and social events that could dramatically change a technical landscape.

**Features**
- 3 year and 5 year business planning
- IT planning driven by business plans
- Annual commitments
- Limited flexibility and responsiveness

- Broad directions pursued
- Deep future allows thinking outside of extrapolated current trends
- Increases flexibility and reduces surprise; more ideas considered
- Hard to prioritize and focus efforts

- Signposts signal disruption and predict dramatic changes in technological evolution
- Specific events and recommended actions allow prioritization without committing to a particular order of occurrence

**Backcasting with Signposts**

**Vision Area**

**Enterprise ecosystem**

**End user**

**Enterprise**

**Enterprise**

**Enterprise**

**Enterprise**

**Vision Area**

**Snapshot of post-signpost situation**