

# SEEDING THE CLOUD SERVICES BY RE-ALIGNING PEOPLE, PROCESS AND TECHNOLOGY

University of Warwick  
United Kingdom  
22 May 2012

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# Haluk Demirkan, PhD & PMP

**Transdisciplinary Research, Consulting & Executive Education Agenda:**  
Service Science/Information Systems/Supply Chain Management/Sustainability

## **Selected Awards and Honors**

- 2011: Association for Information Systems ranked 50<sup>th</sup> in Top-100 World-wide Researchers
- 2011: Journal of Service Research – Research Priorities for the Science of Service
- 2011: Decision Sciences Journal of Innovative Education – Analytics & BI
- 2011: Electronic Commerce Research & Applications–Service-Oriented Tech.&Mng.
- 2010: IEEE Computing Society –Sustainable IT Services
- 2008 : IBM Faculty Award –Design Science for Self Service Systems

## **Academic experiences**

10 years of higher education experiences

## **Professional experiences**

More than 15 years of consulting and executive education experiences

## **Selected Research Accomplishments Since 2002**

~ 150 publications (such as 38 refereed journal articles, 90+ conference proceedings)

**Research funding & collaborations with** American Express (business intelligence & analytics), Intel (service oriented enterprise & supply chain management), MicroStrategy (business-, cloud- and social-intelligence), Premier Healthcare (healthcare services supply chain management), Mayo Clinic (project & service management) and IBM (self service systems)

Co-Editor of two refereed Springer research books:

1) The Science of Service Systems; 2) Service Systems Implementation



# Education and Research

## Education

- Ph.D. in Information Systems and Operations Management, University of Florida
- Post Master of Engineering and Master of Engineering in Industrial & Systems Engineering, University of Florida
- Bachelor of Science in Mechanical Engineering, Istanbul Technical University
- Project Management Professional (PMP) Certificate from the Project Management Institute
- Project Management and Business Intelligence Certifications from AT&T, Citibank & MicroStrategy

My research examines the dynamics created by the emergence of service science, information delivery trends, sustainable innovations and globalization.

## Process Innovation, Management, Re-engineering & Optimization with

- **Service science** & sustainable service innovations
- Innovation-intelligence with business-, social- & cloud services-**intelligence & analytics**
- **Service-orientation**, -transformation & -eco-systems; project & service management
- Co-creation of **value** -chains, -shops & -networks for complex adaptive **service systems**
- Dynamic on-demand **supply chain management & service supply chain management**
- Strategic marketing, information system & digital enablement for business transformation & growth

**Research methods:** analytical, design science, action, empirical research, and relevant combinations.

**Co-Editor of a Book Collection** “Service Systems and Innovations in Business and Society”, in Business Expert Press (with Jim Spohrer, Director of IBM Global University Programs).

**Track chair** for the Decision Analytics, Mobile Services and Service Science Track at the HICSS.

## *Sample list of clients that I assisted*

### **Banking and Financial Services**

American Express  
Citi Corp  
Bank of America  
AT&T Universal  
Card Services  
Norwest Wells  
Fargo  
First Union Bank  
JC Bradford  
Raymond James  
Franklin  
Templeton

### **Manufacturing**

Intel Corp  
Michelin North  
America

### **Sales & Marketing**

Universal Studios  
Office Depot  
Darden  
Restaurants

### **Insurance**

Columbia Health  
Care

### **Consumer**

### **Packaged Goods**

Procter & Gamble

### **E-Commerce**

Lending Tree  
Choice Point

### **Telecom**

AT&T  
Verizon  
Telefonica (Puerto  
Rico)

### **Retail**

Discount Auto  
Parts  
Harris Teeter  
Stein Mart  
Home Shopping  
Network  
Lowe's

### **Healthcare**

Columbia  
Healthcare  
Premier  
Healthcare  
Banner Healthcare  
Parkstone

### **Pharmaceutical**

Eckerd  
Corporation

### **Logistics/Transportation**

Watkins Motor  
Lines  
CSX Lines  
YRC Worldwide

### **ERP/Supply Chain Management**

Intel Corp  
Tech Data

Premier  
Healthcare

### **Government**

National Science  
Foundation  
USA Dept. of  
Education

### **Education**

Arizona State Univ.  
W. P. Carey School  
of Business  
Sebit Inc.  
Adaptive  
Curriculum.com

### **Software**

BISC  
MicroStrategy  
Corp  
Teradata Corp

# Synopsis

- The “services-based-economy” is growing exponentially
- A critical enabler of the services-based economy today is the convergence of Information and Communication Technology (ICT)
- All services - from knowledge-intensive professions (e.g. business consultant, physician, software engineer, legal council, financial advisor, university professor) to labor-intensive employment in hospitality, personal services, IT services, and transportation have shared characteristics (Baldwin and Clark, 1999; Grover et. al. 2002):
  - **intangible** primary products (health, business data, education, etc.) that cannot be easily transported and stored,
  - value creation with an external, customer-supplied production factor (brain to be educated, body to be cured, etc.), which is **non-standardized**,
  - simultaneity of production and consumption (e.g. key airline service is produced while customer is on board) in **highly complex service systems**,
  - **variation of service environment**, and
  - **education and learning for usage**.
- Service-oriented thinking (service-oriented transformation) via cloud computing is one of the fastest growing paradigms in Information Technology

***So, we think that maybe it's time to rethink IT architecture & service oriented cloud computing – from new organizational and technical vantage points***

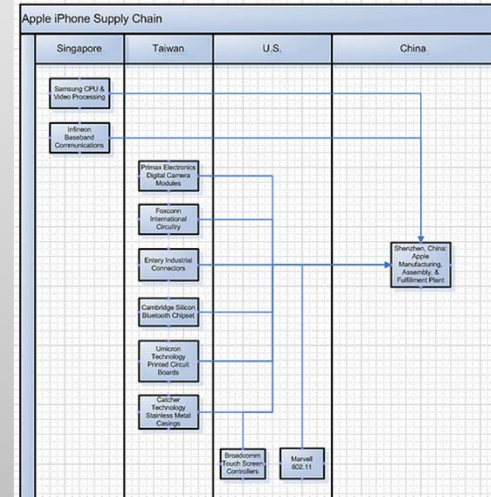
# a sample service: financial

The screenshot shows a Netscape browser window titled "Netscape - [American Express Home Page]". The address bar contains "http://www.americanexpress.com/". The main content area features the American Express logo and "ExpressNet" branding. A navigation bar includes "SHORTCUTS" with links for "Travel Reservations", "Check Your Bill", and "Apply for a Card". The central theme is "do more...with American Express", supported by five circular icons: "Cards" (credit cards), "Travel" (airplane), "Financial Services" (money), "Shopping" (shopping bags), and "Business Services" (handshake). A sidebar on the left offers "Customer Service" and "Site Directory", along with a "0004997" points counter and a prompt to check the "Membership Rewards" account. A footer note mentions "Security Q&A" and "Copyright © American Express Company. All Rights Reserved." The browser's status bar at the bottom shows "Done" and a timestamp of "May 22 2012".

# a sample service: cell phone + music

The new network play

...a value chain, too...



Value network linkages

Apple iPhone: \$599  
 AT&T/Cingular Smartphone Data Plan: \$19.99/mo.

**The New Unity Plan: Priceless**



Next - in the movies?

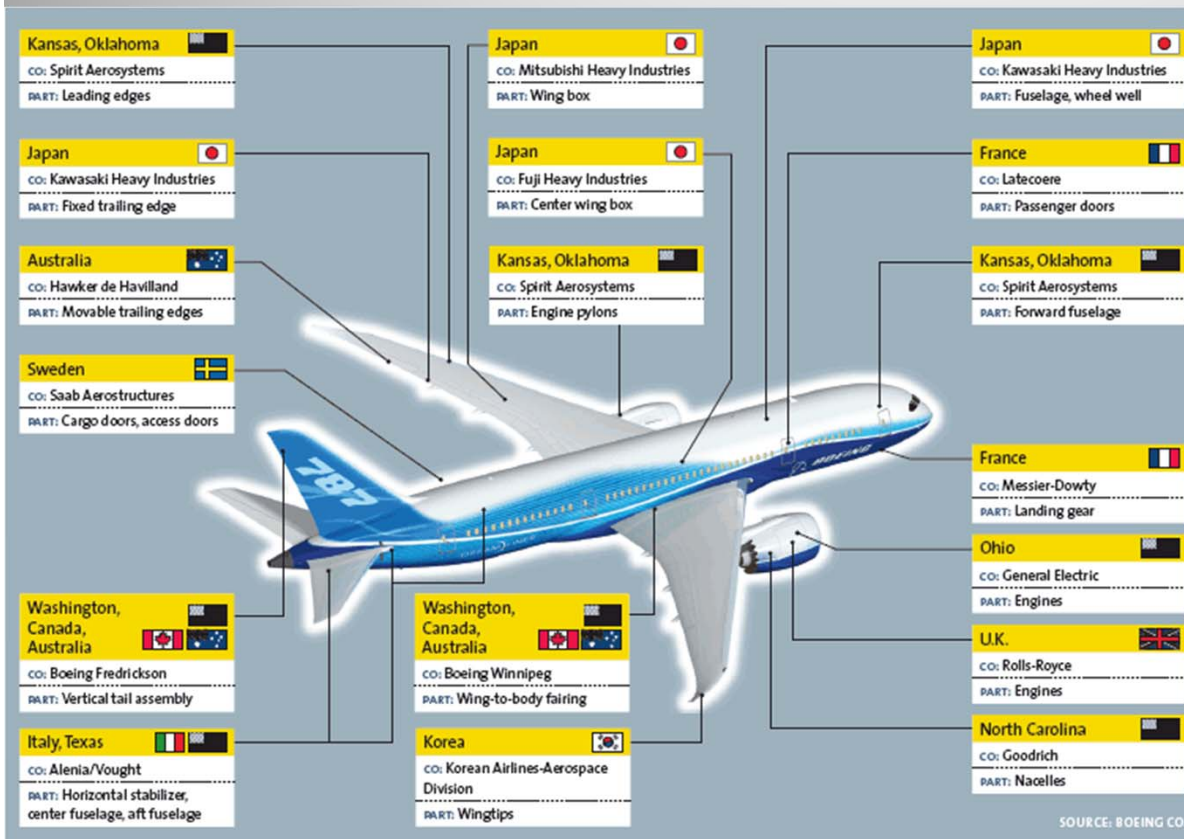


Apple's profits



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 May 22 2012

# a sample service: building an airplane e.g. Boeing's Dreamliner



- Partners have access to a computer simulation model outside the corporate firewall
- In that simulation, partners can virtually test parts' compatibilities; this replaces the 'design to blueprint' approach
- Boeing claims it has moved up the value stream to become a "large-scale service integrator"



# Two Paths of Services Research

## 1. How to improve service operations... because services as a percentage of GDP...

<u>Country</u>	<u>Percent of GDP</u>
Hong Kong	88
United States	80
United Kingdom	74
Netherlands	73
Australia	72
Canada	72
France	71
Singapore	70
Sweden	69
South Korea	68
Germany	68
Japan	68
New Zealand	67
India	61
Brazil	54
Indonesia	50
China	40

Source: The World Factbook,

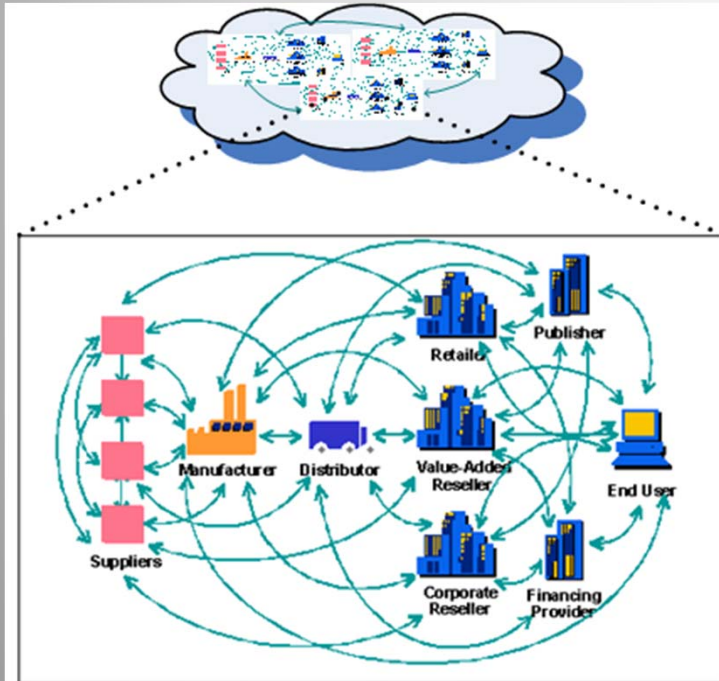
<http://www.cia.gov/library/publications/the-world-factbook> <https://www.cia.gov/library/publications/the-world-factbook/geos/ks.html>

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### Service Can Mean . . . . .

- Service as a product
  - For example, hotels, telecommunication, IT
- Customer service
  - For example, taking requests, answering customer questions, responding to complaints
- Service derived from a tangible product
  - For example, autos (transportation services); mobile phones (communication services)
- Services of product–dominant companies
  - Ranging from value added (e.g., repair and maintenance) to solutions (e.g., integrating products and services)

## 2. Service orientation... because it may improve agility in today's complex business environments..



- Internet speed is driving change which implies need for rapid translation of business ideas into value chain changes and rapidly flow value chain changes into transactional systems

This rapid change requires that we integrate tools to deliver on optimization and facilitate consistent and timely implementation of changes in information systems supporting the network chain

**Service orientation** is based on modularity (i.e. decomposing systems) (Baldwin & Clark, 2000). “Service-oriented” means the independent elements are described, discovered, and negotiated for in terms of the “services” they provide.

OASIS (2007) definition of SOA:

“A paradigm for **organizing** and **utilizing** distributed capabilities that may be under the control of different ownership domains. It provides a uniform means to offer, discover, interact with and use capabilities to produce desired effects consistent with measurable preconditions and expectations”

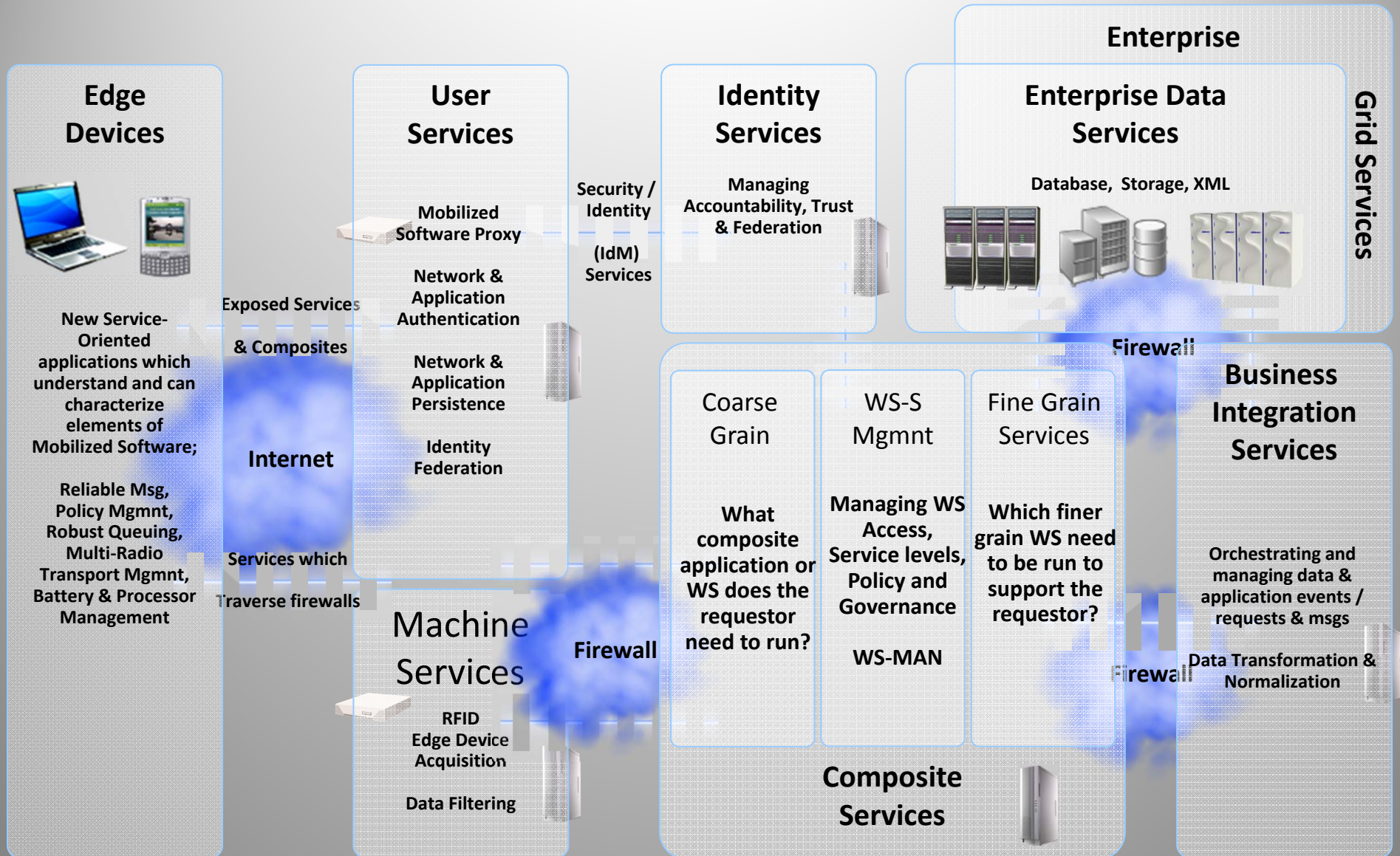
**A fundamental premise of service orientation** is that companies can break siloed business processes into modular independent services that can be reused on-the-fly in loosely-coupled dynamic business service choreographies, and they can source those choreographies by using virtual resources.

# Tradeoff Challenges in Service

Transformation Agenda	
<b>FROM</b> <ul style="list-style-type: none"><li>• Function oriented</li><li>• Build to last</li><li>• Prolonged development cycles</li><li>• Application silos</li><li>• Tightly coupled</li><li>• Object oriented</li><li>• Known implementation</li><li>• Governance model</li><li>• Approval process</li><li>• Value calculation</li></ul>	<b>TO</b> <ul style="list-style-type: none"><li>• Coordination oriented</li><li>• Build to change</li><li>• Incrementally built and deployment</li><li>• Enterprise solutions</li><li>• Loosely coupled</li><li>• Message oriented</li><li>• Abstraction</li><li>• Federated</li><li>• Judge common needs but allow for innovation</li><li>• Hedging options and flexibility</li></ul>

Our society is undergoing a revolution in information technology and services. There is a need to apply robust research findings related to service innovation, quality, design and delivery, customer satisfaction and loyalty. At stake is the ability to deliver cost-effective solutions from inter-dependent service units and the ability for firms and nations to compete globally through service innovation.

# Service-Oriented Computing Framework



# Market place for service oriented technology & management

- Pike Research expects the growth in service-oriented computing (e.g. software-as-a-service, cloud computing) revenue to continue worldwide between now and 2015 at a compound annual growth rate of 28.8%, with the market increasing from \$46.0 billion in 2009 to \$210.3 billion by 2015.

(<http://www.pikeresearch.com/research/cloud-computing-energy-efficiency>)

- ❖ Examples of the ASPs include Salesforce.com, Netsuite, Google, Microsoft and Oracle
- ❖ For example, SAP's SaaS offering in 2009 for their small and mid markets. This market segment now makes up almost 30% of SAP's revenue or about \$1 billion annually.
- ❖ Service-oriented computing market place includes
  - ◆ Enterprise Resource Planning,
  - ◆ Customer Relationship Management,
  - ◆ Supply Chain Management,
  - ◆ Human resources,
  - ◆ Finance,
  - ◆ Personal applications like Microsoft, and
  - ◆ E-commerce platforms like website hosting.

# Challenges/Issues/Barriers

- Losing control over IT governance
- Application performance
- Delivering adequate security
- Preventing runaway costs
- Complying with regional and sector regulations
- Vendors lacking
- Multi tenancy issues
- Resource allocation
- Inter-organizational application processing
- and many more...

## **When cloud computing notions came to the table of the Intel & American Express senior executive teams, they started to ask questions such as the following**

- Where do we start in terms of adopting cloud computing, and what steps should we take to reduce the risk of actually finding out that we increased cost and complexity with cloud?
- How do we integrate computer, network and storage services from one or more cloud service providers into our business and IT processes?
- How do we manage security and business continuity risk across several cloud providers?
- How do we manage the lifecycle of a service in a distributed multiple-provider environment in order to satisfy service-level agreements with our own customers?
- How do we maintain effective governance and audit processes across integrated datacenters and cloud providers?
- How do we adopt and/or switch to a new cloud provider?
- How can we make sure that we comply with regional and sector regulations?
- What type of role should we play in the cloud market? And how?



# Research Model

In this research, we propose a Cloud Adoption Readiness Assessment (CARA).

- An enterprise-directed, integrated exploration process
  - creating an organizational roadmap
  - realizing visions of how to deliver reliable, scalable enterprise processes built upon Service Oriented Architecture (SOA) and cloud computing
- Meaningful analysis of business needs and IT constraints
  - a focus that allows individuals and teams to innovate agendas that are closely aligned with a common vision and a definitive strategic direction
  - takes into account competitive strategy and the immediate requirements of customers, other stakeholders and potential external suppliers

# Cloud Computing

The execution model involves dynamic provisioning of services/resource pools in a coordinated fashion

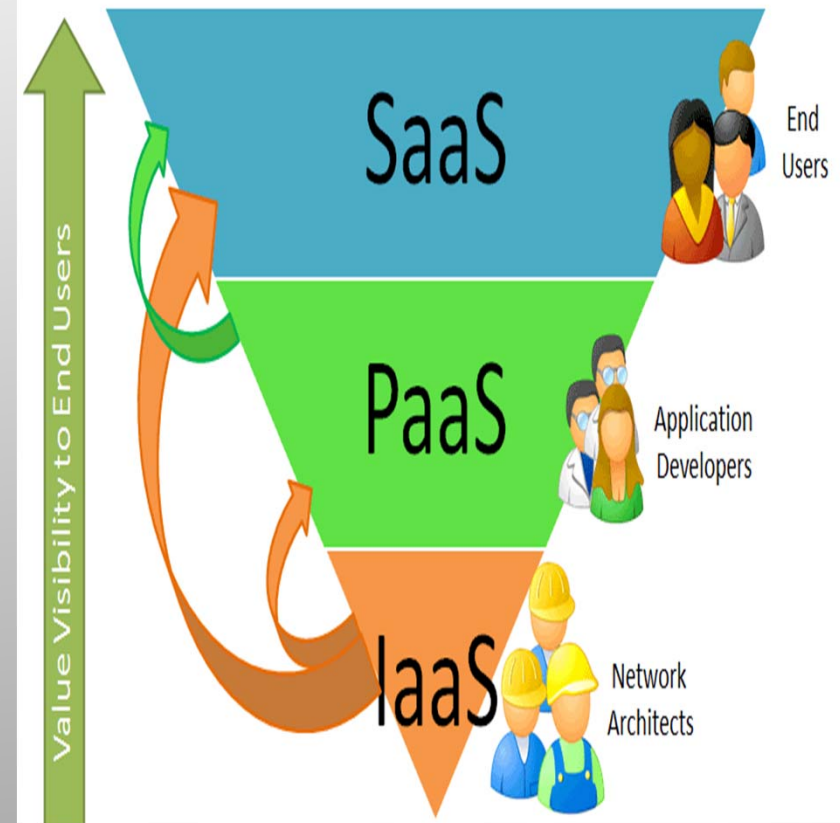
There is on demand computing – No waiting period

The location of resource is irrelevant (loosely coupled)

Note: May be relevant from performance (network latency) perspective, data locality

Not to be confused with

- Grid Computing – a form of distributed computing - Cluster of loosely coupled, networked computers acting in concert to perform very large tasks
- Utility Computing – packaging of computing resources such as computing power, storage, also a metered services
- ~~Autonomic computing~~ – self managed

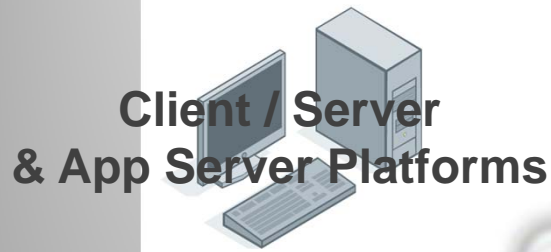


# Context - National Institute of Standards and Technology (NIST) Perspectives

- NIST defines cloud computing as “... a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (for example, networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”
- NIST defines four cloud deployment models:
  - public clouds (cloud infrastructure made available to the general public or a large industry group)
  - private clouds (cloud infrastructure operated solely for an organization)
  - community clouds (cloud infrastructure shared by several organizations)
  - hybrid clouds (cloud infrastructure that combines two or more clouds)



# Context - Organization for the Advancement of Structured Information Standards (OASIS) Perspectives: Business Advantages of the Cloud



Time to Value in Months

Fragmented Security & Compliance

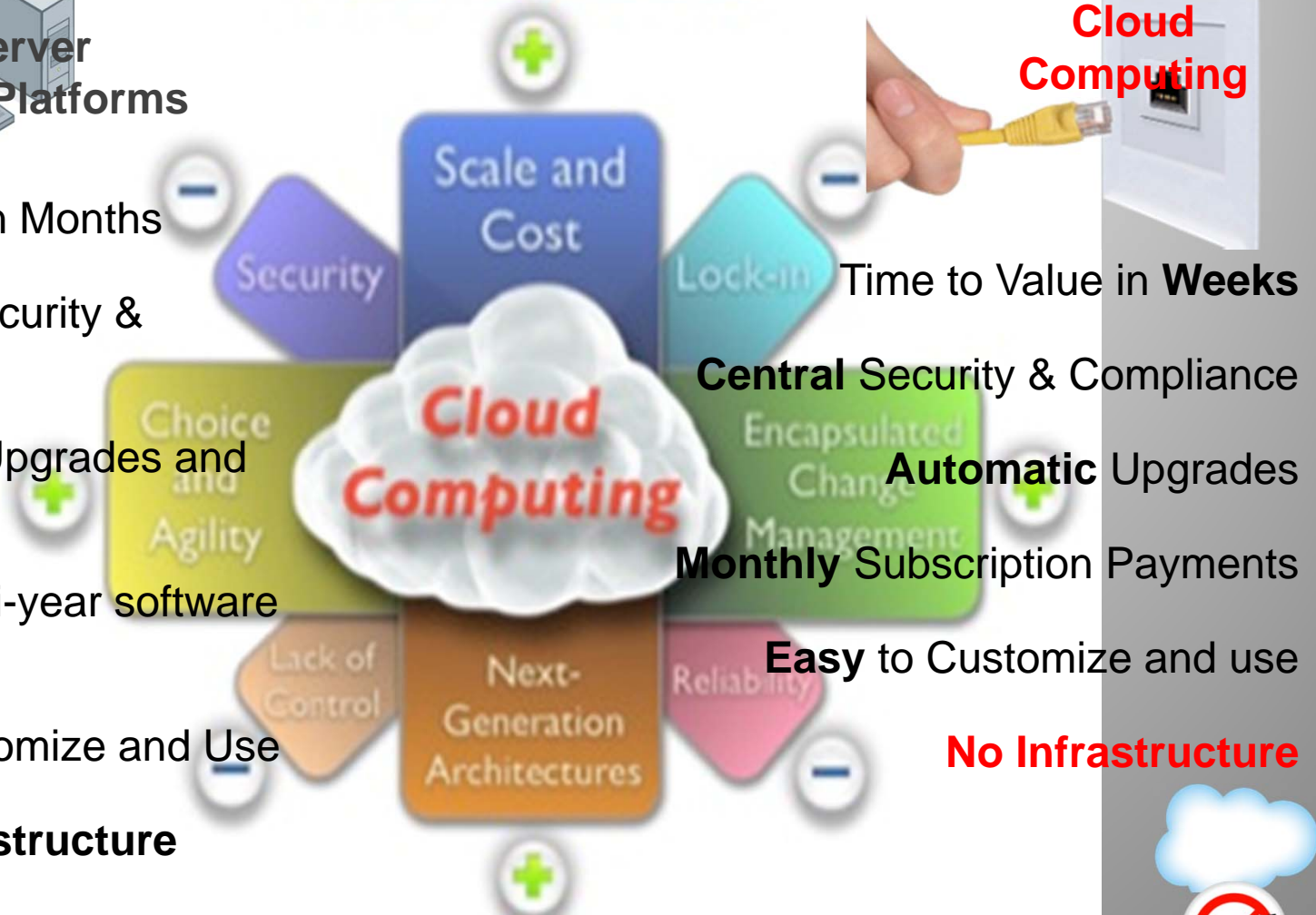
Painful, Risky Upgrades and Updates

Expensive multi-year software licenses

Difficult to Customize and Use

**Complex Infrastructure**

## Pros and Cons



Time to Value in **Weeks**

**Central Security & Compliance**

**Automatic Upgrades**

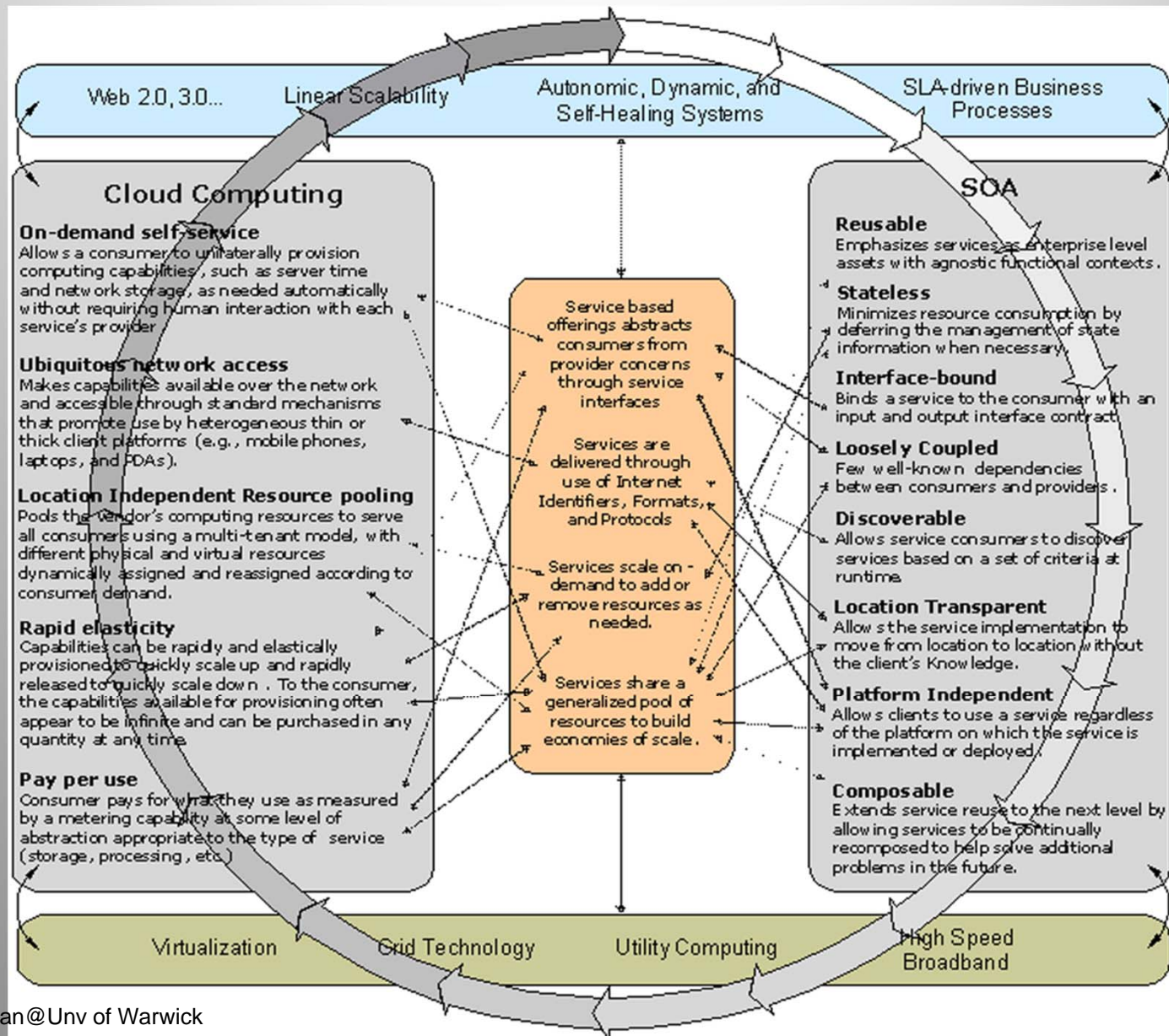
**Monthly Subscription Payments**

**Easy to Customize and use**

**No Infrastructure**



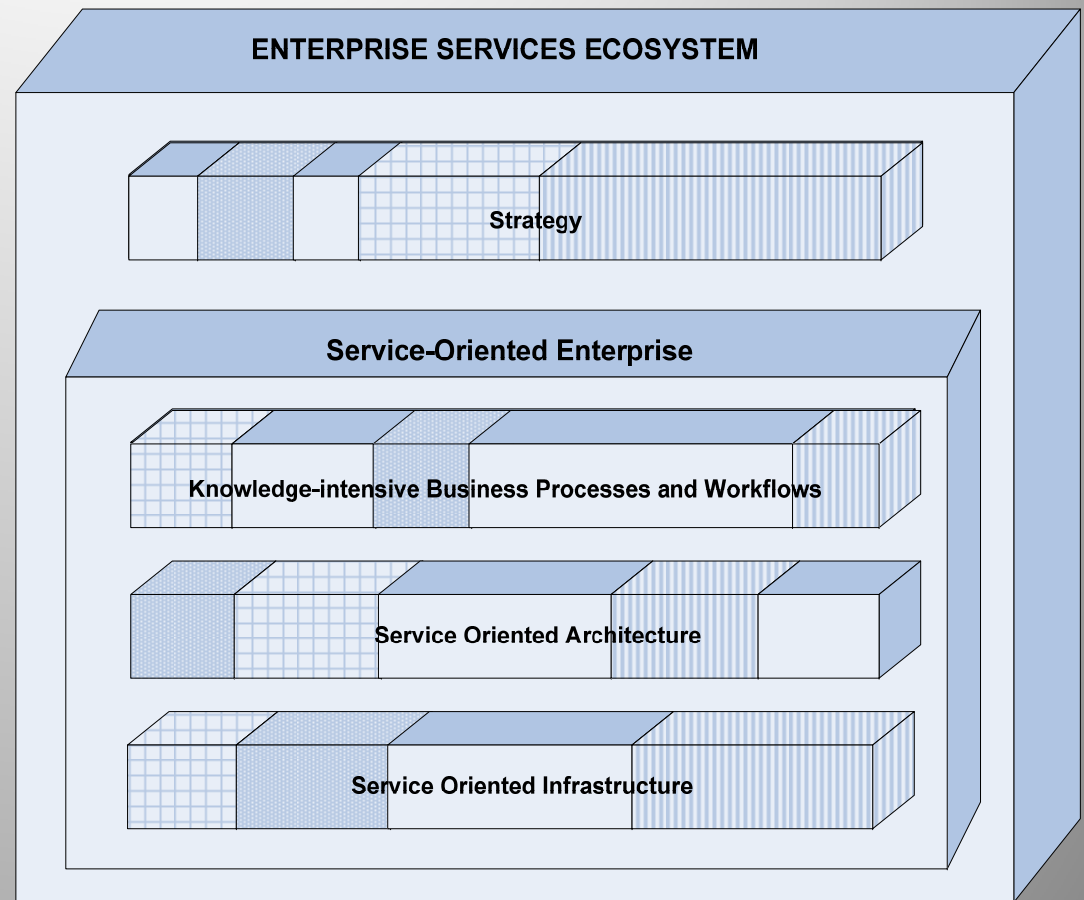
# OASIS Perspective: Ultimate Convergence of Cloud, SOA and SLA-driven Business Process Execution



# Artifacts

## *Towards a Dynamic Conceptual Model Based on the Notion of 'Services Oriented Enterprise'*

- To provide value to a CARA, an SOE ecosystem conceptual model must possess a host of entities, entity properties and entity interdependencies
- We have developed an SOE ecosystem ontology in an ontology modeling tool for the purposes of encoding enterprise use cases
- The ontology modeling tool, the ontology we have developed, and the use cases modeled in the tool serve as a conceptual model for a CARA effort



## Towards a Services Ecosystem - **An environment with** –

- live service entities,
- service entities that are in a state of construction or suspension,
- choreography entities that are compositions of service entities within a business process designed to deliver a complex service (i.e., choreographies are higher-level patterns of ‘means to achieving an end’),
- engagement models that represent interactions between service entities
- orchestration entities to encapsulate choreographies that have been historically executed, the associated metadata on the resources they consumed, the measures of performance (on relevant key performance indicators) that they achieved (i.e., historical executions of patterns), and post mortem analyses to inform pattern reuse (overall, orchestrations are lower-level patterns of both means and resource allocations that achieved an end state with detailed performance results)
- resources along with their current and planned states,
- key performance indicators, and
- utilities for garbage collection and to handle orchestration failure/recovery, etc.
- a general model of service entity roles
- an engagement model for service entity composition
- a model for using the ontology in building a new service
- a conceptualization of the role of the ontology for use in other applications

# Ecosystem (in Protégé 3.1.1)

The screenshot displays the Protégé 3.1.1 interface for an ontology project titled 'SOE Ontology (Nichols 7-25-05)'. The main workspace shows a process flow diagram for 'Make Pizza 2 Person'. The process steps are: Prepare Crust, Prepare Ingredients, Assemble, Cook, Cut, Box, and Deliver. Resources are categorized into Human\_Resource (John, Jane), Hardware\_Resource (Oven), and Service (Box, Deliver). The 'CLASS EDITOR' window shows the 'Service' class with the following template slots:

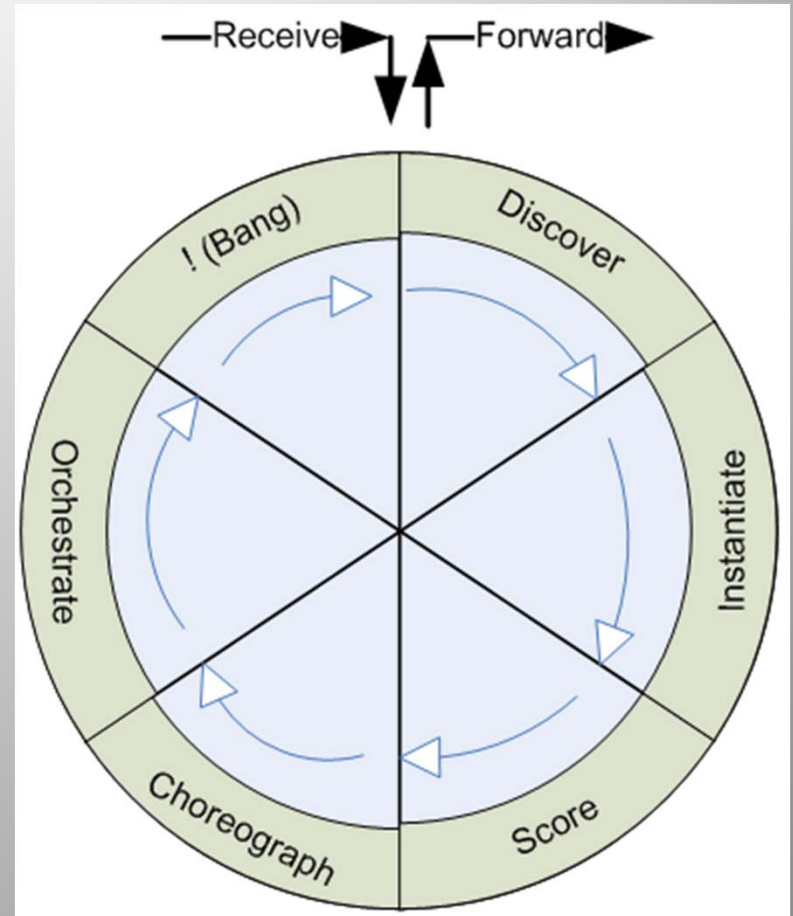
Name	Cardinality	Type
Activation_State	single	String
End_of_Life	single	String
Known_Choreographies	multiple	Instance of Choreography Diagram
Known_Uses	multiple	String
Location	single	String
Purpose_of_Service	single	String
Rationale	single	String
Resources_Responsible_for_Maintenance	multiple	Instance of Human_Resource
Service_Requirements_Document	single	Instance of Service Requirements
Service_Description	single	String
Service_Name	single	String
Start_of_Life	single	String
Time_to_Recover_from_Crashed	multiple	String
Time_to_Relieve_upon_Saturation	multiple	String



# DISCO!

## *Significance of reuse and commoditization*

- An important consideration for P&SFIA is pattern reuse at all transformational bridges - from business process to business sub-process, from business process to services and from services to execution infrastructure.
- Our reuse process approach involves the stages of **D**iscovery and **I**nstantiation of pattern templates, **S**coring resource allocation options, **C**horeographing processes, **O**rchestrating (executing) processes and capturing findings through post mortem analysis (the "!")



## Let's Look at the Possible Issues with the Service Orientation

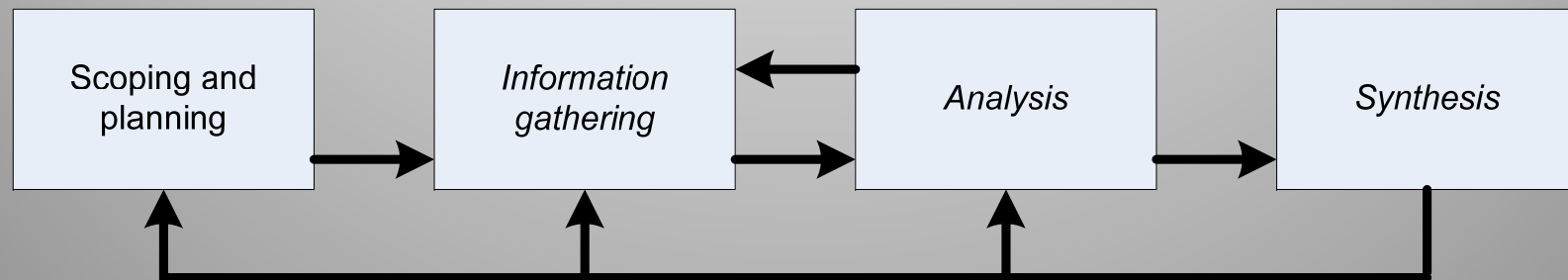
- Significant increase in the number of relationships to manage (modularity tradeoff) (*complexity* ↑)
  - New dependencies are required between service providers (*interdependence* ↑)
    - New forms of collaboration are needed between business and IT groups
  - Increased dynamics from inter-unit and -organizational dependencies (*complexity and interdependence* ↑)
  - Multiple processes can be used in the same service (*complexity* ↑)
- ∴ Complexity ↑ + Interdependence ↑ = Uncertainty ↑

In summary, service orientation increases process complexity and work group interdependence

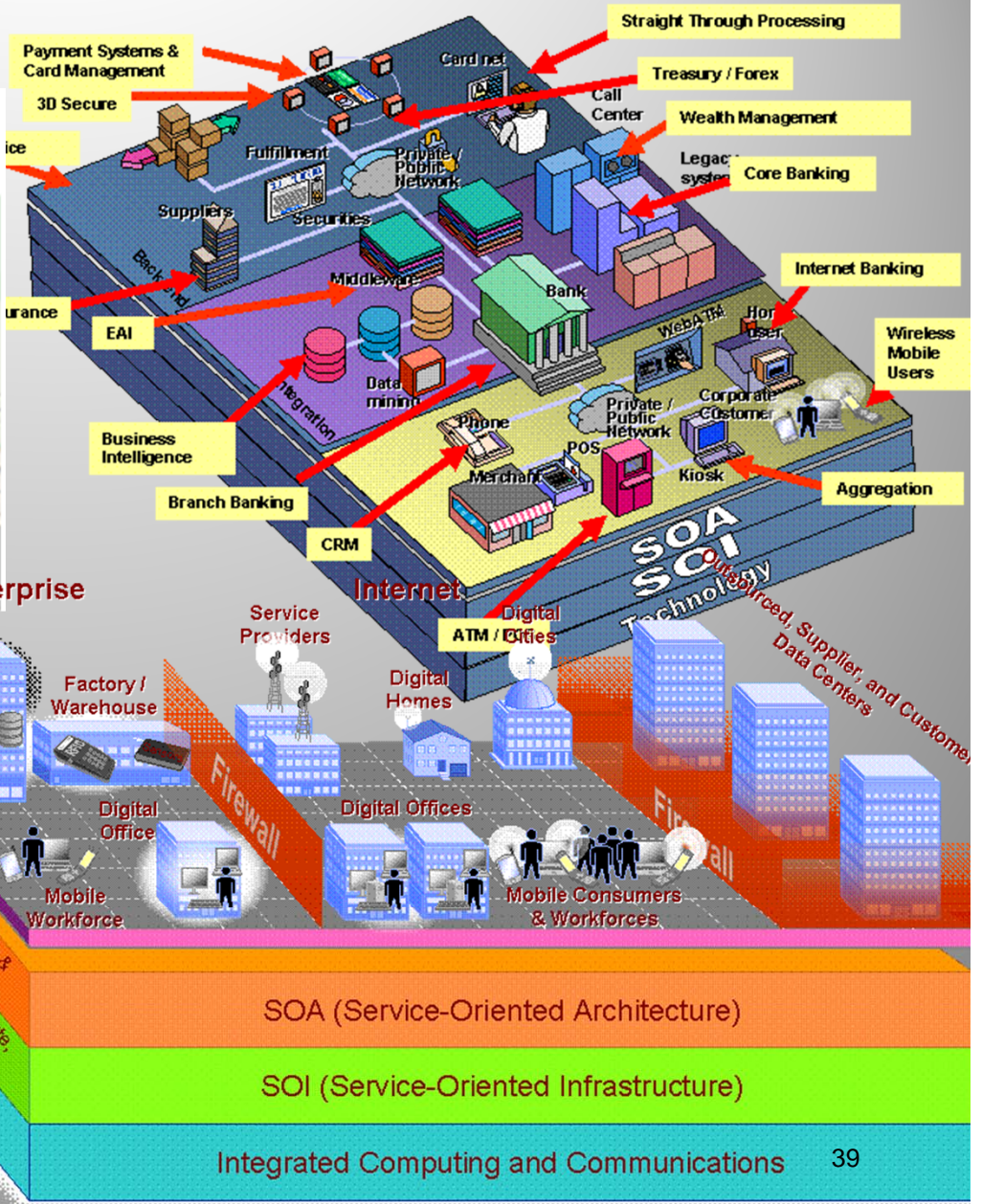
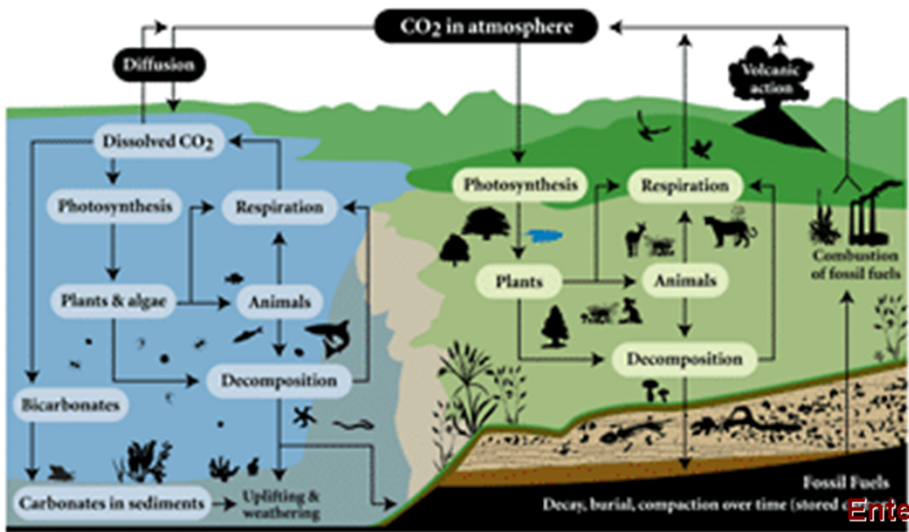
# Overview of CARA Process

The intent of CARA is to map strategy to workable solutions.

- In the end, a critical mass of SOE initiatives is defined by forging a consensus of key stakeholders to an agenda that is tailored to the enterprise's strategy.
- The outcome are not technology acquisitions; rather, outcomes are linked to integrating people, processes, systems and inter-organizational capabilities.



# Towards a Services-based Ecosystem Approach: From Biological to Organizational



- People and Projects in the Cloud Context
  - Modeling for Processes and Services
- 
- Service Level Agreements
  - Service Oriented Architecture and the Cloud
  - Service Oriented Infrastructure and the Cloud
  - Cloud Standards
- 

✦ **American Express**

- ✦ Global Card Services
- ✦ Zap the Gap Example
- ✦ Context of Project – Business Intelligence Group
- ✦ 4:7 Ratio of In-House to Outsourced Development and Execution Services
- ✦ How do we map our services business model to our services-based development and execution environment?

⌘ **Intel**

- ⌘ Supply Chain is a “Network of Service Providers”
- ⌘ From SCOR to Value Chain Example
- ⌘ Context of Project – R&D; Virtualization’s challenge to chip market?; SOA to SOI
- ⌘ Extending service-based concepts to infrastructure
- ⌘ How do we integrate a federation of organizations each using SOA who outsource business processes (across the federation’s landscape), services and infrastructure?



# *Case Study: A large financial institution (American Express)*

*Through CARA, Amex's IT Global Card Services Team was able to reduce service development cycle times and costs, and they achieved an increase in annual project satisfaction rates from 70% to 100%.*

## Situation

Amex is a global financial and travel services provider. The \$ 29 billion company operates over 130 countries. The business unit within which a CARA was completed provides business intelligence-based, customer self-services through corporate card member company portals. They must deliver BI services to their business customers quickly, with maximized operational efficiency, and with true agility in an environment of continuous change.

## Solution

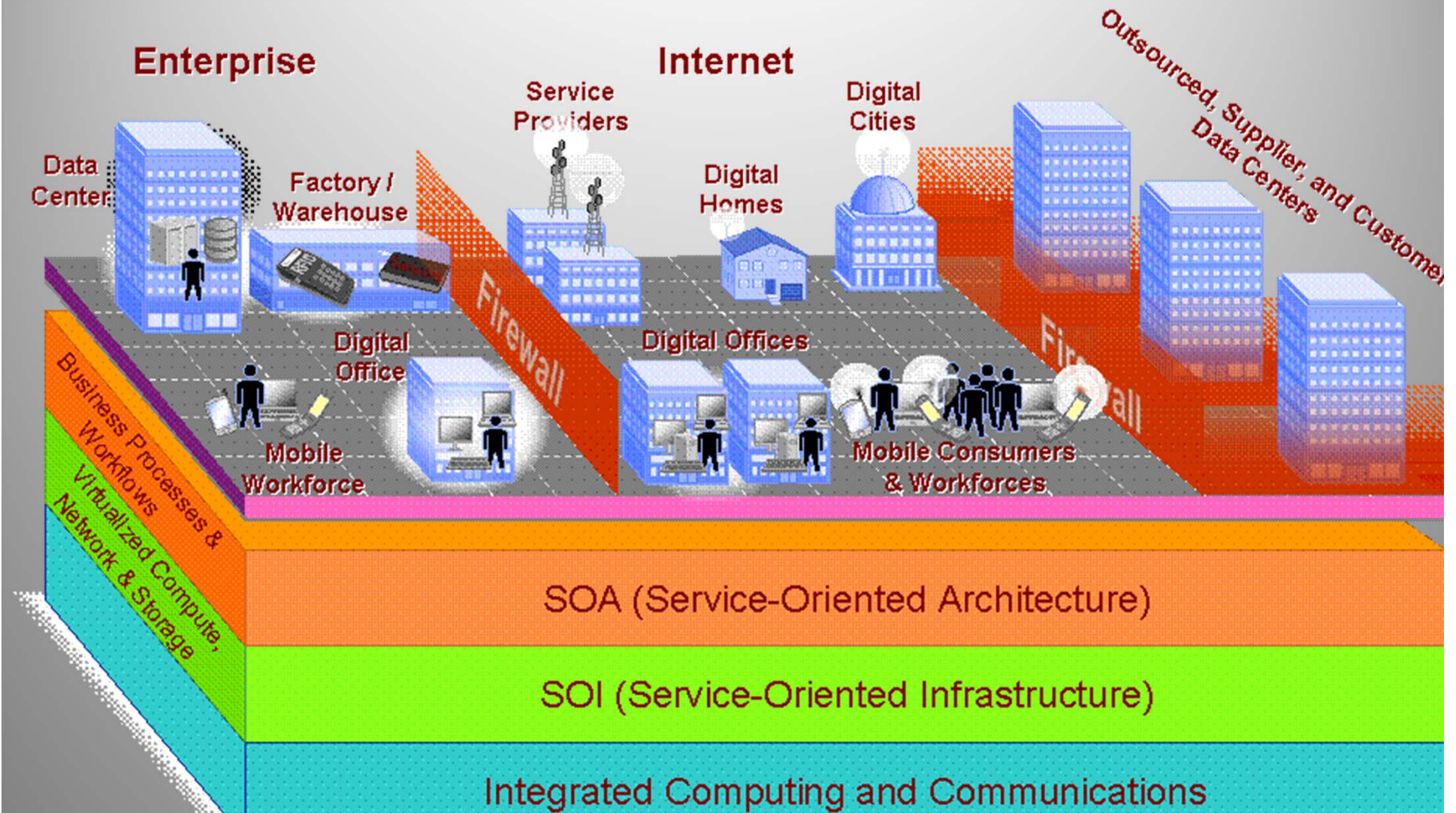
The goal of this CARA was to begin to leverage factory concepts and organizational structuring strategies to more closely align processes used to produce deliverable services with the underlying services needed from each team.

## Benefits

Results associated with aligning service oriented architecture with people, reuse and project streamlining (organizational) issues have been positive. They set new goals and agendas through CARA to:

- Align their organizational structure with a service development team orientation using best practice development process patterns.
- Streamline engagement models between service teams in a way that can result in reduced coordination overhead.
- Educate all stakeholders to the notion of services computing so everyone acts as both provider and customer.
- Be able to architect new service development efforts with process modeling and enhanced collaboration with business partners.
- Start to populate a common semantics-based conceptual model and global knowledge base for the group.

# a Services-based Ecosystem





# *Case Study: A large manufacturer (Intel)*

*With CARA, Intel's Business Agility Team formalized alternatives for workload mapping between SOA and SOI for SOE, and refined the MPOSE IMS proposal accordingly*

## Situation

Intel is a leading manufacturer of computer, networking, and communications products. The business unit within which a CARA was completed is responsible for defining business strategy, the architecture of business applications, and strategies for applying information technology to improve Intel's competitiveness. The overall objectives of this group are to define business strategy, the architecture of business applications to provide flexibility and agility for Intel to respond to changing business needs and to harness resources across globally outsourced design and supply chains.

## Solution

**The goals of this project have been to define strategies that will result in reducing the complexity and costs associated with extensibility of business processes throughout Intel's network of suppliers and customers.**

## Benefits

Examples of strategic directions and next step agenda items made possible through P&SFIA include:

- Business process mappings to inter-organizational applications and services need to reflect that partners may be using all types of infrastructure.
- An abstract model was developed to break functionalities into services and to assemble services into more complex services.
- Fundamental business process patterns were aligned with components of the Federated Enterprise Reference Architecture.
- Business processes defined in terms of value chain reference model (VCOR) semantics need to be addressed in next steps.
- Formalize alternatives for workload mapping between SOA and SOI for SOE, and refine the MPOSE IMS proposal accordingly.

# Process Lessons Learned

1. It is very important to begin by convincing all stakeholders they are players in a complex services ecosystem with under-addressed interdependencies.
2. The stakeholder team must examine the existing culture for aligning strategy, business and IT with an eye towards how that culture will need to change.
3. For business process owners, component developers, infrastructure managers, etc., it is important to establish a benchmark of current pattern template reuse and lessons learned.
4. The team must collectively conduct a detailed examination of simple and complex use cases for representation in a CARA conceptual model.
5. The use cases examined must trace a complete business process is composed of sub-processes that are ultimately sourced by computing infrastructure resources - the transformations need to be examined with an eye towards eliminating bottlenecks to agility.

## Process Lessons Learned

6. The team must brainstorm new stakeholder roles using a new framework to surface transformation ideas, action items and to realign people, processes and technologies prior to engaging cloud providers and negotiating any cloud contracts.
7. Repeating the process considering both transitory and long-term inter- and intra-organizational alliances and services ecosystem interdependencies is essential – it is important to recognize that the business drivers and rules for leveraging cloud will change as analytics surface best practice patterns.
8. Iterate 1-7, to build sufficient critical mass to realize an effective strategy for enterprise-wide cloud adoption.

Based on these experiences, we posit that:

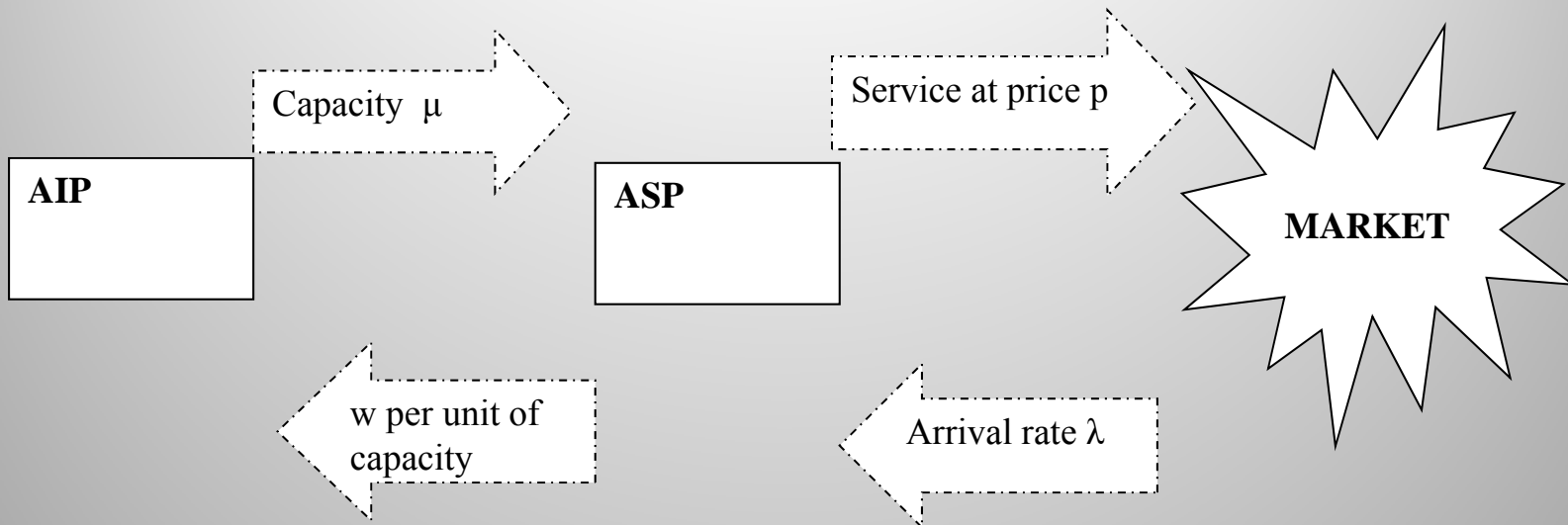
**One overriding lesson from this research** is that SOE is about people, the ways that they engage with computing to execute processes, and it is about the semantics that put people and machines together in new ways. It's about executable semantics and preparing for commoditization of processes, services and computing horsepower. These paradigm shifts – services science, management and engineering and SOA - are not about a specific technology or a product, they represent a major cultural change for organizations. A trans-disciplinary education program needs to be developed by utilizing organizational sociology, law, services marketing, business strategy and operations, accounting and finance, information technology, industrial and computer engineering to provide the knowledge necessary for this culture change.

# Challenges

- Setup cost to build the repository of service patterns and resource allocation patterns.
- Business and systems analysts must take the time to:
  - 1) identify the relevant services (and sub-services, sub-sub-services, etc.) which are needed during typical software projects,
  - 2) define a standardized definition for each service including the required inputs and produced outputs, and
  - 3) create and store an initial set of service patterns, sub-patterns, etc. as well as resource allocation patterns. In addition, standards must be developed so that the process of creating and storing new patterns can be accomplished in a way that will allow a shared understanding of the patterns by all PMs.

# Research Sample 2

# The Software-as-a-Service Supply Chain with Queuing Delay



The market in need of ASP services is characterized by a class of isoelastic demand function specified by Mendelson:

$$D(\lambda) = \frac{k}{\sqrt{\lambda}},$$

where  $\lambda$  is a Poisson rate of transactions per unit of time arriving at the ASP facility for processing, and  $k$  is an arbitrary constant. The arriving transactions have a homogeneous service requirement as they access the same software hosted at the ASP. The ASP service system is modeled as an M/M/1 queue with processing capacities  $\mu$  in transactions per unit of time

# Research Model

## ❖ Coordination Strategies

- ◆ (1) an overall SaaS coordination strategy;
- ◆ (2) the AIP-as-coordinator strategy;
- ◆ (3) the ASP-as-coordinator strategy, and
- ◆ (4) the aligned coordination strategy



# Questions?

