

IBM Service Oriented Technologies and Management for Smarter Enterprise

Professor Theodor Borangiu, Ph.D.
University Relations Coordinator IBM Romania

15th International Conference on System Theory, Control and Computing
October 14-16, 2011, Sinaia, Romania
theodor_borangiu@ro.ibm.com

The Eras of IBM Research

Isolated Research

'50s – '90s
Hardware

Joint Projects

IBM Divisions,
Clients, Universities

'90s – '00s
+ Software &
Services

Radical Collaboration

The World is Now Our Lab

'00s - ..
+ Smarter Planet

IBM Centennial: 1911-2011. A unique milestone... 

IBM Centennial: 1911-2011

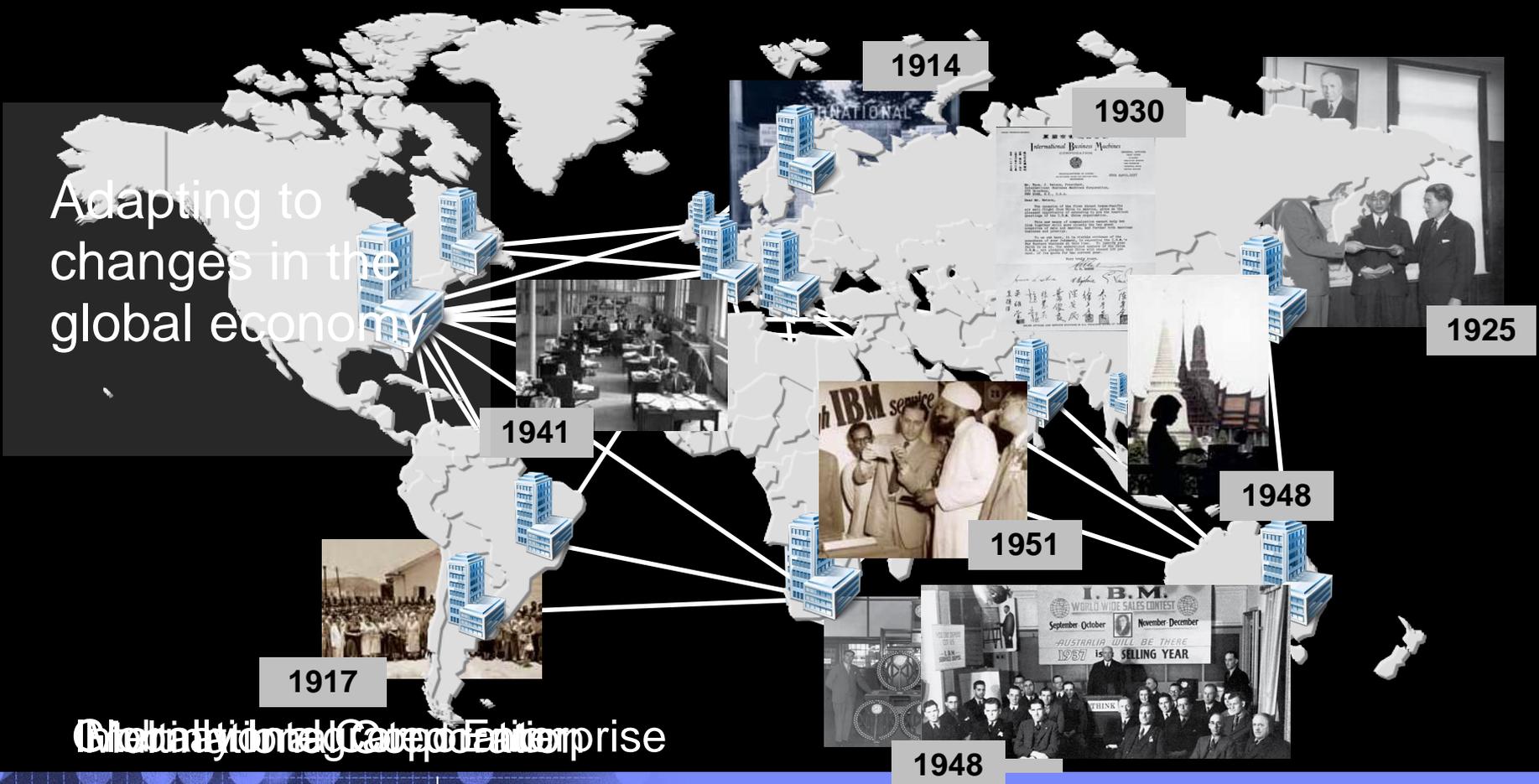
Three lessons from IBM's history for manufacturing enterprise

Adapting to changes in the global economy

Adapting to technological change

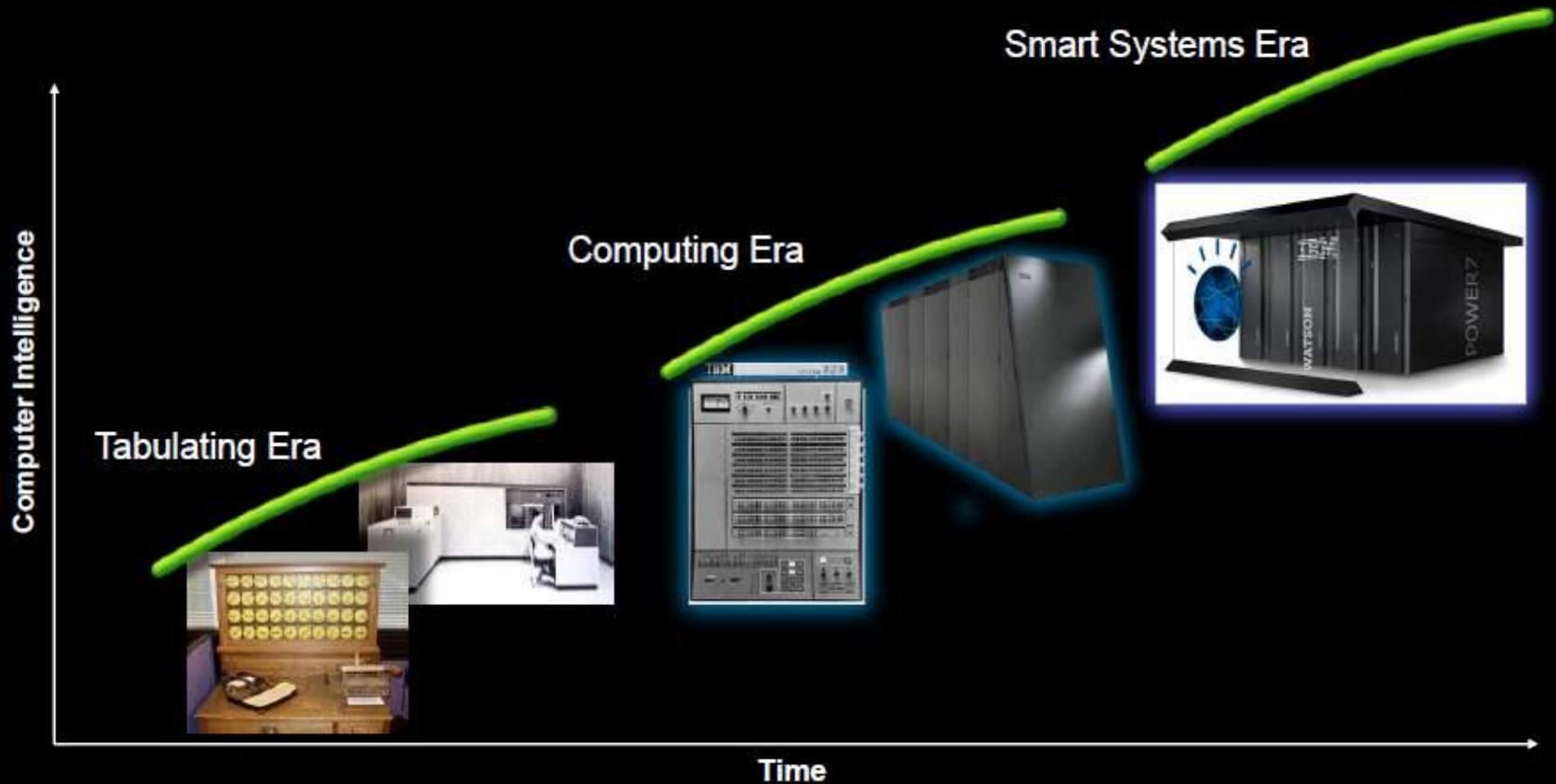
The key to retaining an organization's essence

Three lessons from IBM's history for manufacturing enterprise



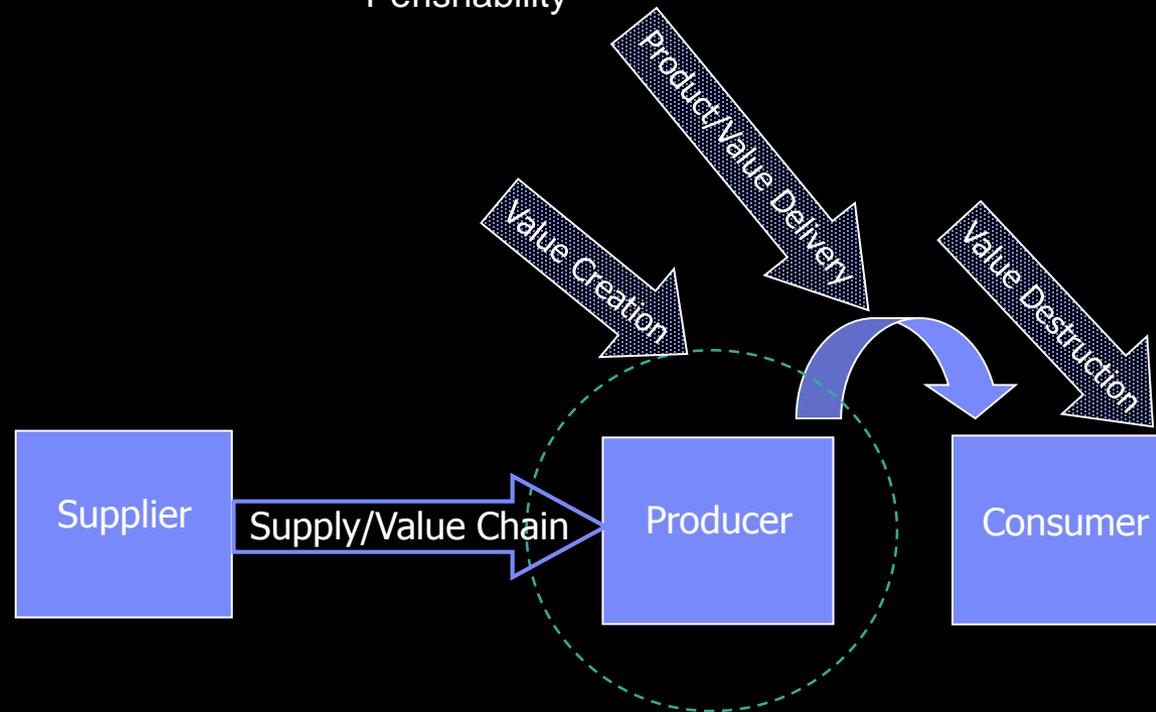
IBM Centennial: 1911-2011

Three lessons from IBM's history



Goods-dominant logic in manufacturing enterprise

- Purpose of economic activity is to **make and distribute units of output** (or goods)
- **Goods are embedded with utility** (value) during manufacturing
- Goal is to **maximize profit by efficient production and distribution of goods**
 - goods should be standardized
 - produced away from the market
 - inventoried till demanded
- **Manufacturing** rather than *marketing*
- **Servitization** (of products): a *strategy changing* process in which the **manufacturing enterprise assume service orientation** and SOA and / or develop more and better services
- Services are merely:
 1. Value-enhancing add-ons for goods
 2. A particular (inferior) type good, characterized by
 - Intangibility
 - Heterogeneity (non-standardization)
 - Inseparability (of production and consumption)
 - Perishability

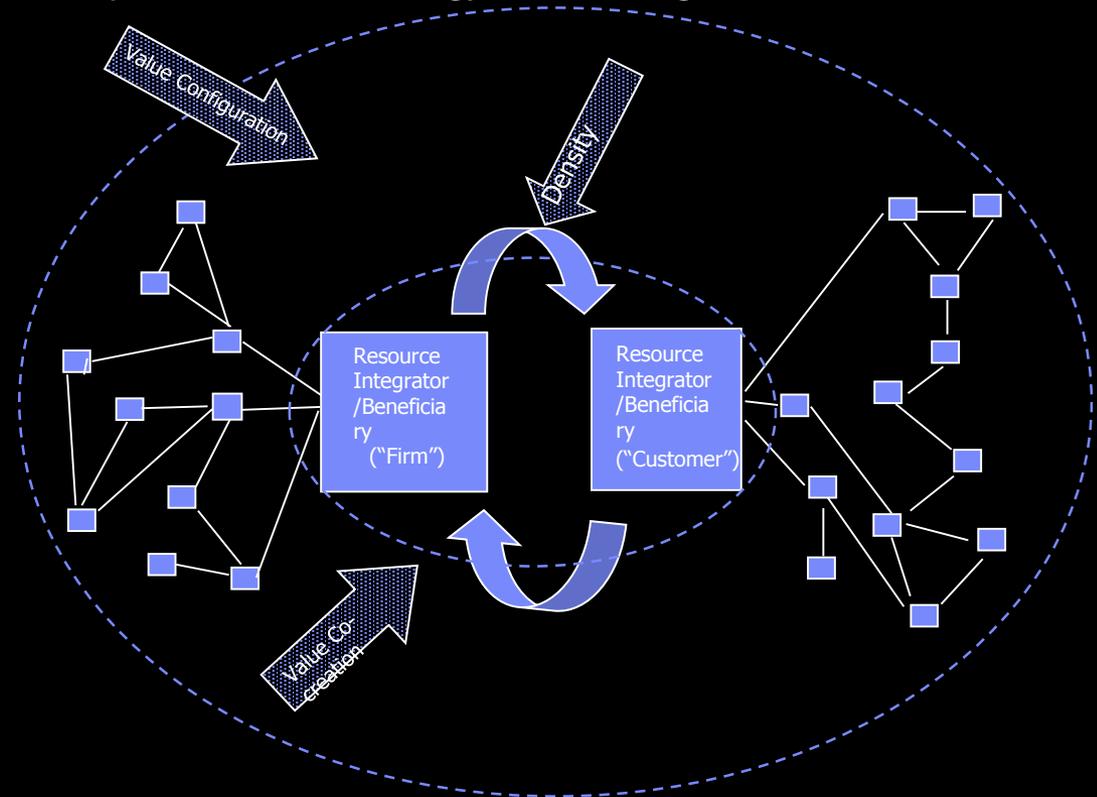


Service-dominant logic in manufacturing enterprise

- **Service** is the *application of competences* (service provider – manufacturing enterprise) *for the benefit of another entity* (service client – another enterprise)
- Service is exchanged for service
- **Value is always co-created**
- Goods are appliances for service delivery
- All economies are service economies
- All businesses are service businesses
- (Services) **productization** includes:
 - **Standardization** and
 - **Modularity**of service processes

Service is the **process of value co-creation** - i.e. a result of inter-human and inter-organisation knowledge-intensive communication, planning and interaction

A **manufacturing service system** is an *open system* in which *the client provides inputs* for the service delivery process, at technology- and management level



Resources are the building blocks of service systems

First foundational premise of service science:

Service system entities dynamically configure four types of resources

The named resource is

Physical
Not-Physical

The named resource has

Rights
or
No-Rights

	Rights	No-Rights
Physical	1. People	2. Technology
Not-Physical	3. Organizations	4. Shared Information
	operant	operand

Formal service systems can contract
Informal service systems can promise/commit

Trends & Countertrends (Evolve and Balance):

Informal <> Formal
Social <> Economic
Political <> Legal

Routine Cognitive Labor <> Computation
Routine Physical Labor <> Technology
Transportation (Atoms) <> Communication (Bits)
Qualitative (Tacit) <> Quantitative (Explicit)

Value propositions coordinate & motivate resource access

Second foundational premise of service science:

Service system entities calculate value from multiple stakeholder perspectives

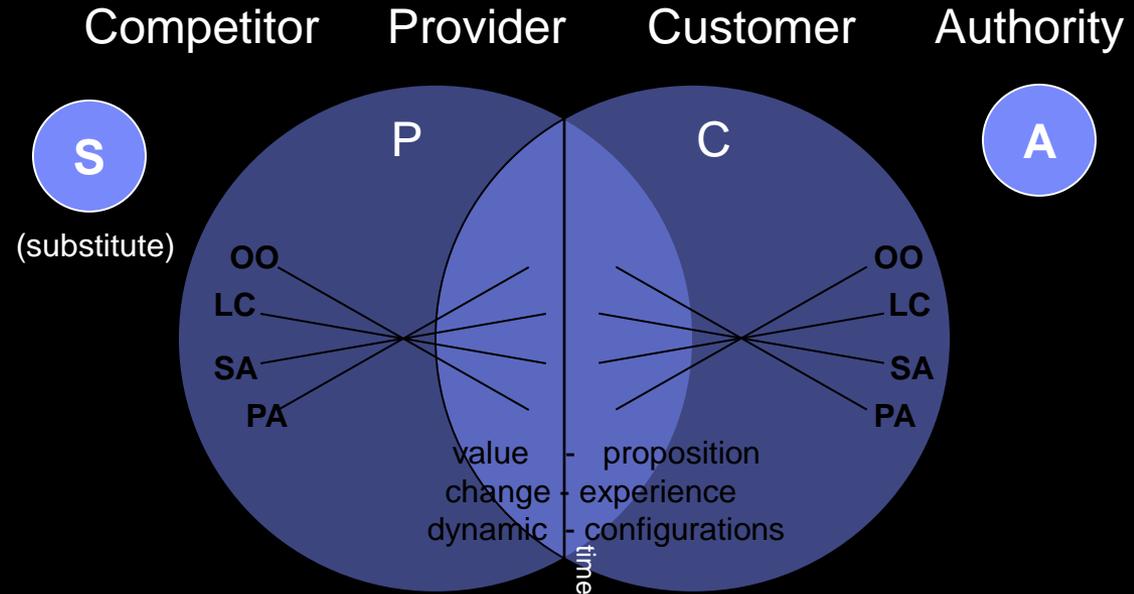
A **value proposition** can be viewed as a request from one service system to another to run an algorithm (the value proposition) from the perspectives of multiple stakeholders according to culturally determined value principles.

The **four primary stakeholder perspectives** are: *customer*, *provider*, *authority*, and *competitor*

Stakeholder Perspective (the players)	Measure Impacted	Pricing Decision	Basic Questions	Value Proposition Reasoning
1.Customer	Quality (Revenue)	Value Based	Should we? (offer it)	Model of customer: Do customers want it? Is there a market? How large? Growth rate?
2.Provider	Productivity (Profit)	Cost	Can we? (deliver it)	Model of self: Does it play to our strengths? Can we deliver it profitably to customers? Can we continue to improve?
3.Authority	Compliance (Taxes and Fines)	Regulated	May we? (offer and deliver it)	Model of authority: Is it legal? Does it compromise our integrity in any way? Does it create a moral hazard?
4.Competitor (Substitute)	Sustainable Innovation (Market share)	Strategic	Will we? (invest to make it so)	Model of competitor: Does it put us ahead? Can we stay ahead? Does it differentiate us from the competition?

Third foundational premise of service science:

The access rights associated with customer and provider resources are reconfigured by mutually agreed to value propositions relationships



service = value-cocreation

provider resources

Owned Outright
Leased/Contract
Shared Access
Privileged Access

B2B
B2C
B2G
G2C
G2B
G2G
C2C
C2B
C2G

customer resources

Owned Outright
Leased/Contract
Shared Access
Privileged Access

Access rights

Access to resources that are *owned outright* (i.e., property)

Access to resource that are *leased/contracted for* (i.e., rental car, home ownership via mortgage, insurance policies, etc.)

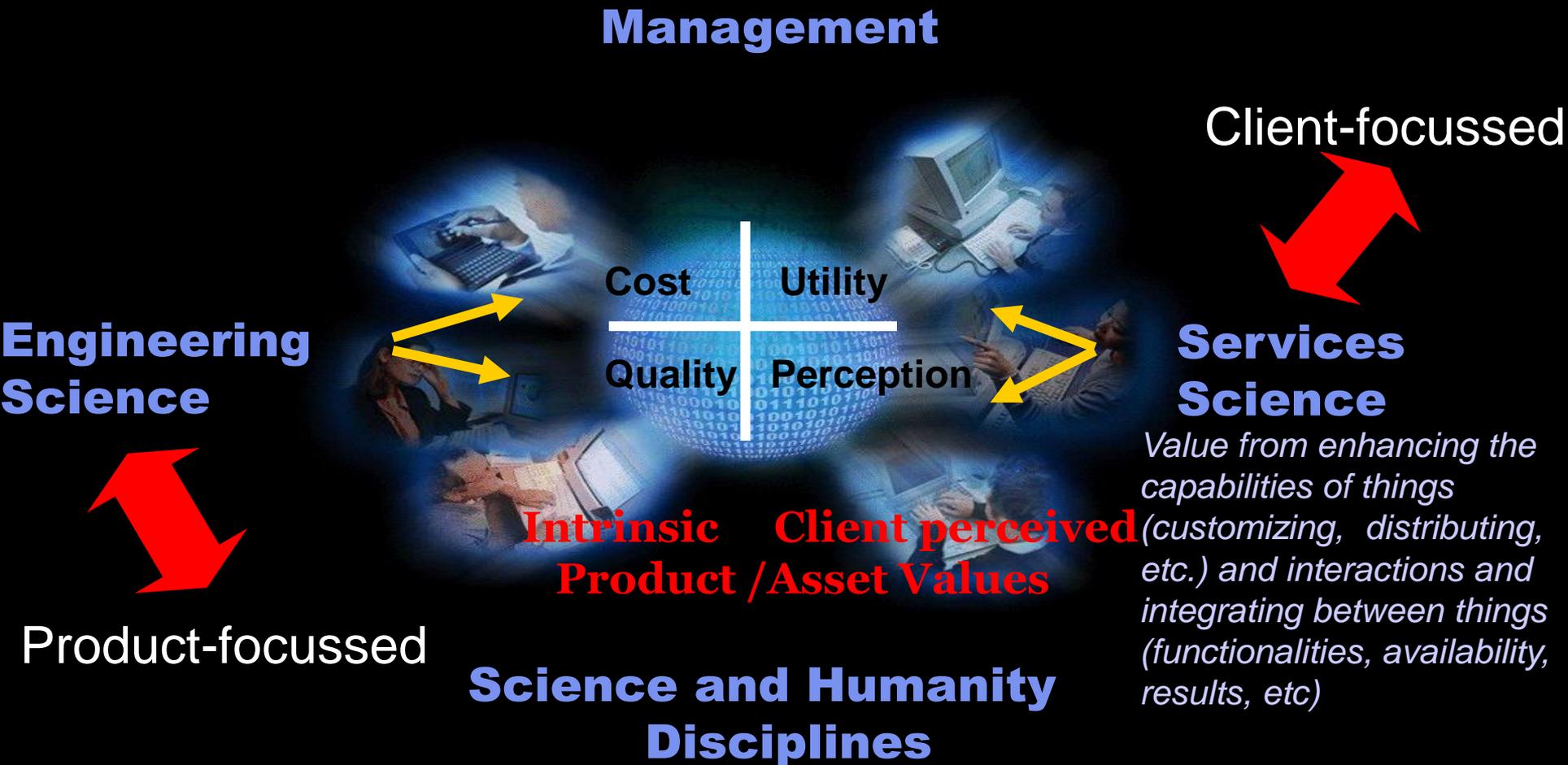
Shared access (i.e., roads, web information, air, etc.)

Privileged access (i.e., personal thoughts, inalienable kinship relationships, etc.)

Value Creation: Engineering vs Service

HOW VALUES ARE CREATED?

Services focus on creating Utility Value or Perceived Value for a product/asset. They are in contrast with Engineering which focuses on Cost and Quality



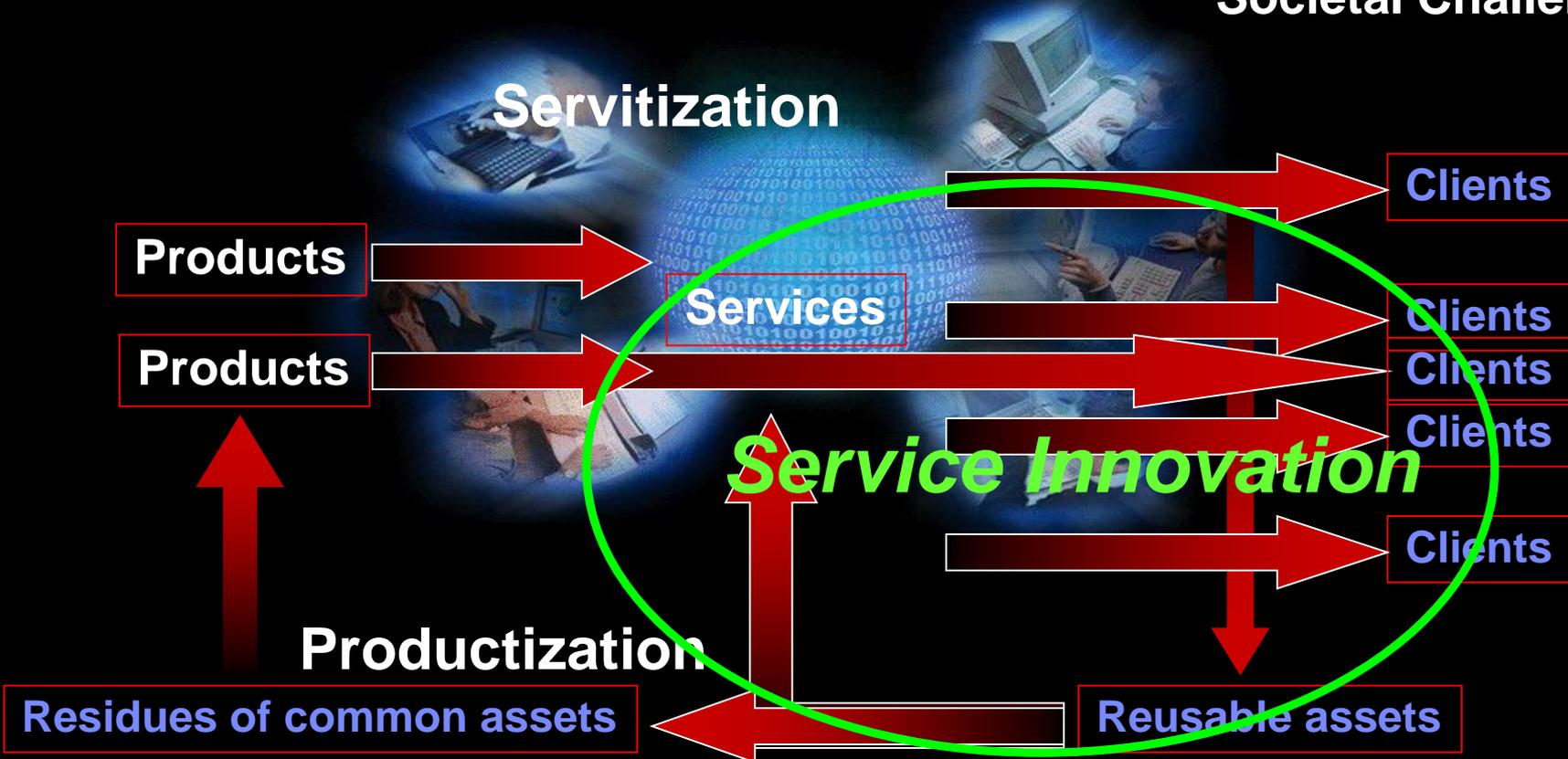
Route to Market: Servitization vs Productization

Service: non mass producible – labour intensive

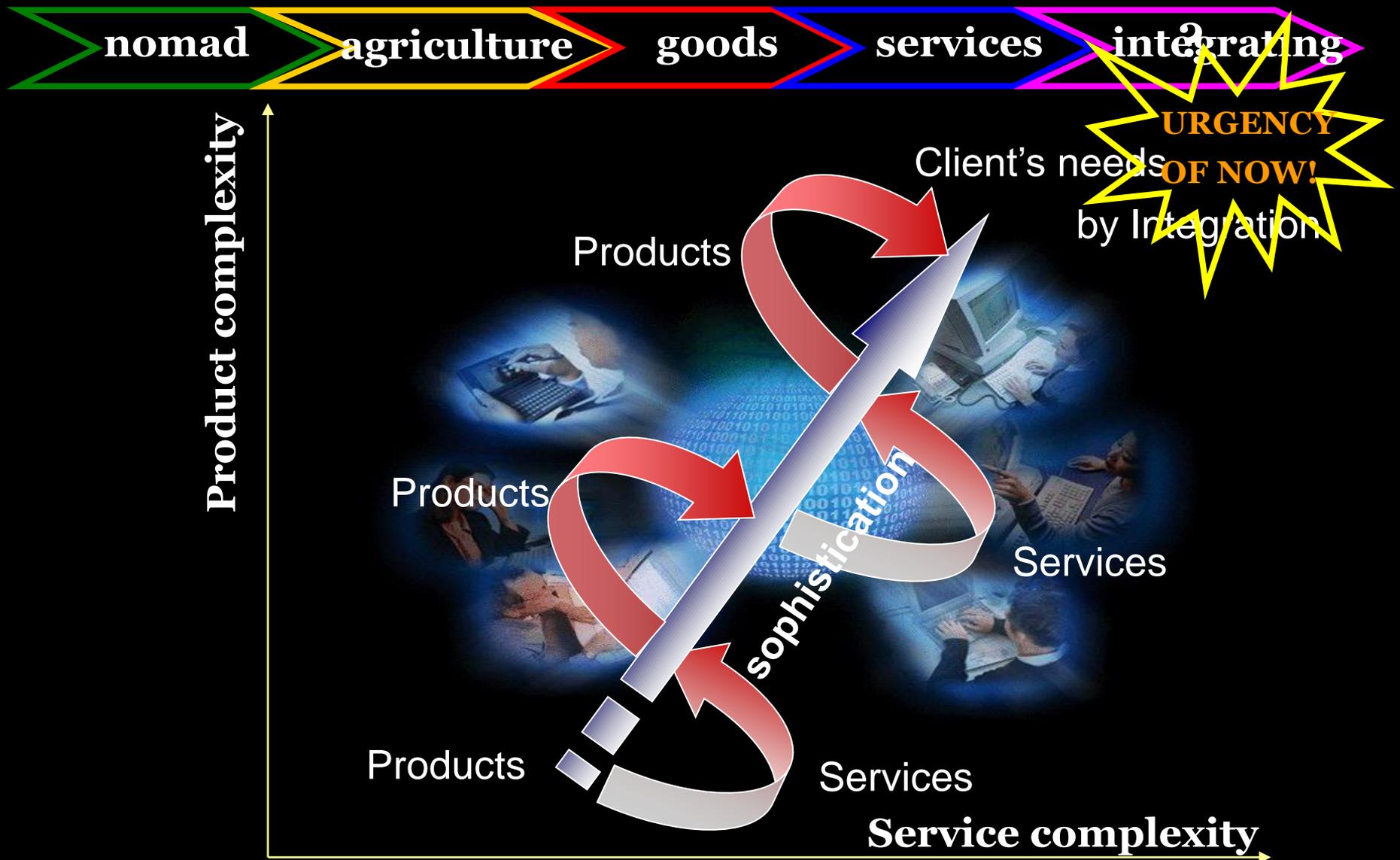
Product: mass producible – capital intensive

Service/Product: mass customizable – labour/capital intensive

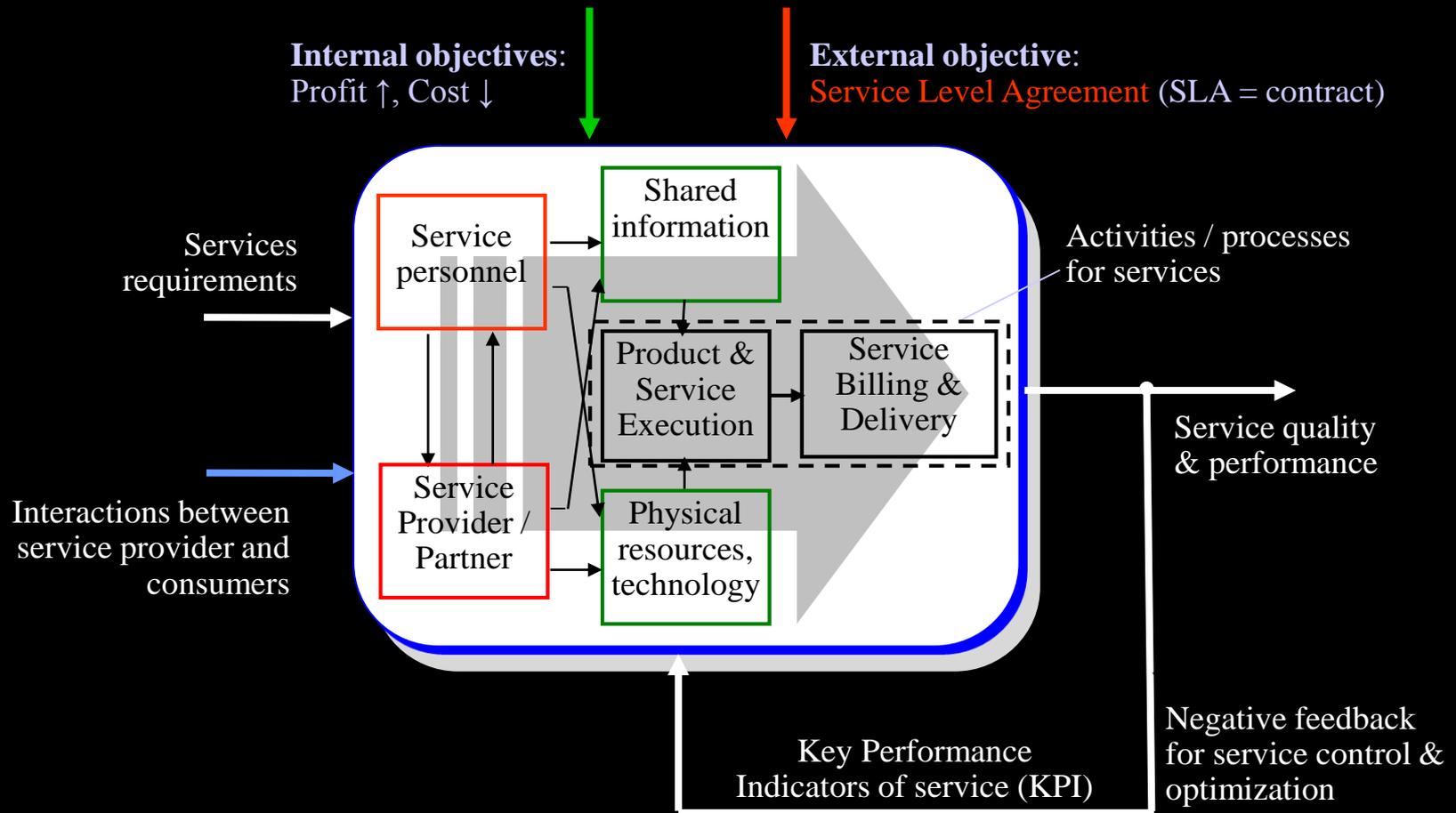
**Business or
Societal Challenges**



Value Creation Driver: getting closer to users



A systemic view of service system entities



Service Value Creation Model

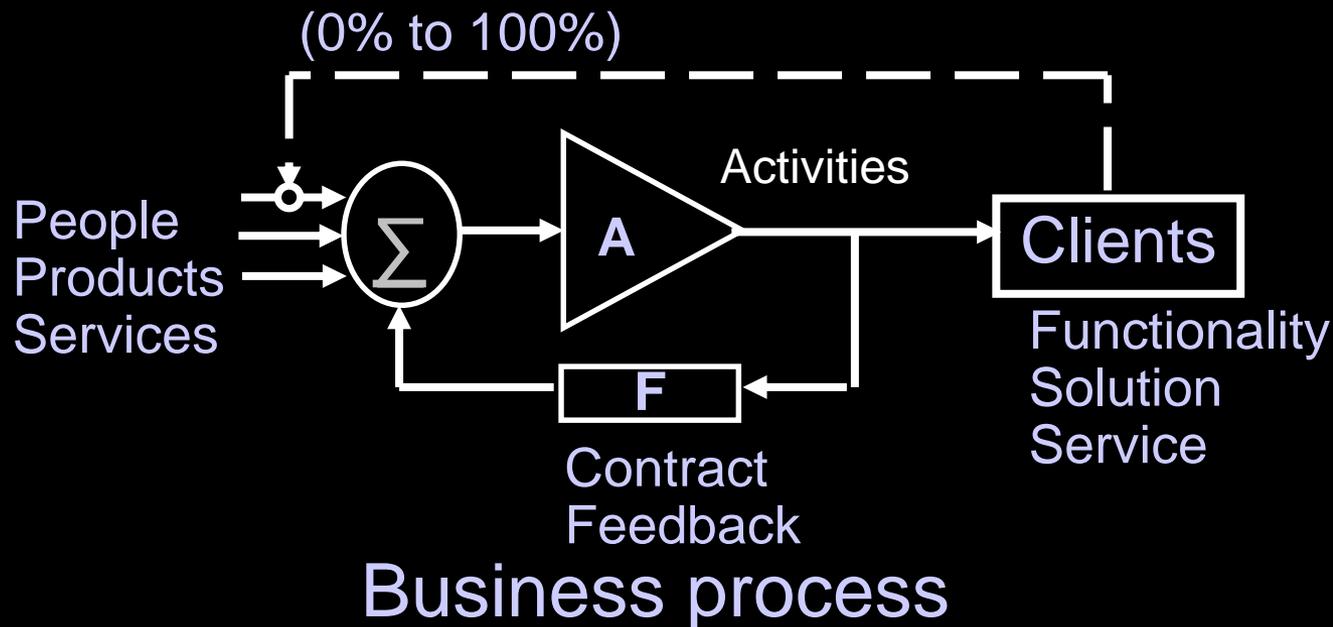
- **Agility**: fundamental requirement for modern manufacturing companies in order to face challenges provoked by the globalisation, changes on environment and working conditions regulations, improved standards for quality, fast technological mutation, and changes of the production paradigms.
- The turbulent and continuous market changes have **impacts at different levels**, from **company management** to **shop floor**.
- **Shop floor reengineering** for agility:

– **Modularity**: manufacturing systems as compositions of *building blocks* [information counterparts: agents, holons]

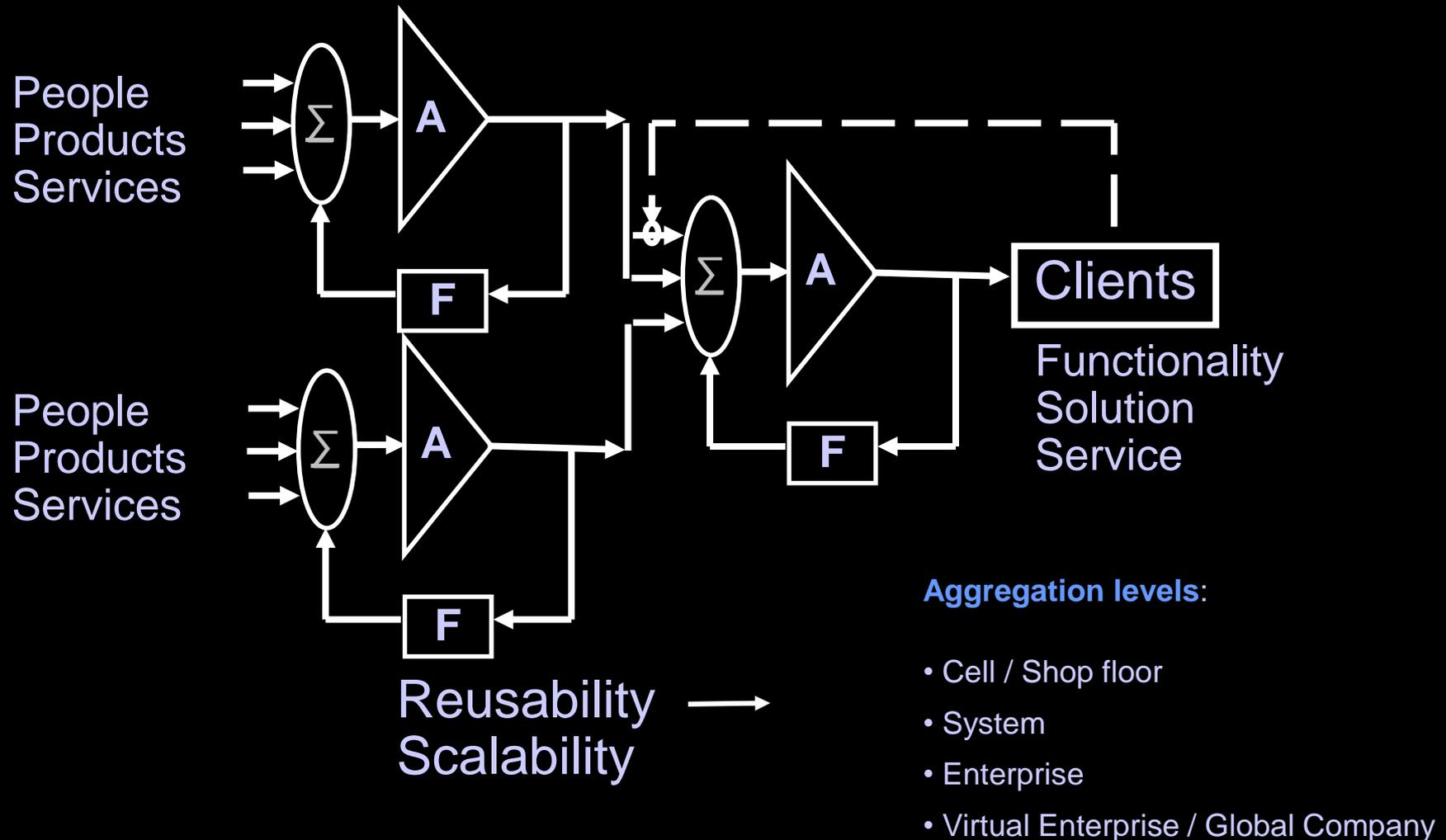
– **Configuration rather than programming**: *contractual relationships* among building blocks (modules)

– **High reusability**

– **Legacy system migration**: legacy and heterogenous computers and controllers interconnected and used (proxy, RDA)



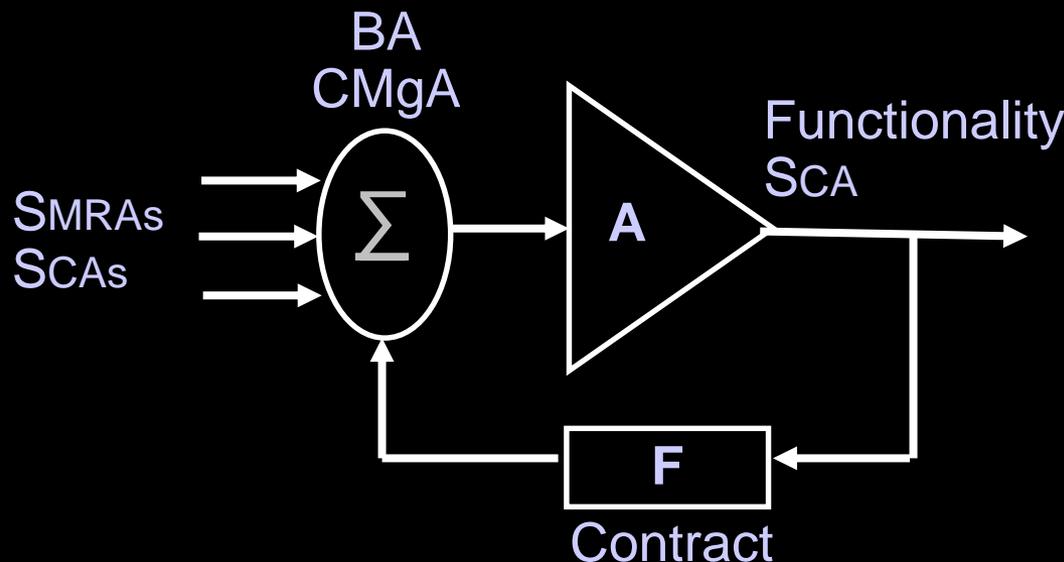
Service Value Creation Recurrent/Recursive Model



CoBASA Skills Creation Model

(Coalition Based Approach for Shop floor Agility)

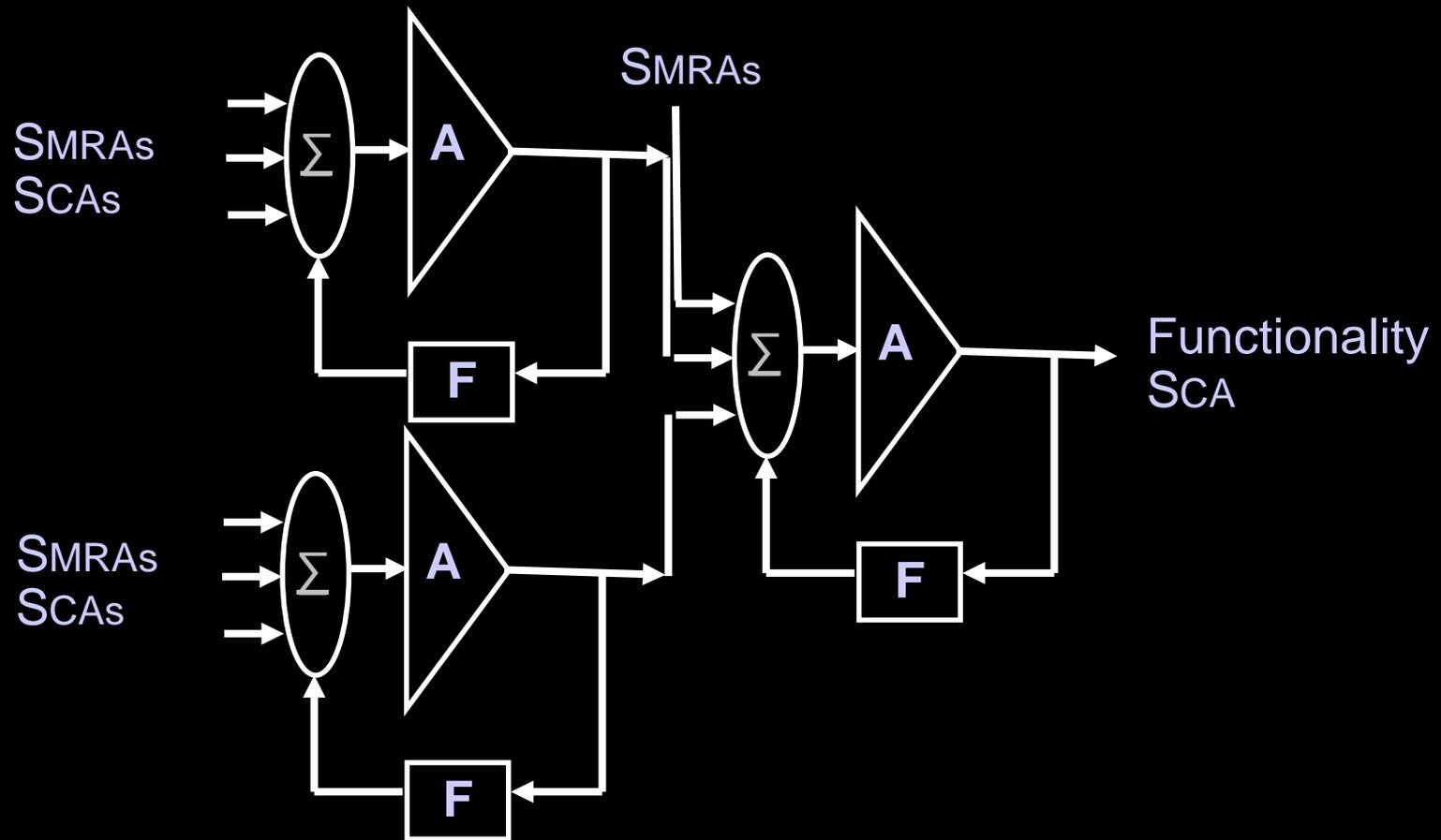
- **Resources** are *building blocks* of manufacturing service systems
- Enterprise **Cluster**: the global pool of resources
- **Coalition** or **Cooperative Consortium** [Virtual Enterprise]: group of resources [companies] that *cooperate to reach a common objective* – its formation is triggered by *business objectives*



Manufacturing process
(service-dominant logic)

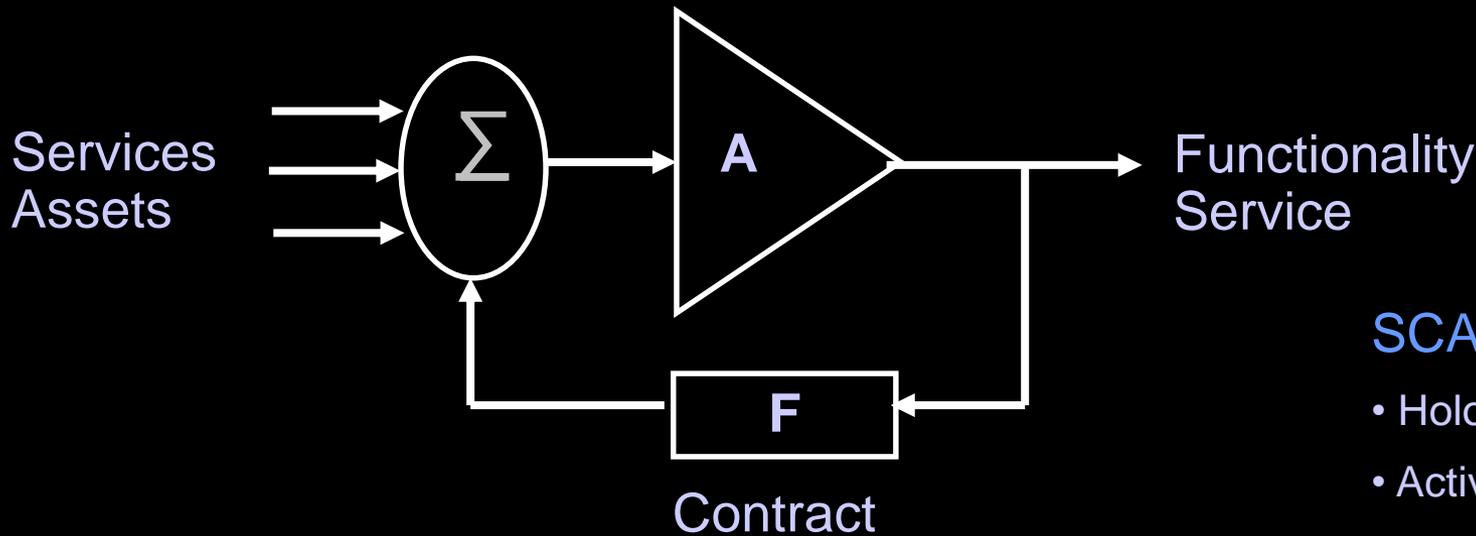
- **MRA - Manufacturing Resource Agent**: an agentified manufacturing component extended with agent-like skills (such as negotiation, contracting and services...)
- **CA - Coordinating Agent**: the agent specialised in coordinating the activities of a coalition (CA represents the coalition)
- **BA - Broker Agent**: the agent responsible for the creation of coalitions
- **CMgA - Cluster Manager Agent**: the agent that supports the activities required by the cluster it represents

CoBASA Skills Creation Recurrent Model



Reusability + Flexibility in reconfiguration → Agility

SOA Value Creation Model



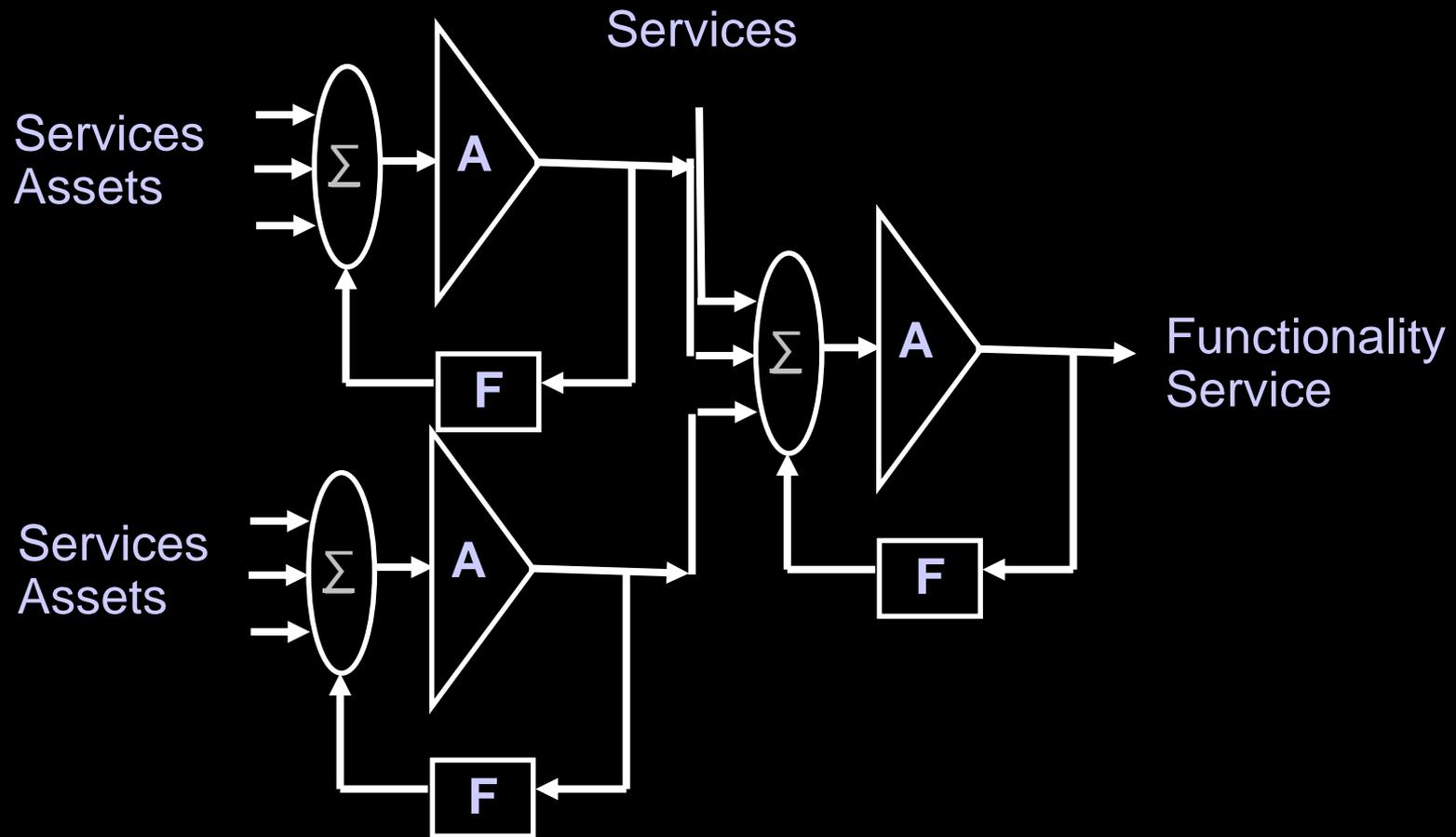
Business process
Application

SCA: Service Component Architecture

SCA levels:

- Holons
- Active Holon Entities
- Intelligent Products
- Holarchies, HMES
- SOA, SOEA

SOA Value Creation Recurrent Model



Reusability + Flexibility + Standardization \longrightarrow Agility

The Challenge for Enterprise Agility

Business Objectives

Innovation

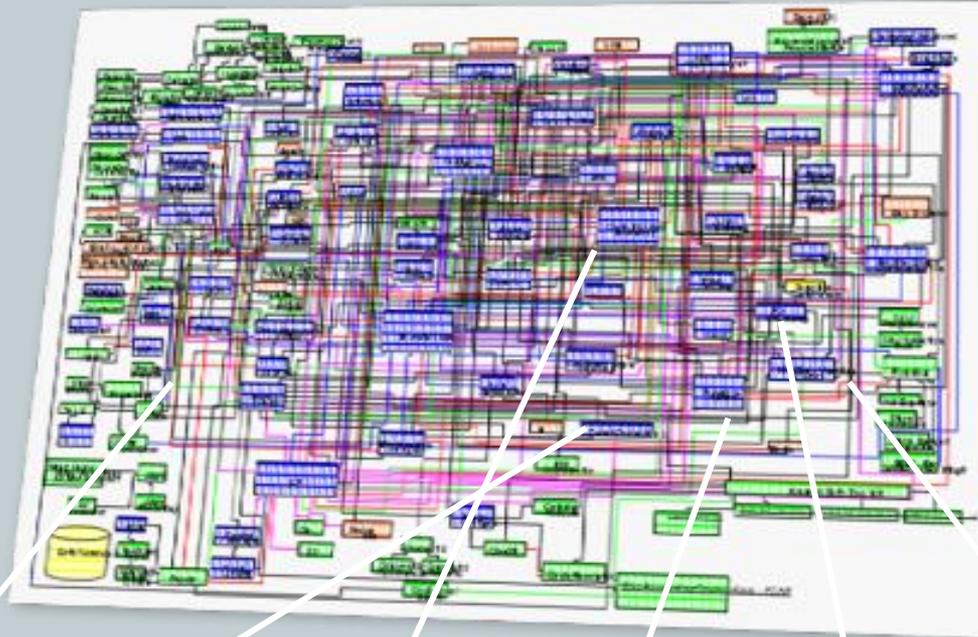
Top line growth

Operational Excellence

Reduce costs

Gain market share

- *Complex processes & systems*
- *Complex applications & interfaces*
- *Difficult to adapt quickly*
- *Large portion of IT budget spent on maintenance, not on new value add investments*



Resources and IT Assets

Legacy Claims Database

Auto Claims System

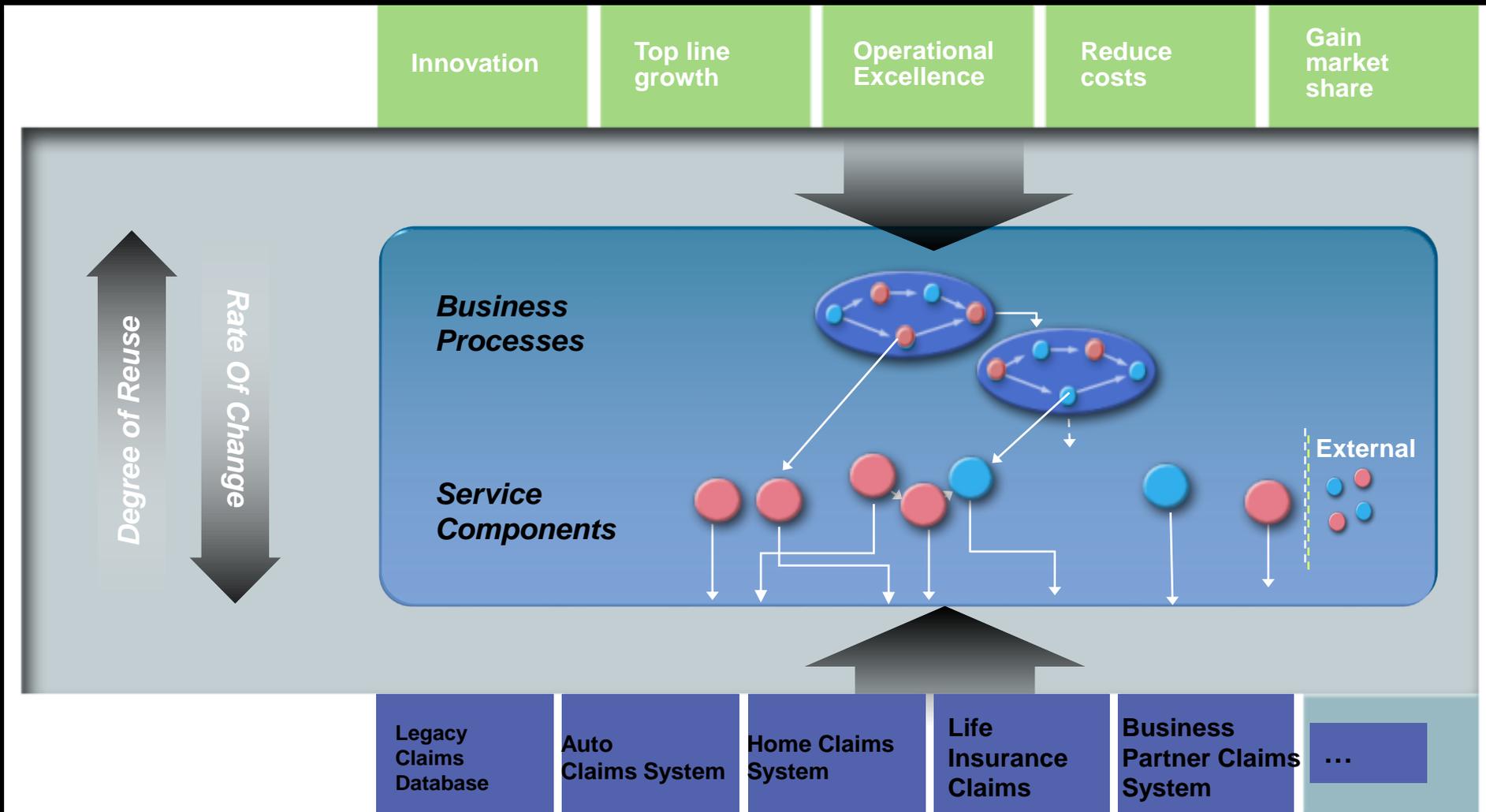
Home Claims System

Life Insurance Claims

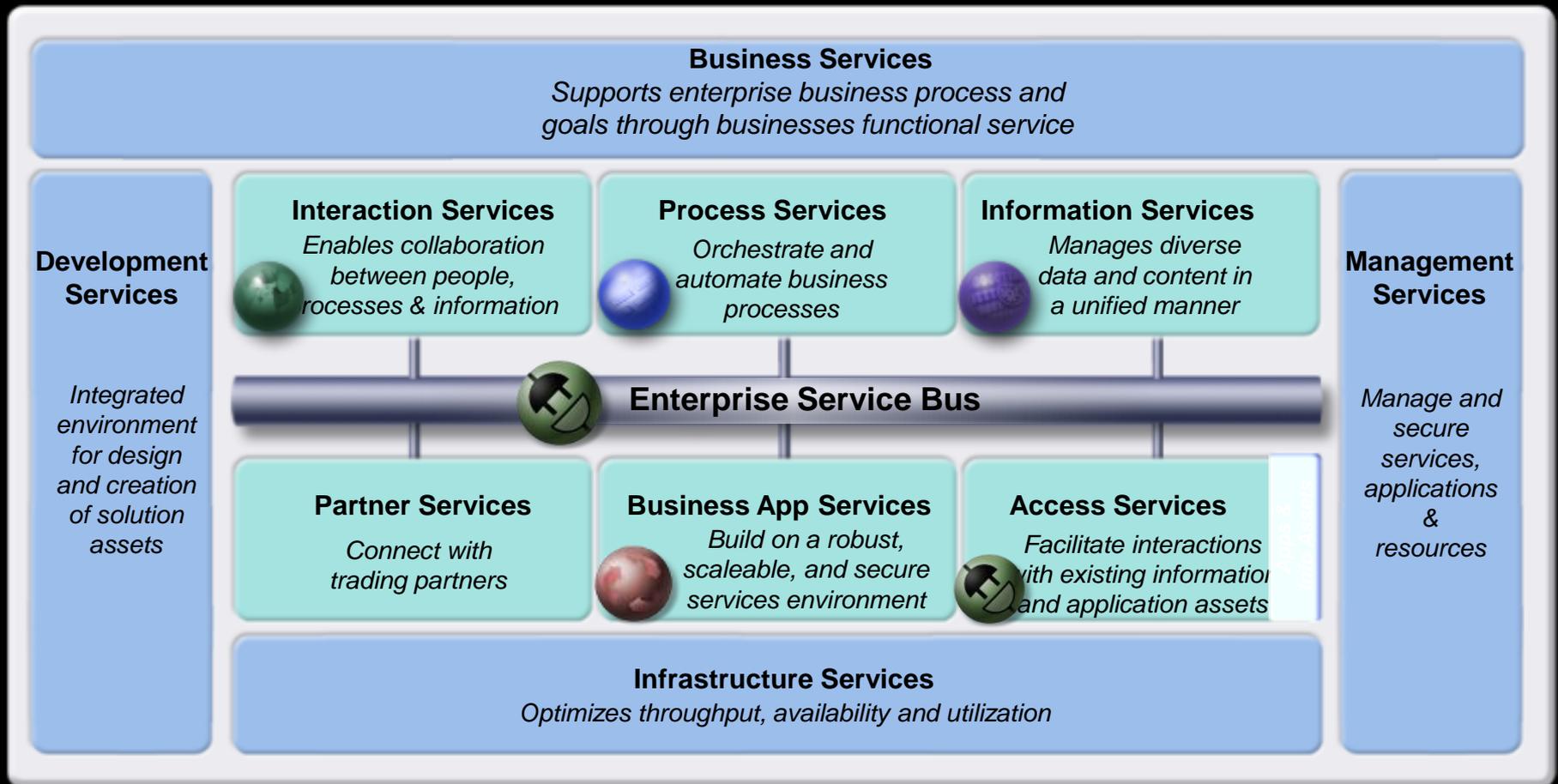
Business Partner Claims System

...

Service Oriented Architecture Addresses this Challenge



Connectivity is central to the SOA environment SOA Reference Architecture



Messaging & the ESB – “The Heart of SOA”

ESB *Service Enrichment*

- *Match & Route communications between services*
- *Converts between transport protocols*
- *Transforms between data formats*
- *Identifies and distributes bus events*

Messaging

- *Connect everything in your SOA*
- *Leverage existing skills and assets*
- *Support business growth and agility*
- *Deliver fast ROI*

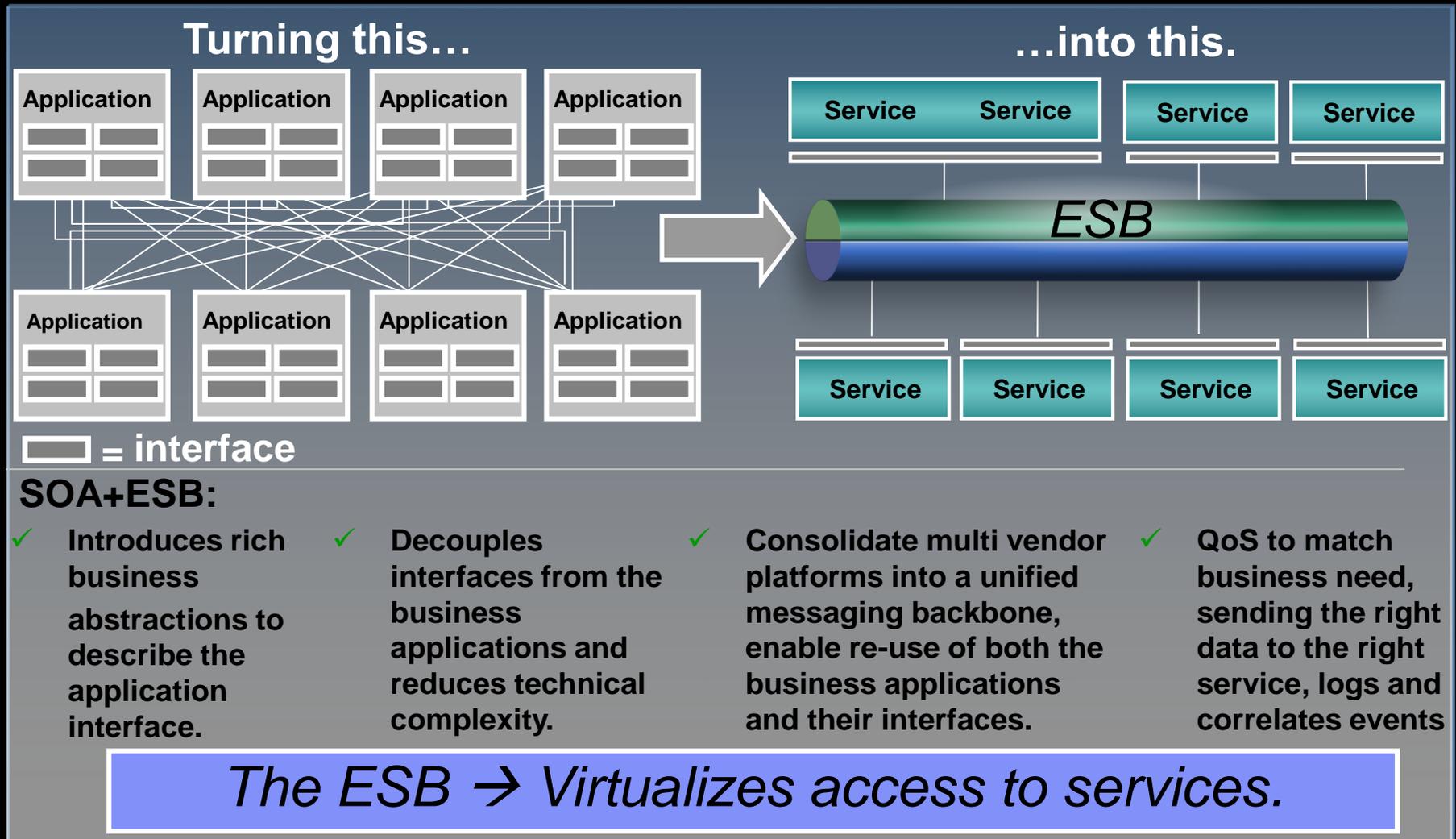
- WebSphere ESB
- WebSphere Message Broker
- WebSphere Datapower Appliance
- WebSphere Business Events

New and Enhanced!

- WebSphere MQ
- WebSphere MQ File Transfer Edition

New and Enhanced!

SOA with an ESB – Simplifying Interfaces and Applications



Agile Connectivity Begins with Integration *The Enterprise Service Bus (ESB)*



Connects everything
to everything



Transforms between
different data formats



Distributes
Business events



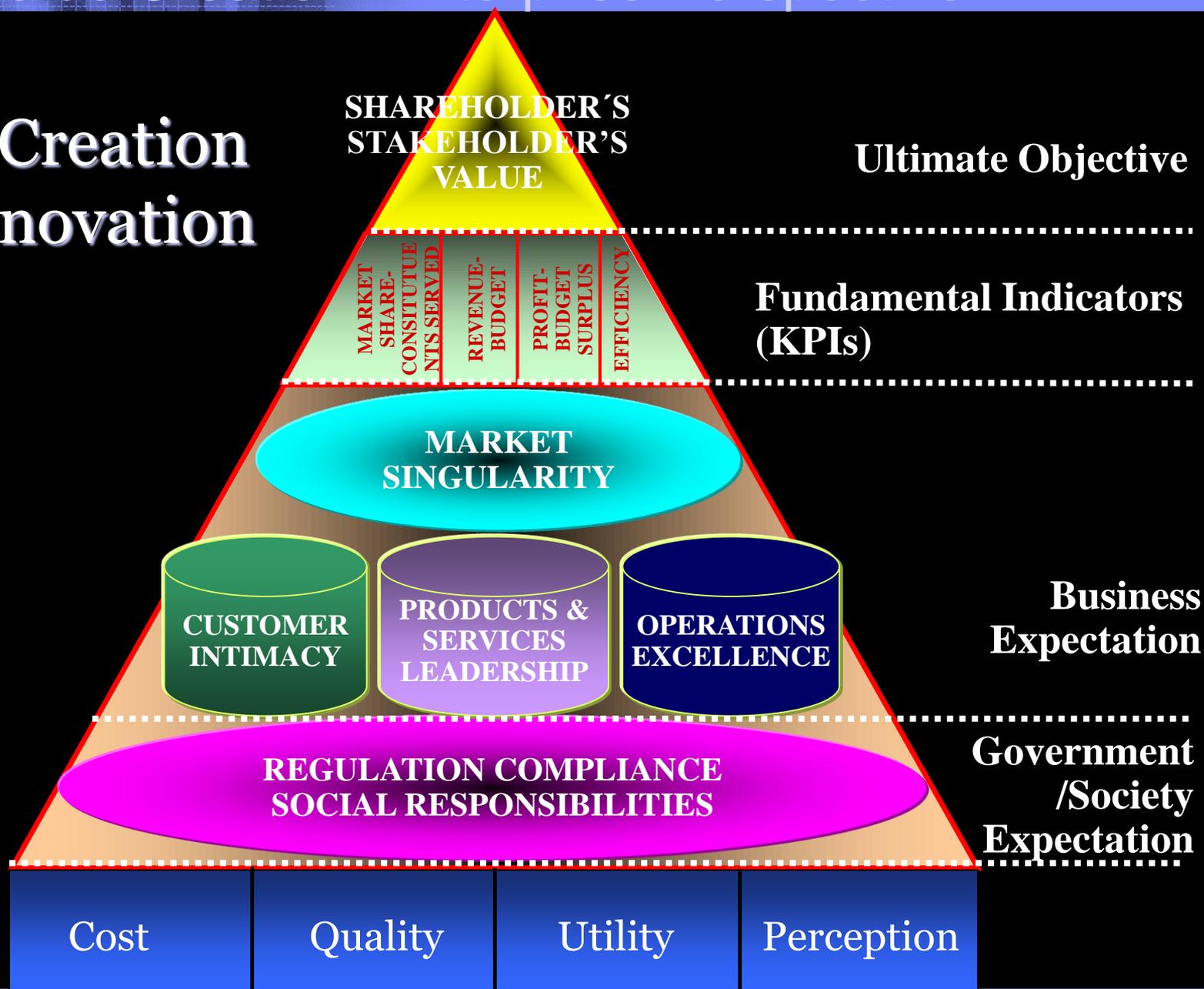
Converts between
different transport
protocols



Matches & routes
communications between
services

*An ESB enables flexible SOA connectivity for integrating
business applications, services and processes*

Value Creation by Innovation



Service Innovation: Value Creation Matrix

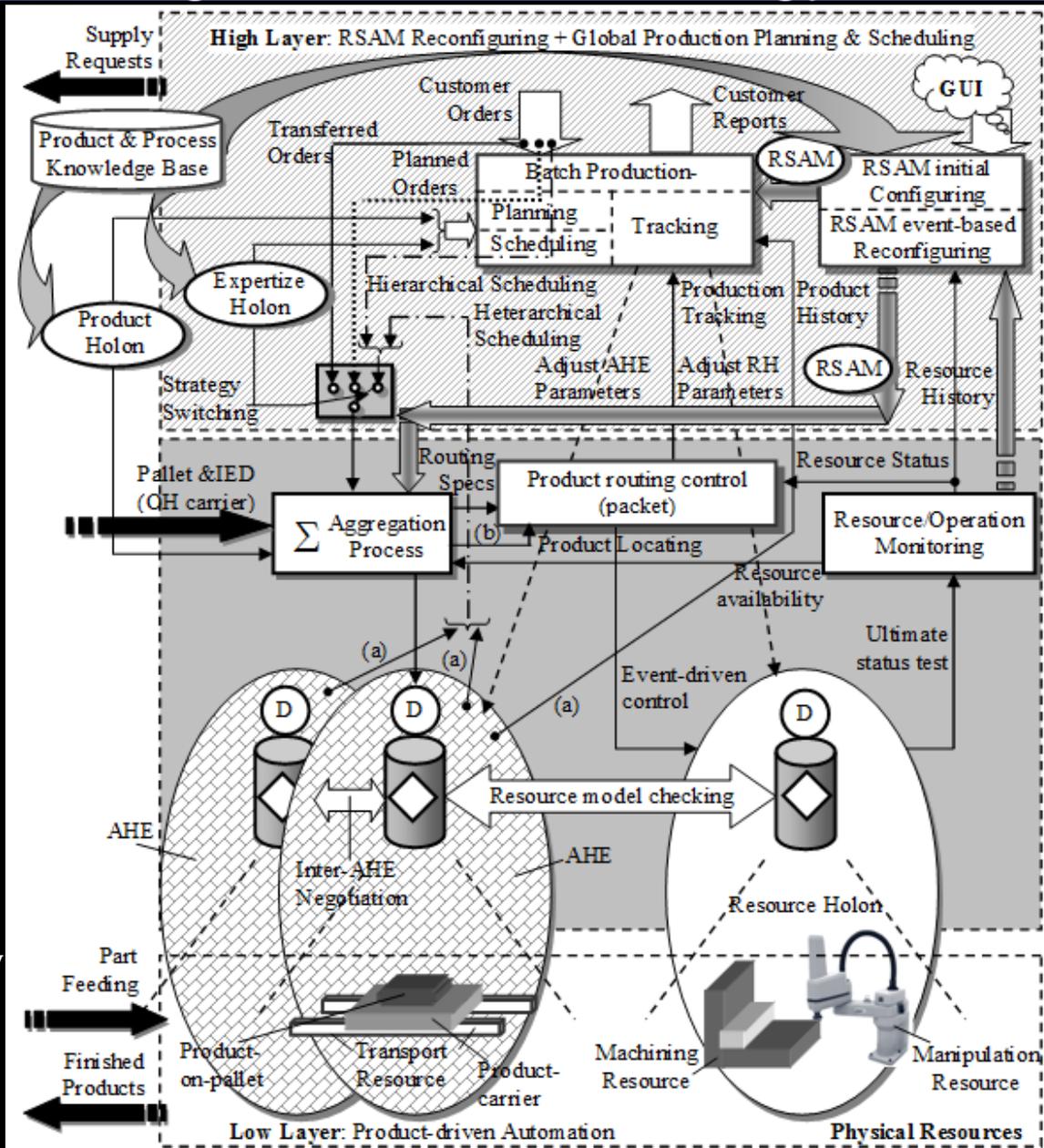
Do we have Science in Services?

	Value	Market Share	Revenue	Profit	Productivity /Utility
Challenges					
Customers	<p>Mass Customization</p> <p>Facilitation, Simplification, Integration, Standardization, Differentiation, Business Continuity and Resiliency</p> <p>Globalization, Market Singularization</p> <p>Optimization, Automation, Integration, Organization, Securitization, Virtualization</p> <p>Regulation Compliance Optimization</p> <p>Risk Management</p>				
Products & Services					
Market & Competitors					
Operations/ Processes/ Resources					
Governance & Business Integrity					

Case Study: Service Oriented Shop floor

Composing entities / holons:

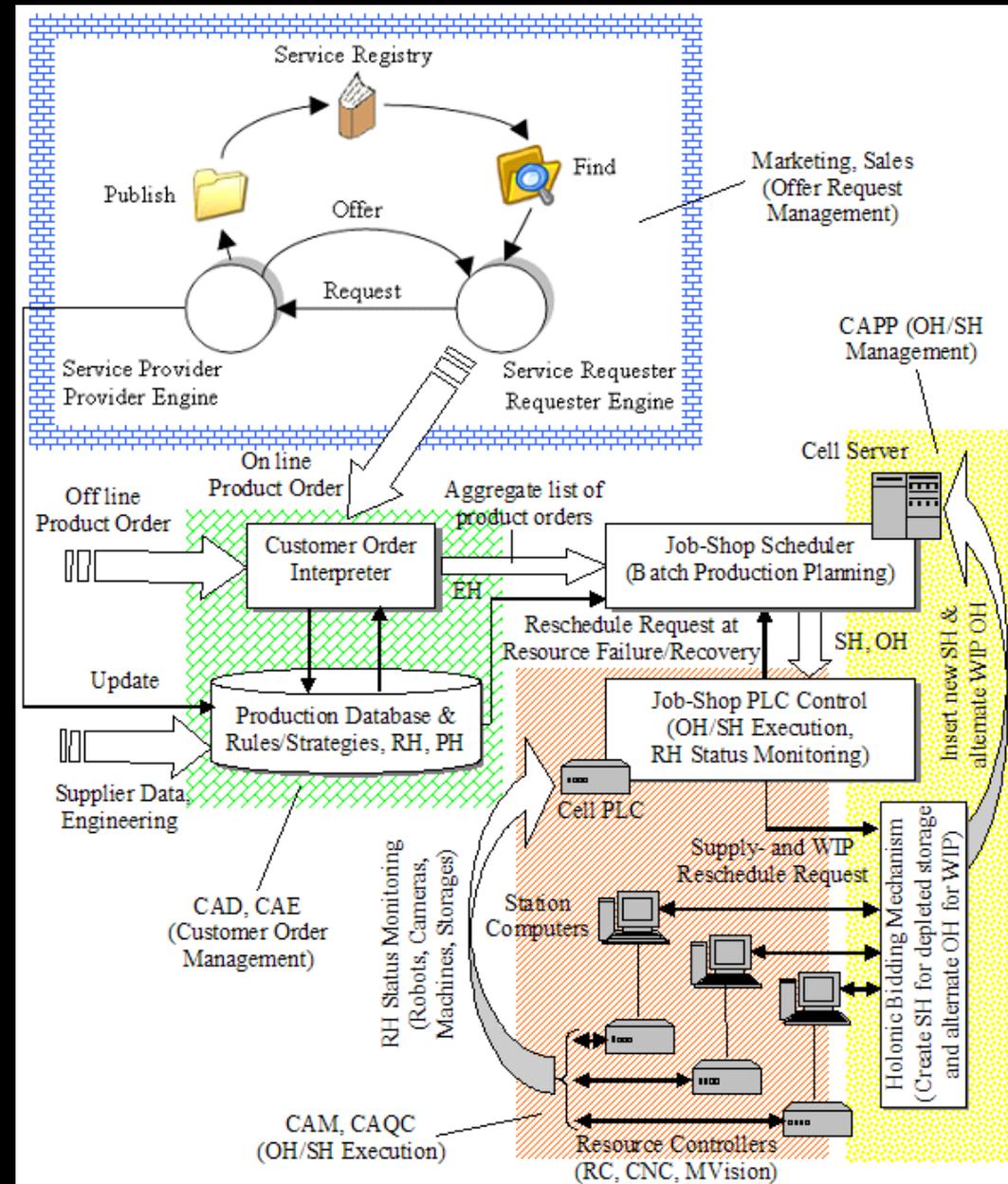
1. **Expertise Holon (EH)**: global production planning, scheduling, coordinator, GUI and production strategy decider;
2. **Active Holon Entity (AHE)**: an aggregate intelligent entity in charge of taking real-time decisions;
1. **Resource Holon (RH)**: physical resources together with the control counterpart;
2. **Product Holon** and **Process Knowledge Database (PPKB)**: stores the operations structure for the products;
3. **Resource Service Access Model (RSAM)**: distributed autonomous entity in charge of collecting resource information and offering it in a concise manner.



Case Study: Service Oriented Enterprise

Services management for:

- Offer request
- Customer order
- Production Planning, resource allocation
- Monitoring rush orders
- Production execution control
- Production tracking
- Resource monitoring and RSAM update



IBM's Corporate Character

- Pioneer intellectual capital that creates new value
- Apply science and technology to business and societal challenges
- Transform engineering education – SSME
- Be global – in presence, viewpoint, and lasting impact
- Collaborate as experts dedicated to the success of others

The key to retaining an organization's essence is to

And in doing so, making the world work better.

