



Almaden Services Research

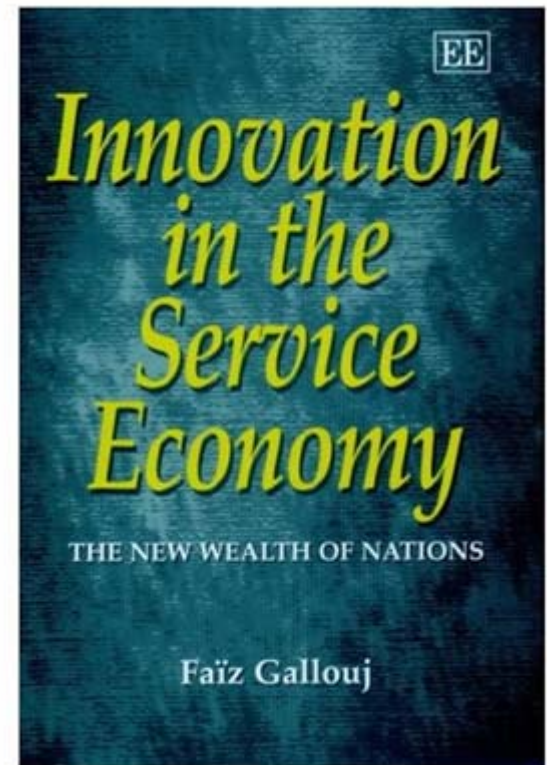
Steps Toward a Science of Service Systems

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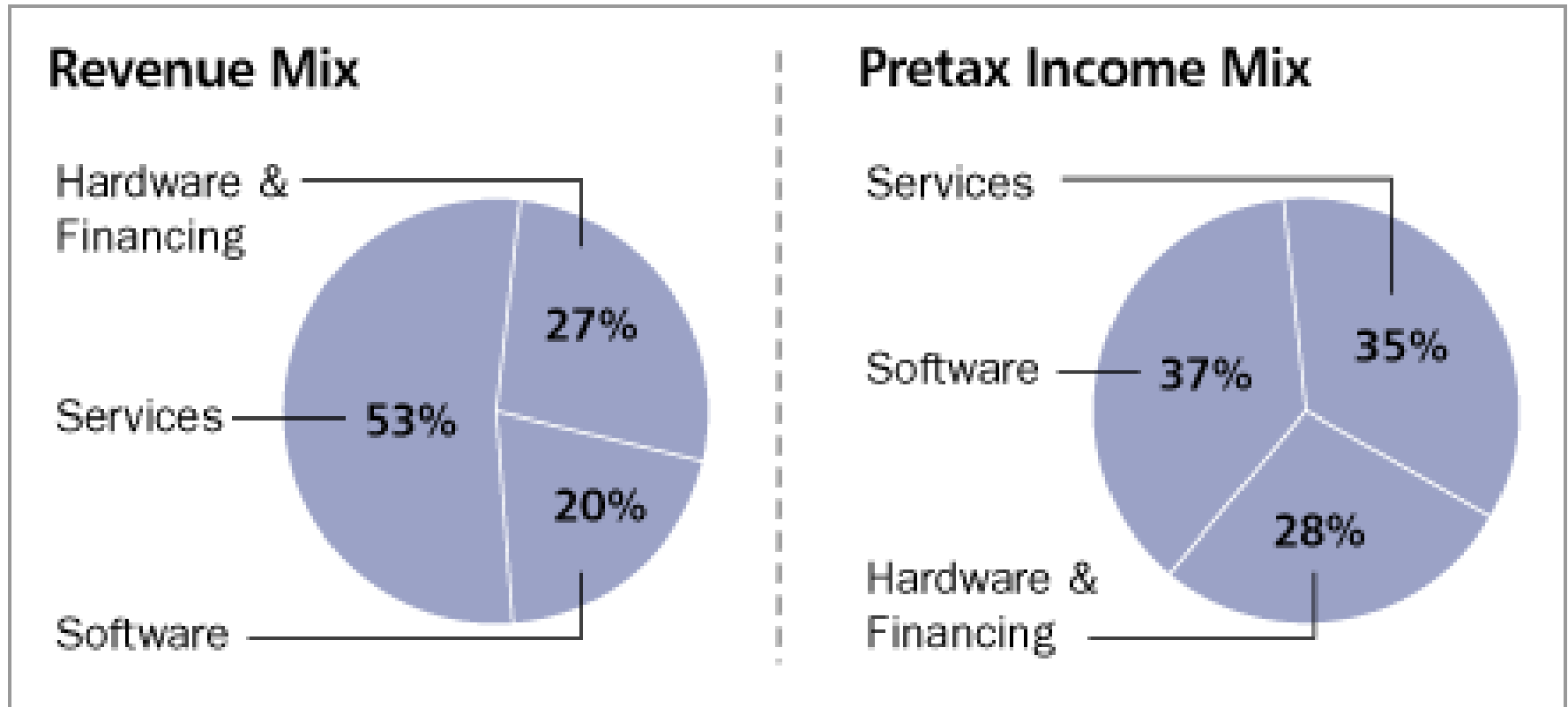
The Problem

“... modern economies are both service economies and economies of innovation. Paradoxically, they are not regarded as economies of innovation *in* services... It is as if service and innovation were two parallel universes that coexist in blissful ignorance of each other.”

Gallouj, F. (2002). *Innovation in the Service Economy: The New Wealth of Nations*. Cheltenham UK: Edward Elgar.



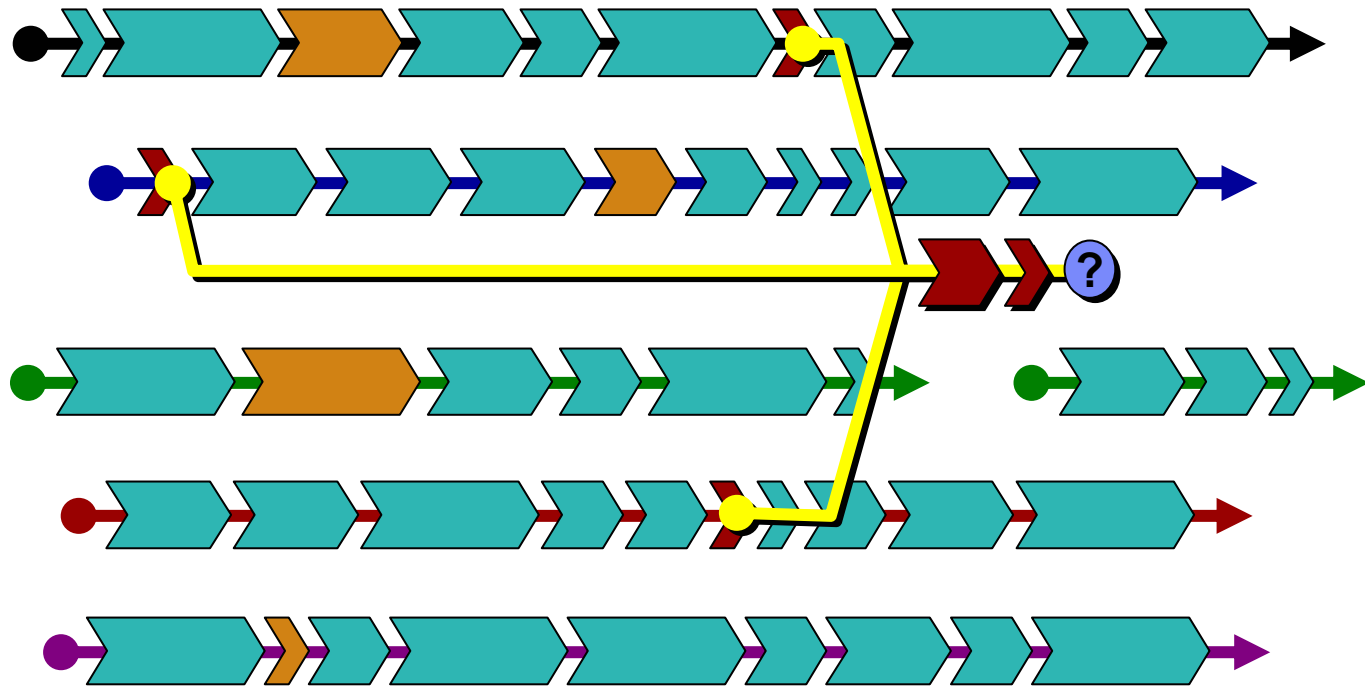
Why Understanding Service Innovation Matters to IBM



Fundamental Service Science Challenge:

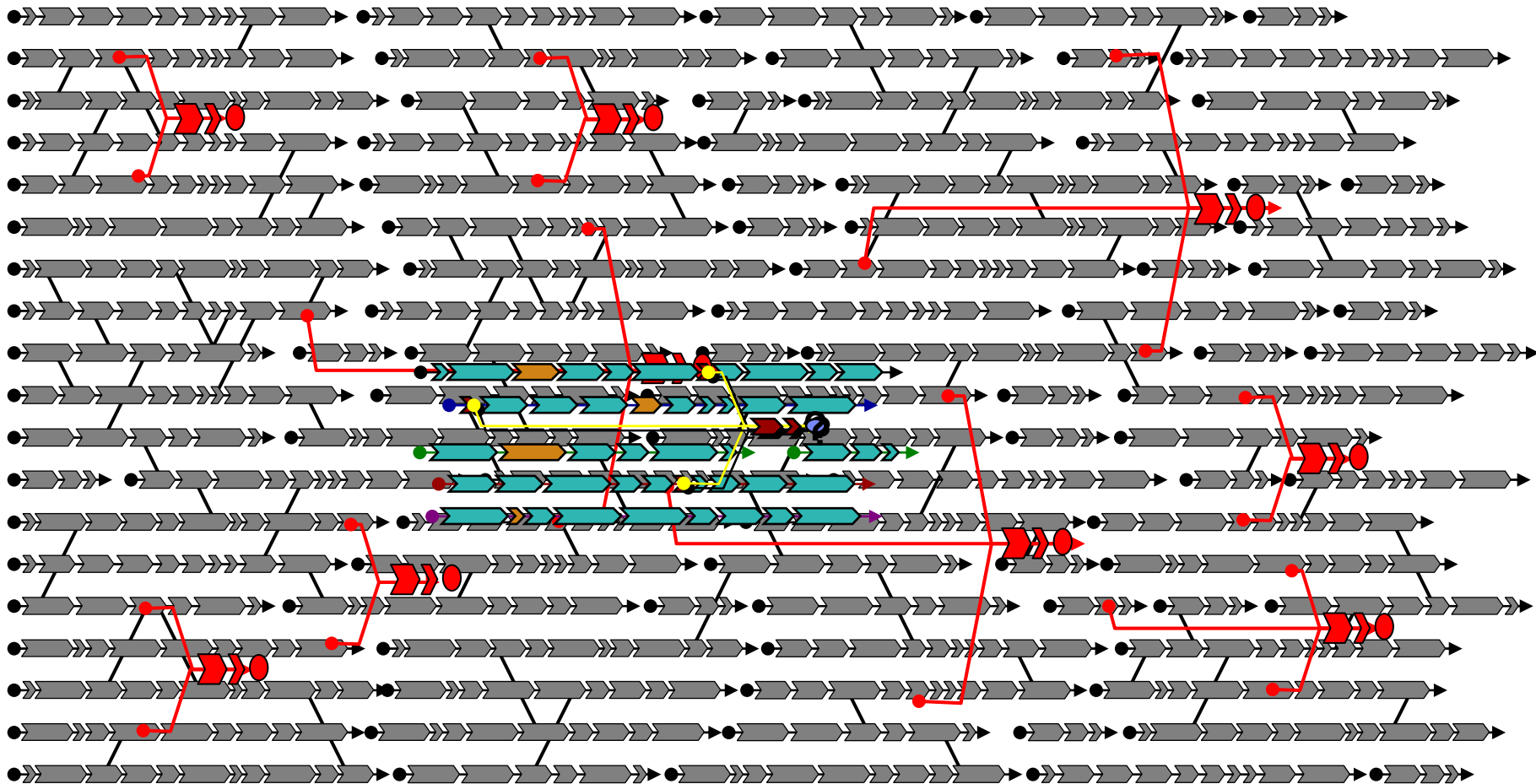
Scaling & learning curves are different for IT manufacturing and IT services
How to invest to make progress (efficiency, effectiveness, and sustainable growth)?

Traditional Analysis Aims to Improve Existing Processes

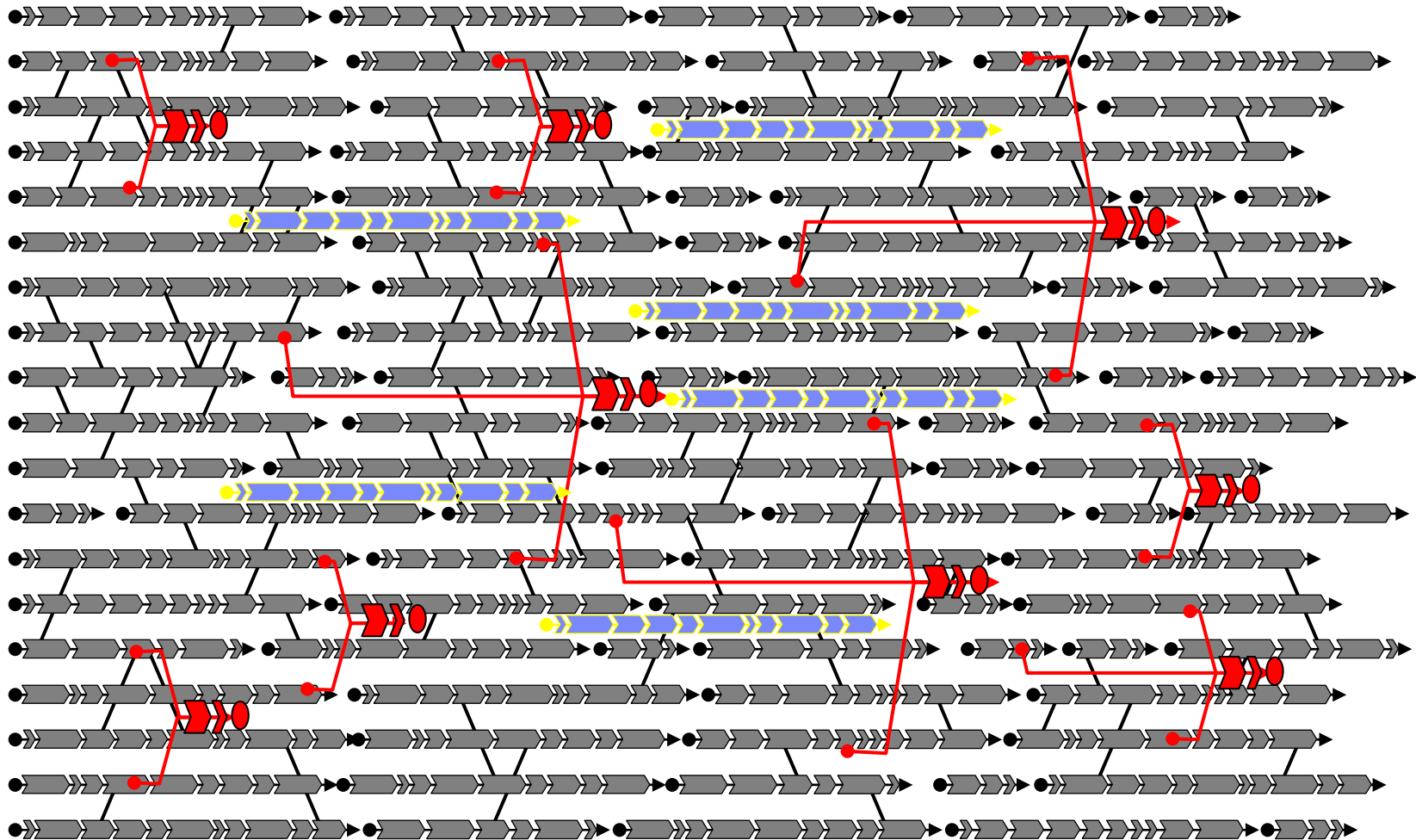


The process perspective does not force the generalization of common tasks nor help rationalize shared activities

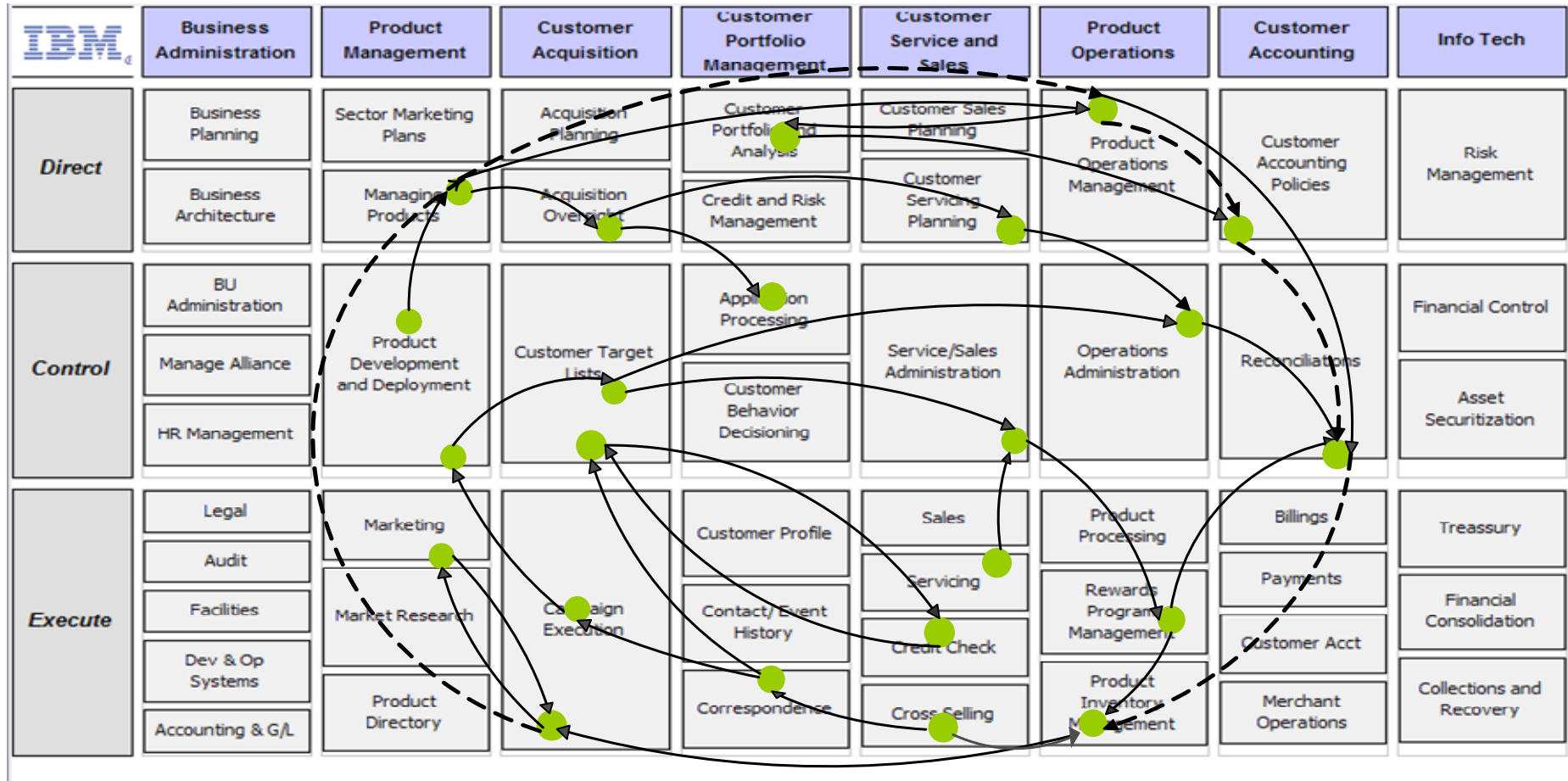
For Significant Businesses, the Picture Gets Very Complex ...



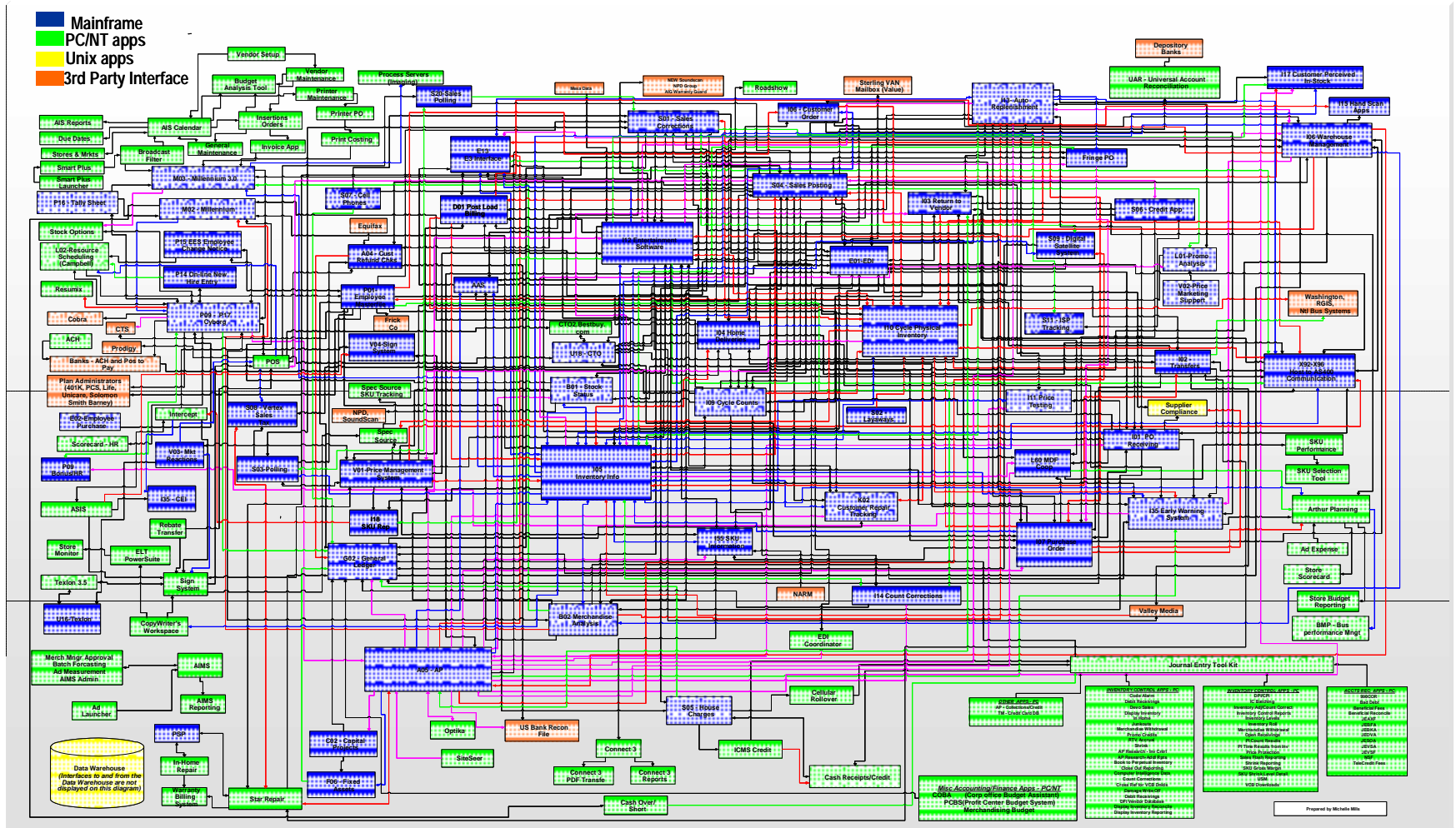
Any Addition Typically Builds on Top with Little or No Re-use



Component Business Modeling: CBM



Reality Check



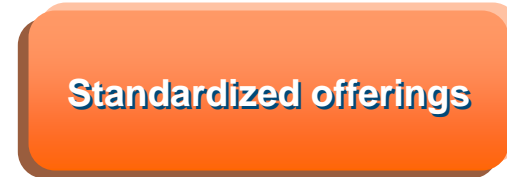
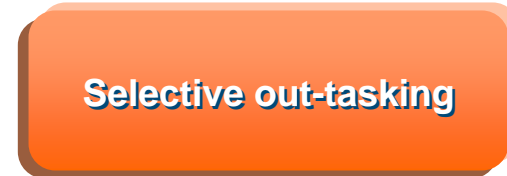
Actual Application Architecture for Consumer Electronics Company

The IT Services Market

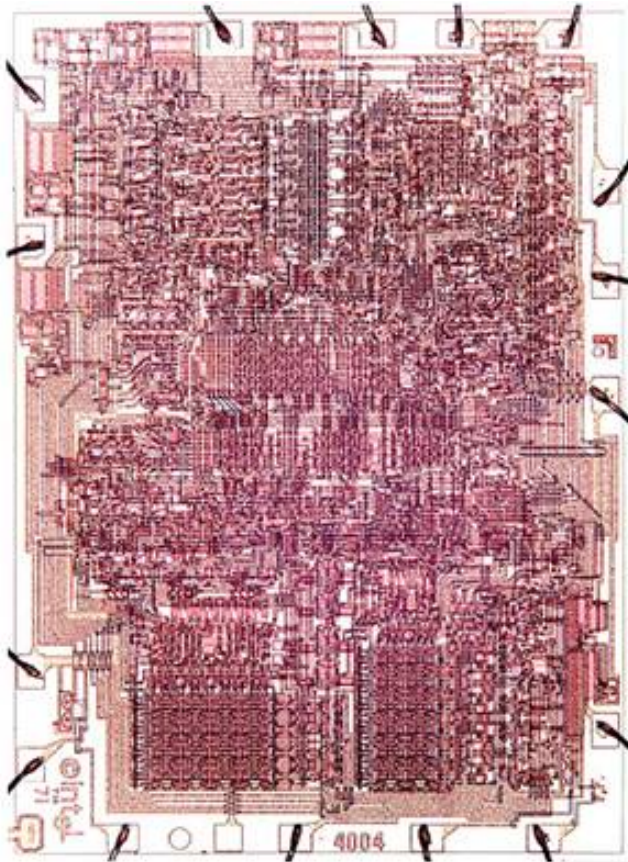
Services market 1999-2004



Emerging services market 2006-2008

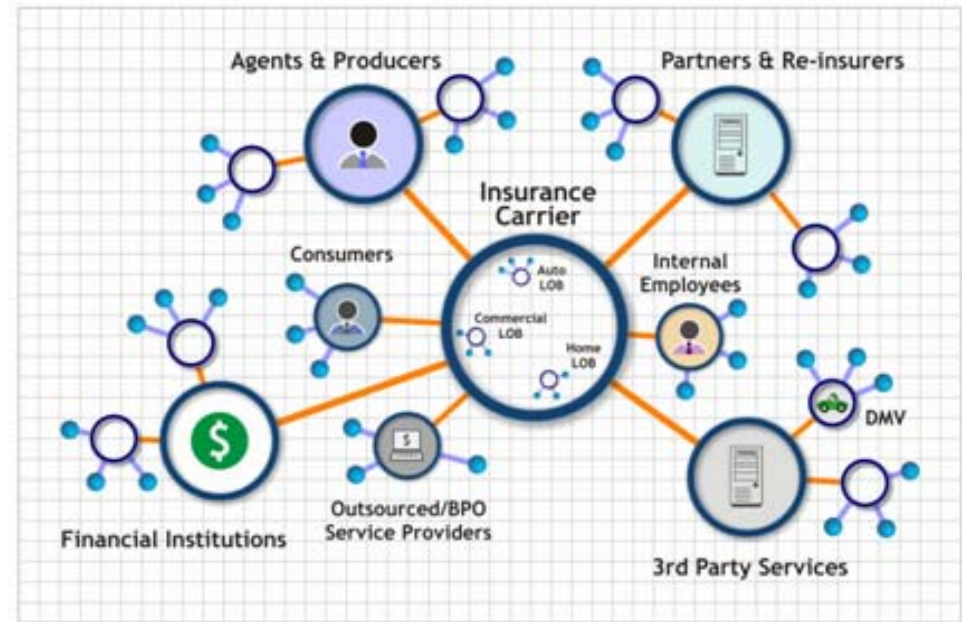


How to Invest for Systematic Improvement?



Computational System

Shrink Transistors



Service System

1. People (division of labor, multi-tasking)
2. Technology
3. Internal and External Service Systems
Connected by Value Propositions
4. Shared Information (language, laws, measures)

People do more, high value win-win actions

So What is Service?

In economics and marketing, a **service is the non-material equivalent of a good**. Service provision has been defined as an economic activity that does not result in ownership, and this is what differentiates it from providing physical goods. It is claimed to be a process that creates benefits by facilitating either a change in customers, a change in their physical possessions, or a change in their intangible assets.

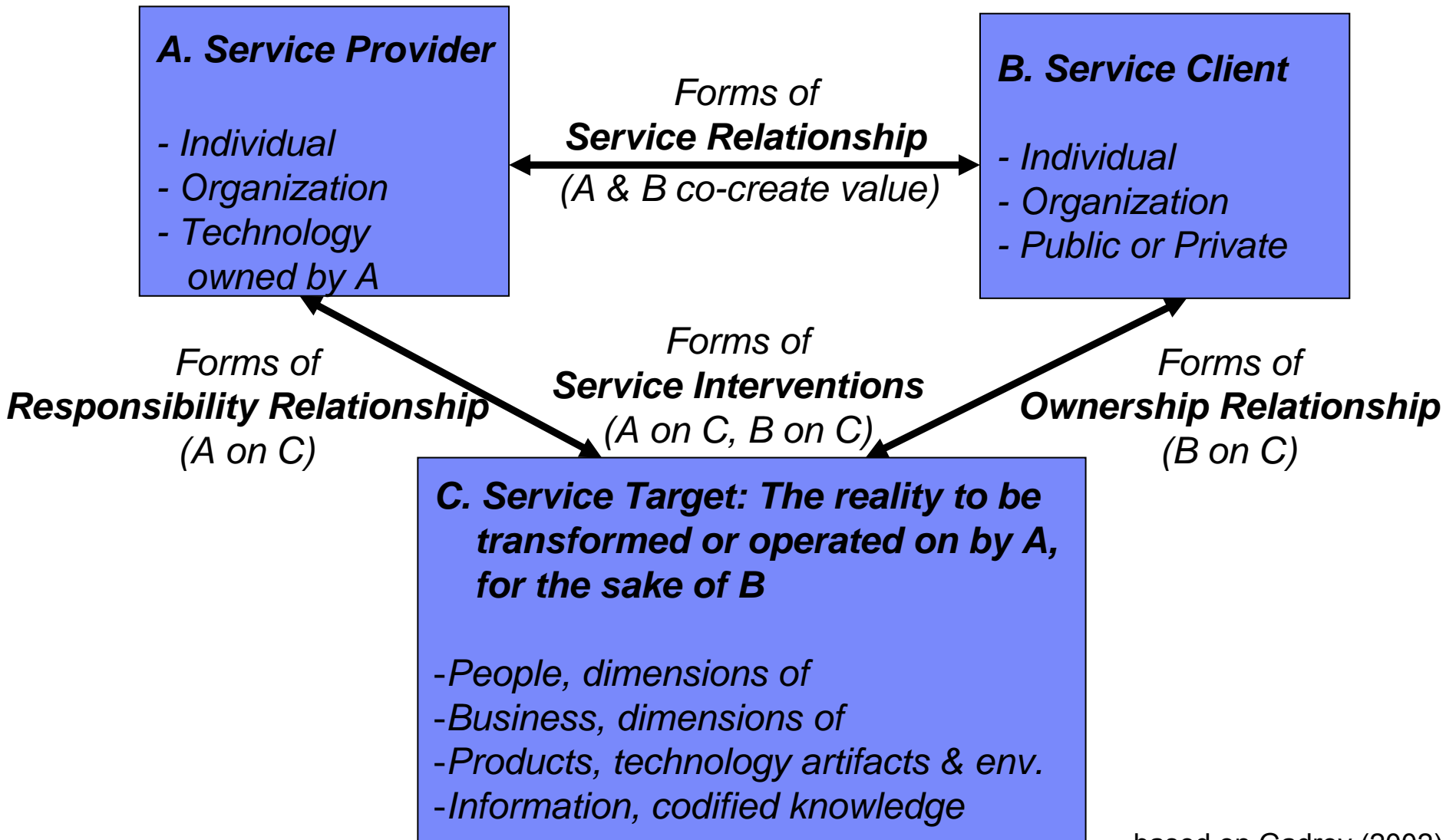
By supplying some level of **skill, ingenuity, and experience**, providers of a service participate in an economy without the restrictions of carrying stock (inventory) or the need to concern themselves with bulky raw materials. On the other hand, their investment in expertise does require marketing and upgrading in the face of competition which has equally few physical restrictions.

— from Wikipedia, see <http://en.wikipedia.org/wiki/Services>

What Really Defines Service?

- Deed, act, or performance
 - Berry (1980)
- An activity or series of activities... provided as solution to customer problems
 - Gronroos (1990)
- All economic activity whose output is not physical product or construction
 - Brian et al (1987)
- A time-perishable, intangible experience performed for a customer acting as co-producer
 - Fitzsimmons & Fitzsimmons (2001)
- A change in condition or state of an economic entity (or thing) caused by another
 - Hill (1977)
- Deeds, processes, performances
 - Zeithaml & Bitner (1996)
- Application of specialized competences through deeds, processes, and performances to benefit another
 - Vargo & Lusch (2004)

Another Definition of Service... as Systems of Relationships



- based on Gadrey (2002)

Service Systems Depend on Value Co-creation

<i>Provider</i>	Lose-win (coercion)	Win-win (co-creation)
	Lose-Lose (co-destruction)	Win-Lose (loss lead)
<i>Client</i>		

- Provider and client interact to co-create value
- Value is achieving desired change or the prevention/undoing of unwanted change
- Changes can be physical, mental, or social
- Value is in the eye of the beholder, and may include complex subjective intangibles, bartered – knowledge intensive
- Boundary of service experience in space and time may be complex

Need Shared Vocabulary

What is a service system – a type of complex adaptive system?

- Operations Research and Industrial Engineering
 - More realistic models of people
- Computer Science and Electrical Engineering, Information Systems
 - Software and systems that adaptively change with business strategy
- Economics and Business Strategy, Service Management and Operations
 - Better models of scaling and innovation
- Law and Political Economy
 - Better models of social innovation – in what way is passing a law innovation
- Complex Systems and Systems Engineering
 - Better model of robustness and fragility of service systems (sustainability)
- Service systems are value co-creation configurations of people, technology, internal and external service systems connected by value propositions, and shared information (such as language, laws, measures, models, etc.)
 - Examples: People, families, cities, businesses, nations, global economy, etc.

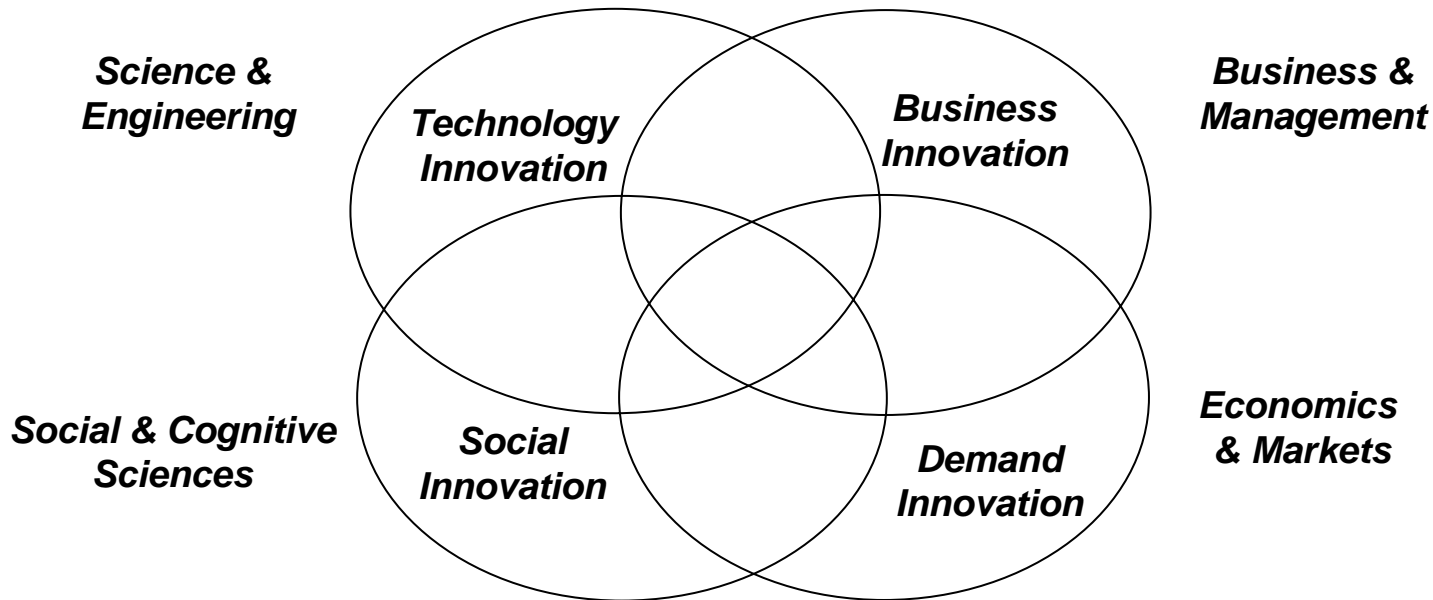
Michigan Technological University: Service Systems Engineering

- NSF funding to develop new undergraduate curriculum
 - aimed at satisfying the engineering needs of the service economy

- Eight new courses
 - World of Service Systems Engineering
 - Service System Design and Dynamics
 - Analysis and Design of Web-based Services
 - Human Influences on Service Systems
 - Service System Operations
 - Optimization and Adaptive Decision Making
 - Project Planning and Management for Engineers
 - Managing Risk

What I See...

- Services depend critically on people, technology, and **co-creation** of value
- People **work together** and with technology to provide value for clients
- So a **service system** is a complex **socio-technical** system
- Growth requires innovation that combines **people, technology, value, clients**



Some Fundamental Service Questions

- What are the concepts, typologies and methodologies that might serve to bring some order to the diversity of services particularly with a view of measuring and evaluating results and performance?
- What are the role and social organization of knowledge and intelligence in the production, innovation, consumption and trading of services?
- What are the role of ICTs in the development of services and the rationalization of the processes whereby they are produced, as well as in innovation in services?

— Gadrey & Gallouj (2002). *Productivity, innovation, and knowledge in services*. Cheltenham, UK: Edward Elgar.

Some Service Research Areas

- Measuring work, service intensity, and service complexity
 - What are the limits to self-service? How much work can we shift to end-users?
- Representing and cataloging skills
 - How do we organize and breakdown the human skills needed to do work? How can we take this into account in composing and optimizing teams?
- Global communication tools
 - What are the barriers to highly productive human-human coordination? Distance, trust, communication, common ground, culture, technology?
- Service workforce management
 - Application of supply chain methods to service supply chains, which are people-centered
- Effective service automation
 - Understanding tradeoffs in human vs computer effort in creating customized business services

Grand Challenge: Moore's Law of Service?

- Moore's Law: Computational power doubles at a predictable rate.
- Are there capability-doubling laws in service?
- Consider Amazon's book recommendations
 - Quality of recommendations depends on accurate statistics – the more purchases made, the better the statistics for recommendations.
- Consider call centers
 - Speed and quality of call center responses can be improved given accurate statistics about the kinds and number of queries that are likely to be received. In both, traces of activity are used to improve productivity and quality.
- Imagine three improvement “laws” for service
 - The more an activity is performed (time period doubling, demand doubling), the more opportunities to improve.
 - The better an activity can be measured (sensor deployment doubling, sensor precision doubling) and modeled, the more opportunities to improve.
 - The more activities that depend on a common sub-step or process (doubling potential demand points), the more likely investment can be raised to improve the sub-step.

Grand Challenge: Formalizing Service, Defining Innovation?

■ Problem

- Investment is drawn by the ability to capture value,
- Patenting of service innovation is immature, relatively unknown
- But where would computers be if it had been difficult to patent transistors, disk drives, and the like?
- Government policies must encourage growth of private investment in service innovation. But how?

■ Approach

- How can we assess novelty in complex sociotechnical systems?
- What formalism can we use to express design of such systems?
- What methods do we have to understand – or at least simulate – processes in complex sociotechnical systems ?

■ Solution?

- The problem is that when we have people working in coordination with one another, taking account of capabilities, motivations, incentives, interactions, and such is not straightforward or predictable.
- Government can bootstrap investment in services research
- Develop tools for specifying service system designs, allowing for formal specifications and simulations to assess novelty.

My Approach to Service Science

- **Studying coordination** among individuals, groups, and technology
 - communication, information, action, and interaction

- **Understanding impact** of individuals, groups, and technology
 - connecting business impact with human activity

- **Innovating** to support coordination and impact
 - technologies, learning, organizations, other structures

Some Studies of IT Service Systems

- Collaboration in Globally-distributed Sales Teams (Melissa Cefkin)
 - How can information sharing in globally distributed teams be improved?
 - What are existing information sharing practices and how effective are they?
- Practices of IT Service Delivery (Eser Kandogan)
 - How can we automate more function?
 - What do folks on the provider side do?
- Summary
 - Service delivery requires human-human coordination/negotiation
 - Technology can support coordination, but take care...

What do globally distributed sales teams do?

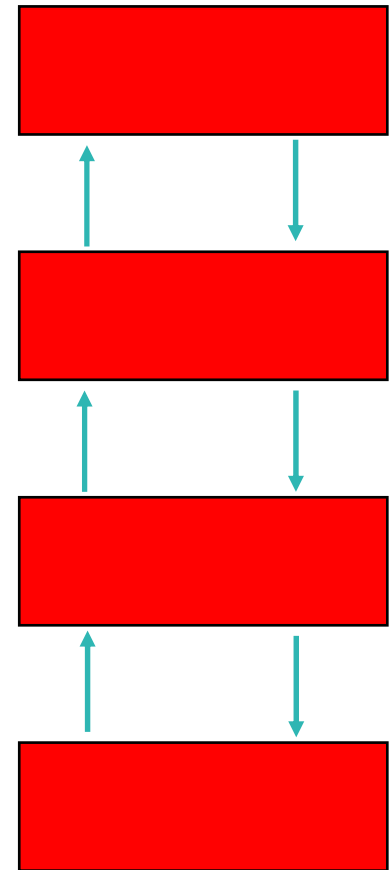
- What information is shared? Why? Under what circumstances?
 - What standardized information is shared?
- How does information sharing happen now?
 - What practices specific to sharing standardized information exist?
- What happens to the information at the inflection points of sharing?
 - How does standardized information flow through inflection points?
- How does information sharing impact collaboration?
 - What dependencies exist and coordination practices emerge regarding the gathering and supply of standard information?

Approach

- Research activities
 - Study of three globally distributed sales teams
 - Ethnographic interviews and observations
 - 41 interviews, 44 interview hours + 165 observation hours
 - Included Managing Directors, Sales Managers, Client Managers, Operations and Finance staff, product and service line sales specialists, assistants
- Focal area for Information: Sales Opportunity Pipeline data
 - Weekly updating of sales opportunity status
 - Involves relatively standardized information
 - Opportunity ID: specific name of buyer(s) in client org, name assigned to opportunity
 - Potential revenue amount
 - Products and services in deal
 - Anticipated close date
 - Reported from sales reps on the ground through organization to C levels
 - Mandated use of a single system (Siebel) to track and monitor

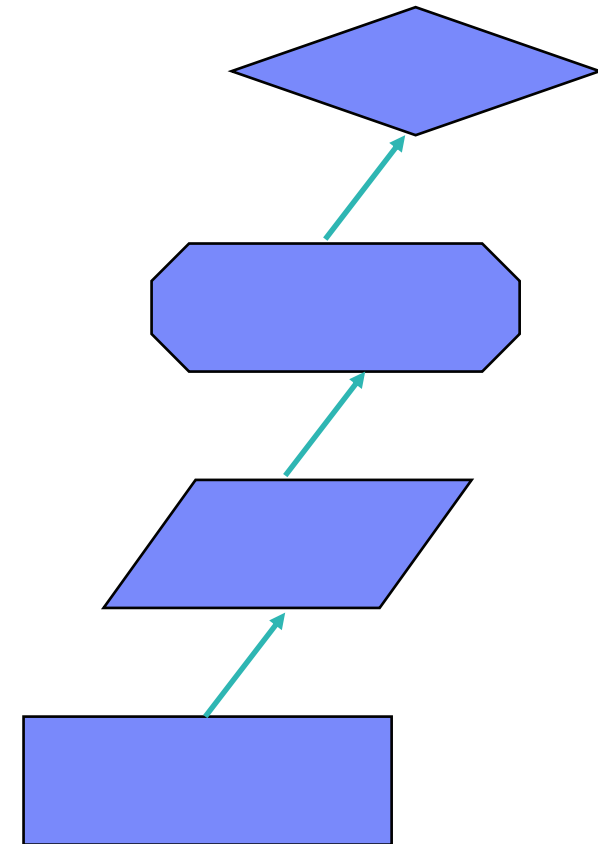
How pipeline information is updated and shared: **Red Team**

- 79 person team
- Master view of opportunities overseen by senior managers through use of standard application (Siebel)
- Master view kept updated by team assistant (50% of time on this activity)
- Sales reps expected to update information directly into standard application (Siebel)
- *Updated* master view reviewed in weekly team meetings



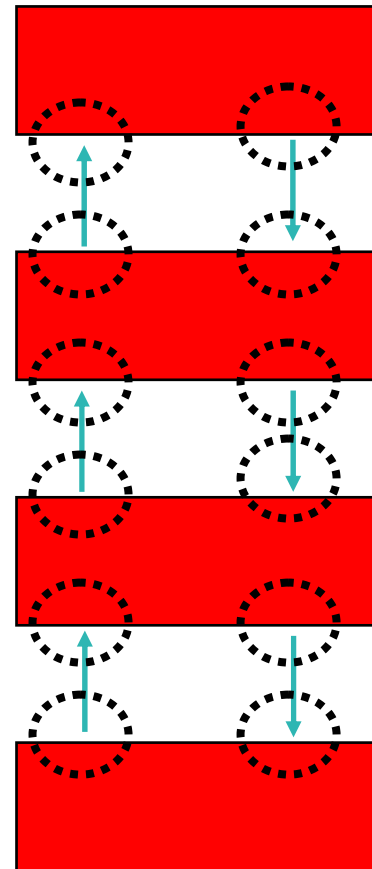
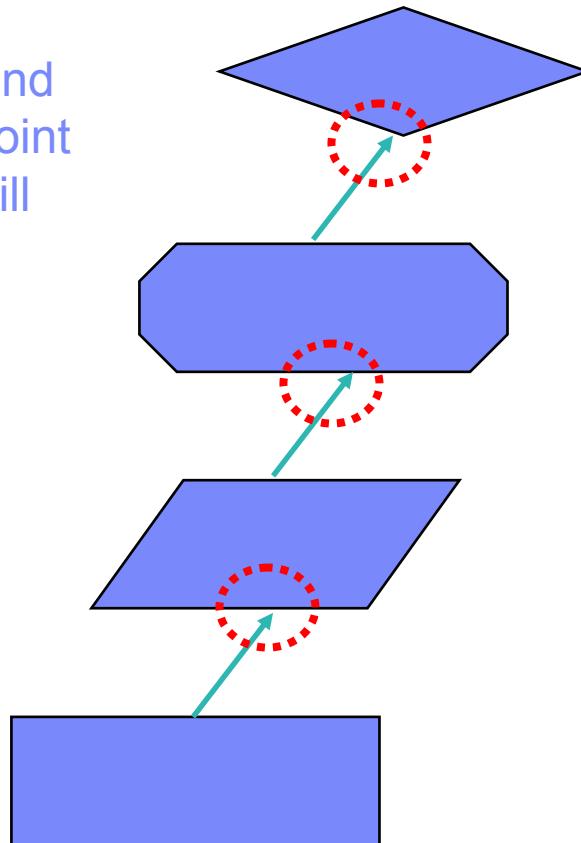
How pipeline information is updated and shared: **Blue Team**

- 70 person team
- One master view held by senior team managers
- View updated and maintained through
 - Weekly written communications from sales reps
 - Weekly discussions in sales team meetings (updated real time)
 - On-going interactions
- Each member tracks and passes information in personally chosen way



What happens at sharing inflection points

Interpretation and translation at point by party who will next pass it on



Interpretation and translation both coming and going

Some Implications

- Standard information + standard tools \neq standardized processes
- Standard information + standard tools + standard process does not necessarily increase team efficiency
 - Time spent on pipeline update
 - Blue Team: 65 estimated total hours
 - Red Team: 124.17 estimated total hours
 - 59.17 hrs/wk more by Red Team, or almost 1.5 FTE
 - If 15 of 30 teams (those focused on companies largest customers) do like the Red Team, ~22.5 FTE weekly spent on sales-opportunity update process
- Standard information + standard tools + standard process doesn't necessarily increase effectiveness for knowledge sharing and collaboration within team
 - Red Team paid high degree attention to completing process yet we saw information sharing gaps in sales pipeline process
 - Blue team paid much less attention to process yet we saw no information sharing gaps in sales pipeline process

So what?

- Time spent on process is time not spent on sales
- No evidence that process improved information-sharing effectiveness
- Potential impact on collaboration practices through heightened focus on dependencies and chains of responsibility for information sharing
- There may be efficiency and effectiveness gains experienced higher up the organization that are not accounted for here



IAMOT 2007

Presented by **University of Miami, Department of Industrial Engineering**

[Home](#) > **Overview of the Conference**

Overview of the Conference

Management of Technology for the Service Economy

IAMOT 2007 will provide an international technical forum for experts from industry and academia to exchange ideas and present results of ongoing research in the tracks listed below.

- Knowledge Management
- Green Technologies
- Social impact of technology development
- MOT Education and Research / Corporate Universities
- New Product/Service Development
- National and Regional Systems of Innovation
- Small and Medium Enterprises
- Emerging Technologies
- Technology Transfer, Marketing and Commercialization
- Technology Foresight and Forecasting
- Information and Communication Technology Management
- The Integration of Technology and Business Strategies
- R&D Management
- Project and Program Management
- Industrial and Manufacturing System Technologies / Supply Chain Management
- New Forms of Organizations
- Management of Technology in Developing Countries
- Technological Alliances, Mergers and Acquisitions
- Theory of Technology
- Technology Incubation
- Management of Technology for the Service Economy
- Innovation/technological development and productivity

<http://www.iamot.org/conference/index.php?cf=11>

Field Studies of IT Service Delivery



Web Hosting
Southbury
1 Week

Web Hosting
Southbury
1 Week

Data Management
Poughkeepsie
3 Days

Data Management
Charlotte
3 Days

Web Hosting
Boulder
3 Days + 1 Eve

Web Hosting
Boulder
1 Week

Operating system
Boulder
3 Days

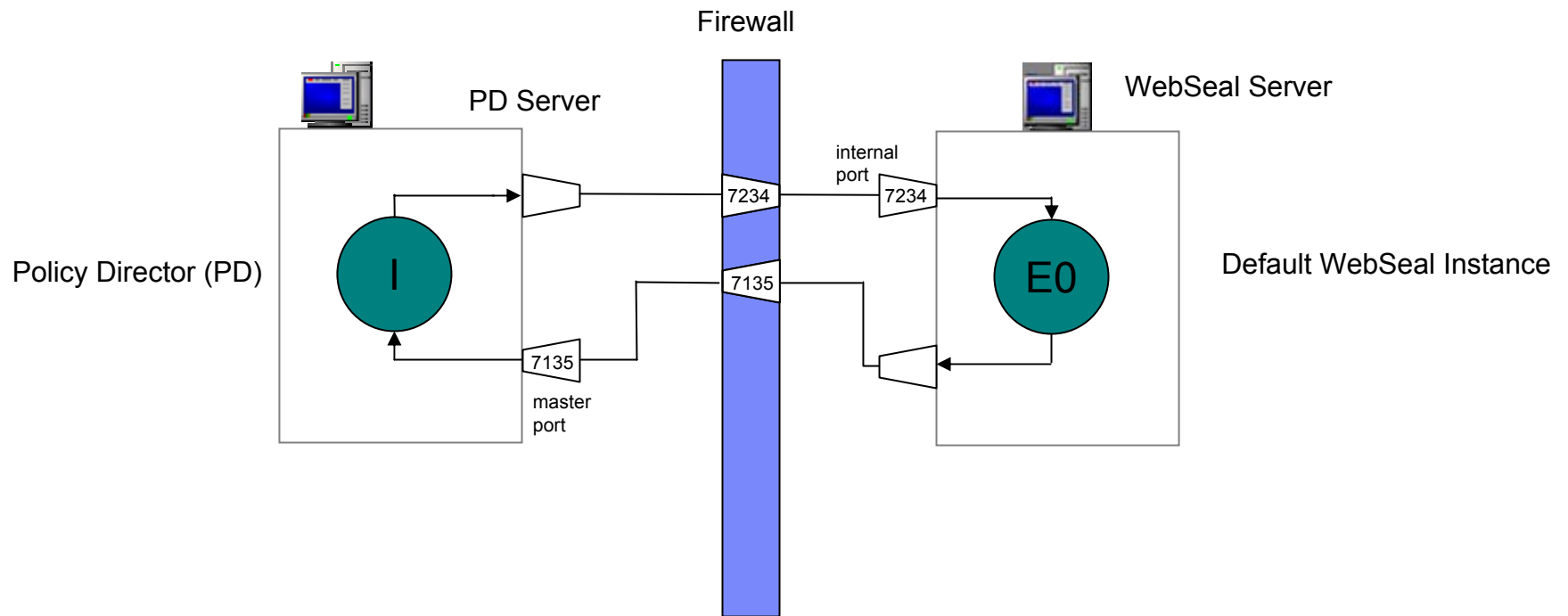
Security
Urbana
3 Days

Storage
Boulder
3 Days

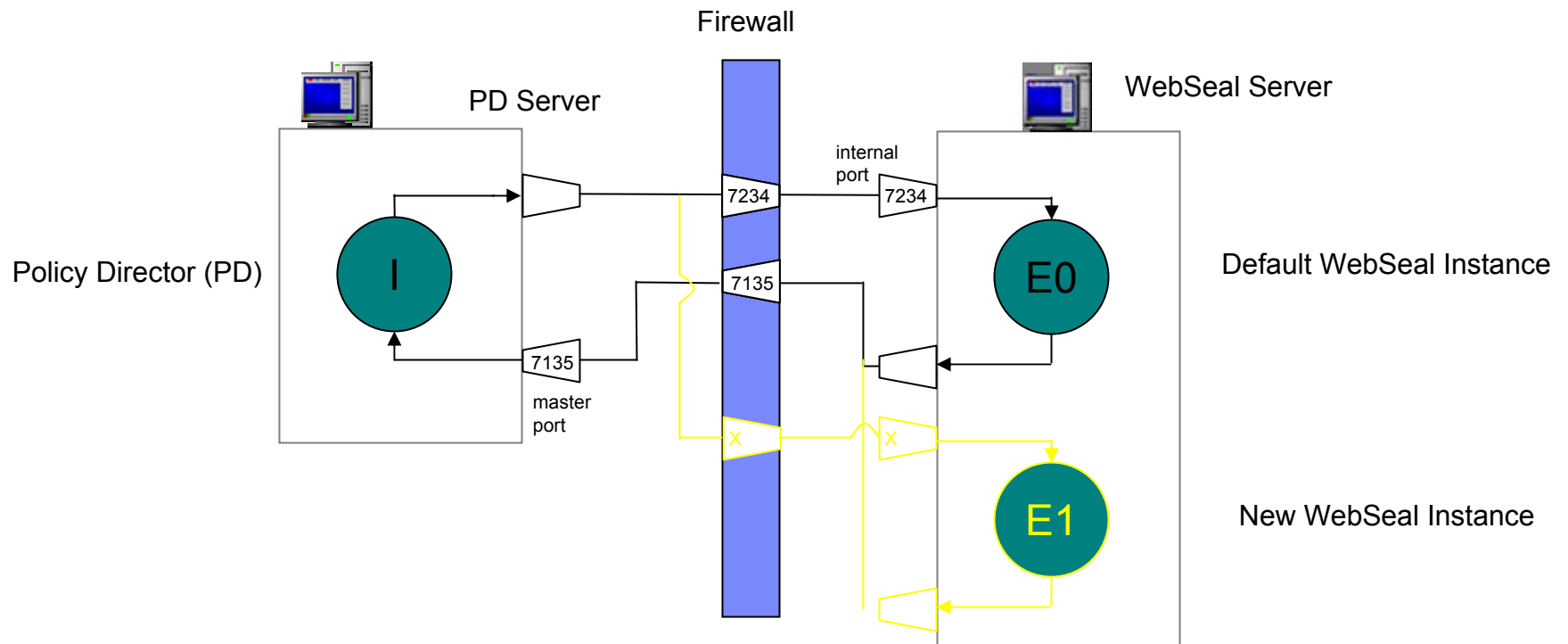
Security
Urbana
1 Week

- Web Hosting, Data Management, Operating System, Security, and Storage
- 14 Visits, 5 sites
- Surveys (~ 100 people)
- Observations (~ 50 days)
- Video (~ 300 hours)
- Interviews (~ 30 people)
- Diary (~ 10 months)
- Qualitative and quantitative analysis

Initial Configuration



Desired Configuration



The Problem

PDWeb_config -i <instance-name> -m <internal-port>

internal port: Unique port number for inter-Access Manager server communication.

```
// Create new WebSeal instance
```

```
PDWeb_config -i E1 -m 7137
```

```
// Check if new instance is shown
```

```
pdadmin> server list
```

```
...
```

```
webseald-E1
```

```
...
```

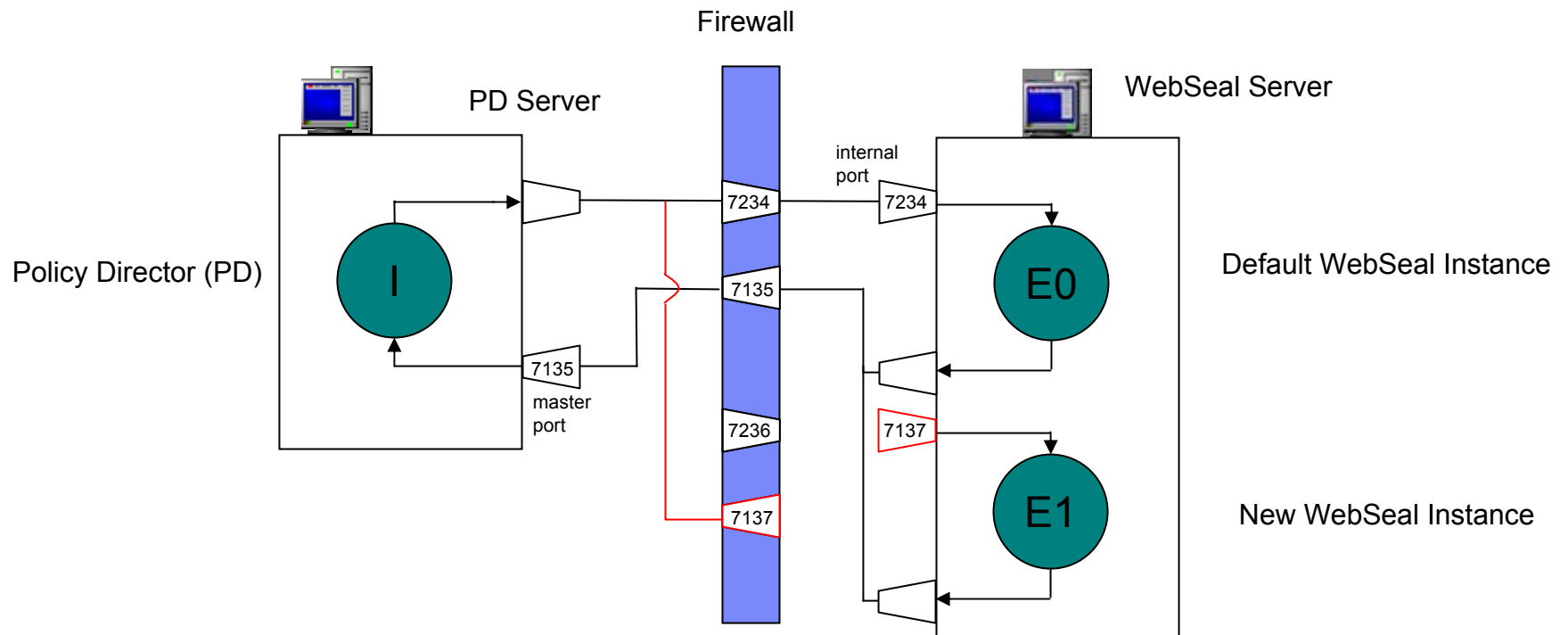
```
// Create junctions
```

```
pdadmin> server task webseald-E1 create -t tcp -h 123.456.789.100 -I -s -b ignore
```

```
Could not perform the administration request.
```

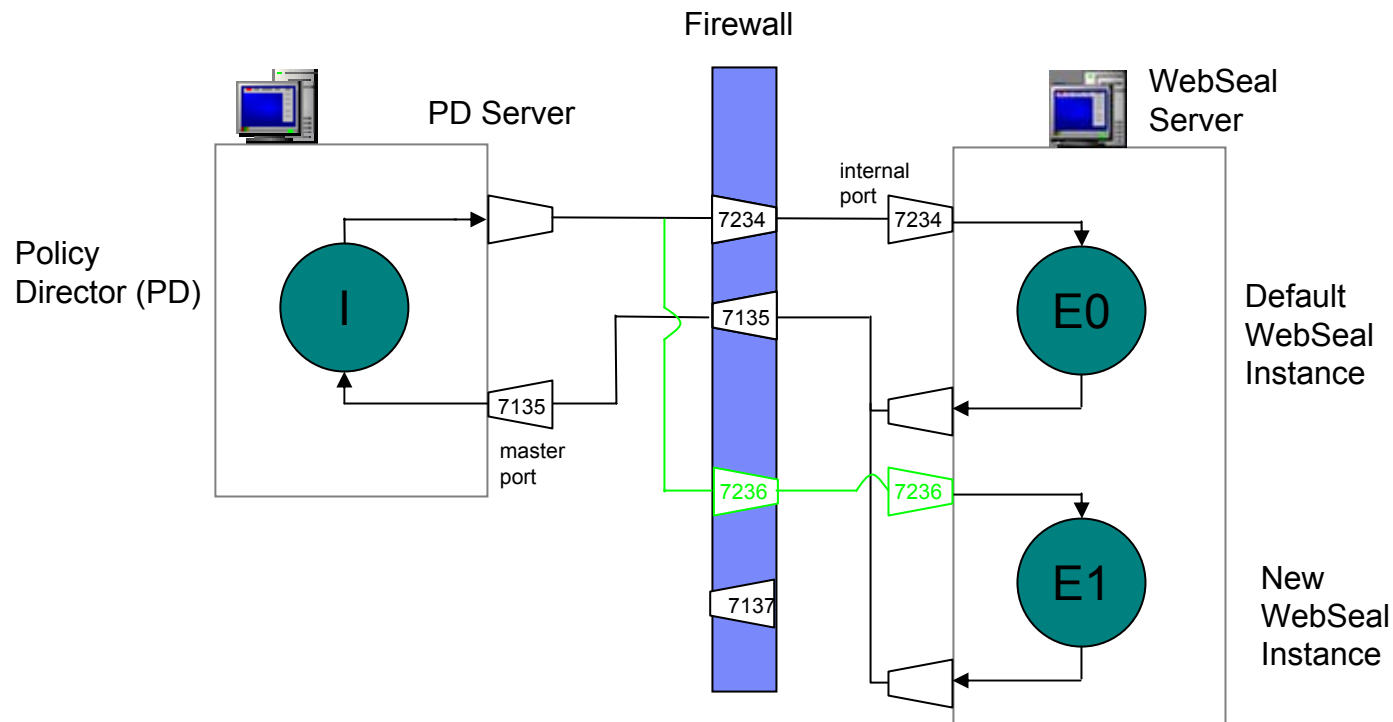
```
Error: Could not connect to server. (status 0x1354a324)
```

Problematic Configuration



What are you talking about?

Fixed Configuration



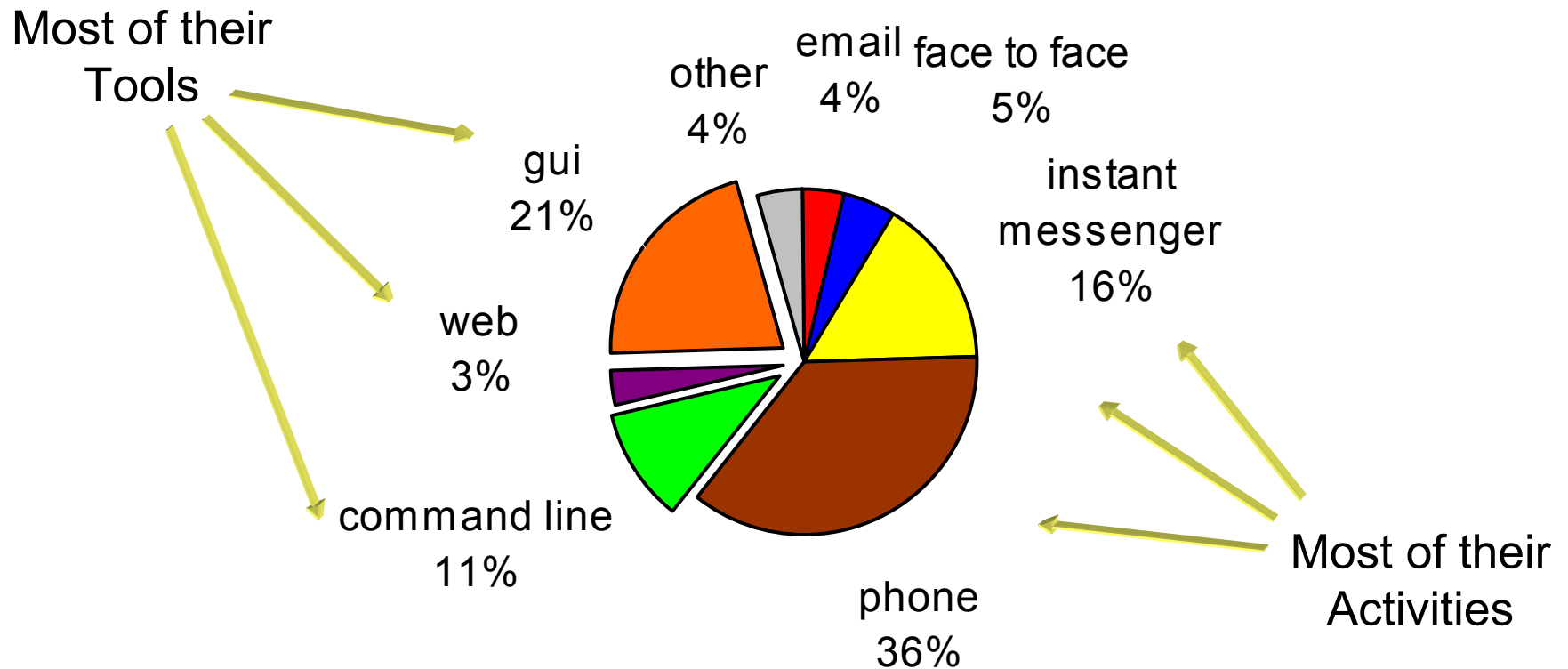
- // Create new WebSeal instance
- PDWeb_config -i cruz -m ~~7137~~ 7236

Patch Management in the Real World

Patch Management

- **Policy:** “OS shall be updated to current patch level every 120 days”
- **Theory:** Simple rule, “easily” programmed
- **Reality:** Every OS patch decision requires negotiation, coordination
 - “Maintenance window too short for this critical server”
 - “You’ll be in bigger trouble without this security patch”
 - “Ok, apply the security patch and any others you can do in 30 min”
 - “Bug patch XYZ is cited on the Usenet as problematic with Oracle ABC.3”
 - “Who said so? Besides, we run Oracle ABC.2”
 - “No comment on that version – patch or skip?”
 - “We’re upgrading to Oracle ABC.3 next month – let’s hold on that one”

What do System Administrators Do?



Tools don't address their real activities



1st Symposium on Computer Human Interaction for Management of Information Technology

March 30-31, 2007: Cambridge, MA

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→ MISSION

Over the years, IT systems have become increasingly complex such that management is now a serious bottleneck to personal and organizational productivity. IT service delivery costs are now dominated by operating expenses, and end-user productivity suffers as a consequence. Simply put, we are at a turning point in IT: Further advances in technology, business efficiency, and growth require fundamentally new approaches to system design and management. Solutions will require a broad understanding of technology, people, organizations, and business.

This symposium aims to bring together stakeholders, researchers, practitioners, and designers from diverse fields such as human-computer interaction, human factors, computer science, management science, social sciences, and service sciences, to identify issues, put forward a research agenda, and propose solutions.

Important Dates:

February 27, 2007:
Advance Registration
Ends

March 29, 2007:
Web Registration Ends

March 30-31, 2007:
On-Site Registration

<http://chimit.cs.tufts.edu/>

Studies of Service Delivery Systems

- Collaboration in Globally-distributed Sales Teams
 - Time spent on process is time not spent on sales
 - No evidence that formal process improved information-sharing effectiveness
- Practices in IT Service Delivery
 - Depends on communication, coordination
 - Most sysadmin time is spent talking, negotiating
- Understanding work can help drive innovation
 - How can technology improve client – provider interactions?
 - How can automation support IT service providers?

Toward a Science of Service Systems

- Service systems are value co-creation configurations of people, technology, internal and external service systems connected by value propositions, and shared information (such as language, laws, measures, models)
- Service systems are designed (computer systems)
- Service systems evolve (linguistic and social systems)
- Service systems have scale-emergent properties (economic systems)

16th Annual AMA Frontiers in Service Conference

**2007
October 4 - 7**

The conference will highlight the latest thinking in service, particularly those that combine aspects of technology, social science, and business.



<http://www.rhsmith.umd.edu/ces/frontiersconference.html>

Questions?

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