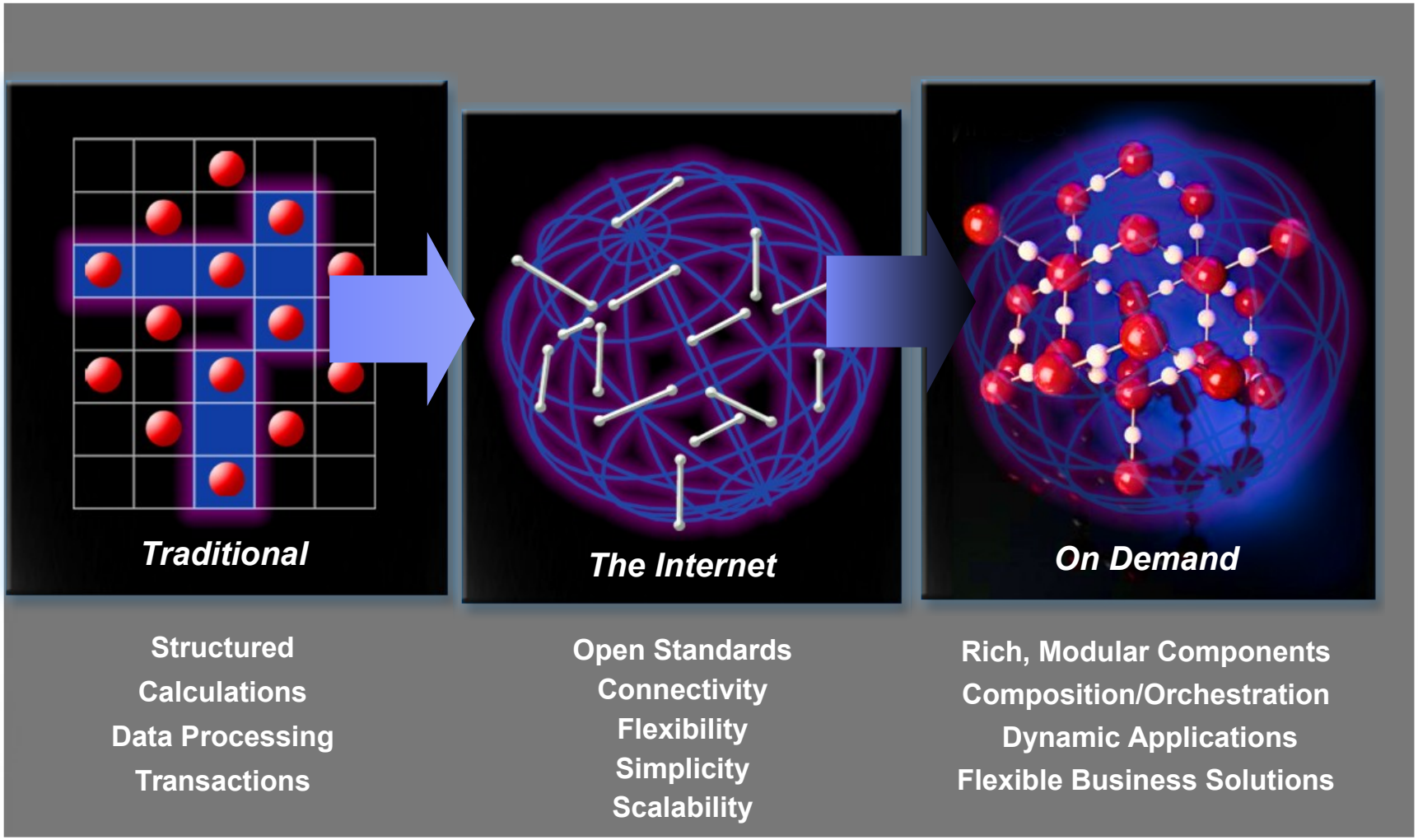
Veer Narmad South Gujarat University
M.Sc. (IT) Programme

Service Oriented Architecture

Introduction to SOA

The information technology industry

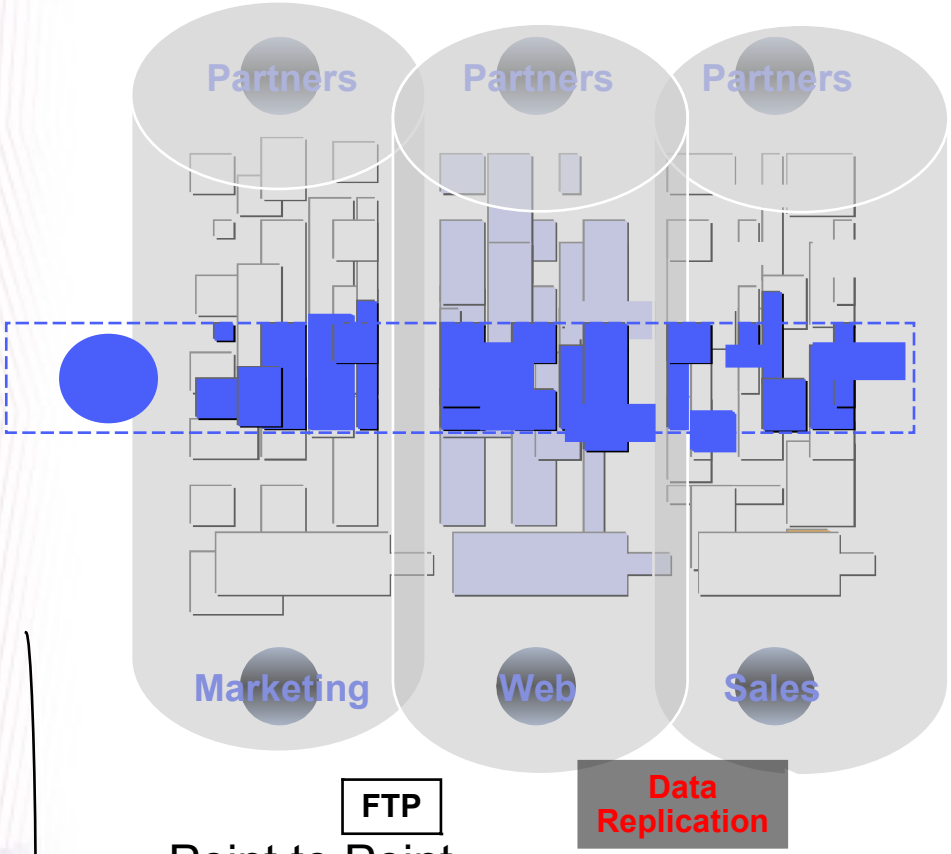


Moving to a new state…

On Demand Business

*An enterprise whose **business processes — integrated end-to-end** across the company and with key partners, suppliers and customers — can **respond with flexibility and speed** to any customer demand, market opportunity or external threat.*

Moving beyond Today's Reality



Horizontal Process

Historical limitations:

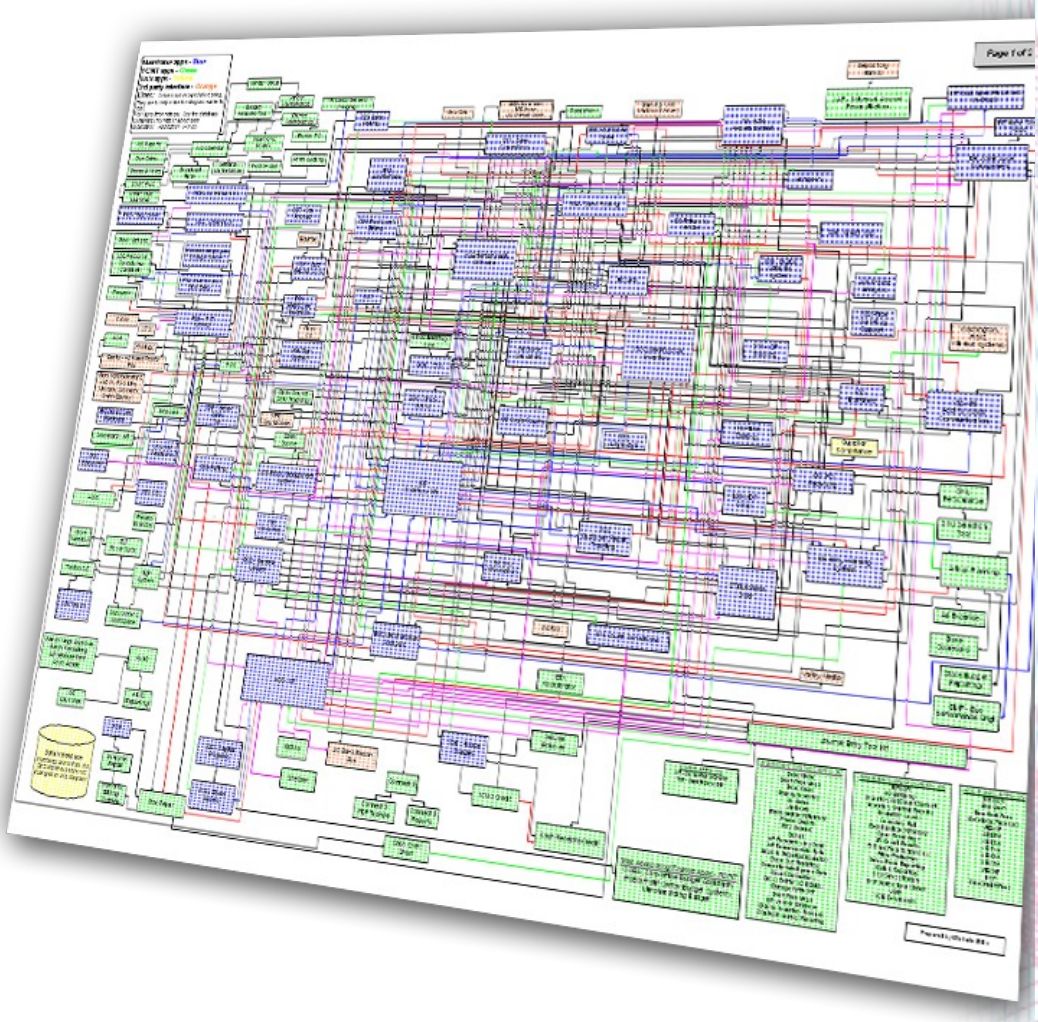
Monolithic applications can't be reused

Ad hoc integration creates connections that are difficult to change/maintain

Lack of standards limits ability to deliver meaningful interoperability

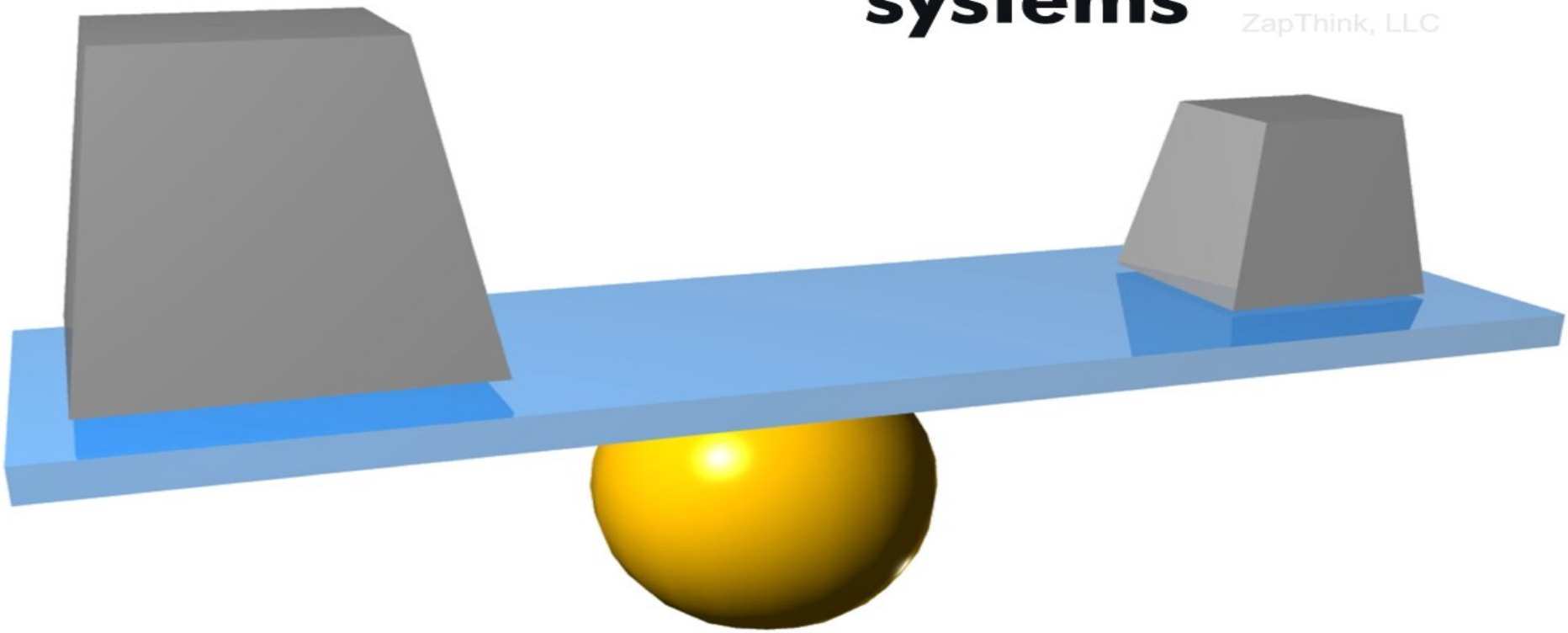
What are the barriers to business flexibility and reuse?

- Lack of business process standards
- Architectural policy limited
- Point application buys to support redundant LOB needs
- Infrastructure built with no roadmap



The Cost of Business Integration …

70% of IT development budgets are spent on integrating different systems

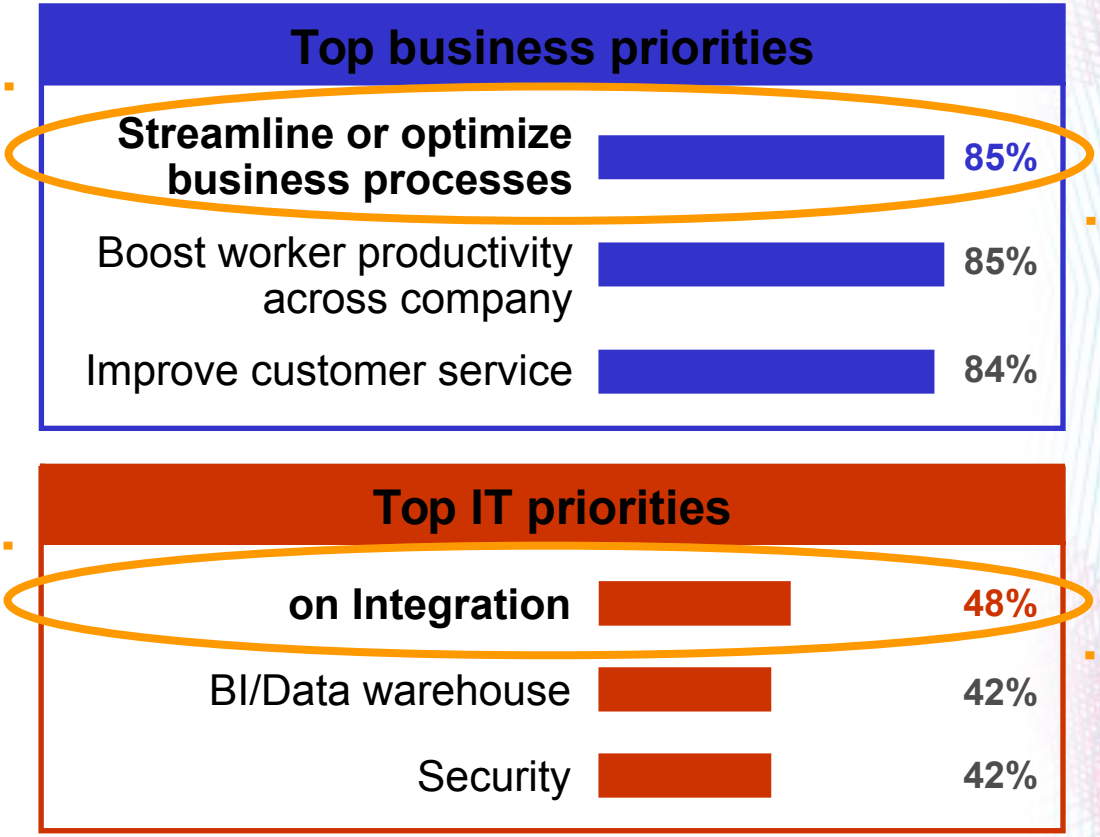


Changing Market Conditions Drive On Demand Business Needs: Addressing Top Business and IT Priorities

"More than 80% of CEOs see unpredictable market forces as the key inhibitor to growth."

Source: IBM's Global CEO Survey, February 2004

- Economic volatility and globalization
- Increasing consolidation across industries
- Increasing regulations and industry standards
- Technical realities



Sources: *Outlook 2004: Priorities 1Q InformationWeek* Research, January 2004; Merrill Lynch CIO Survey Results, September 2004

The Challenge: Business and IT

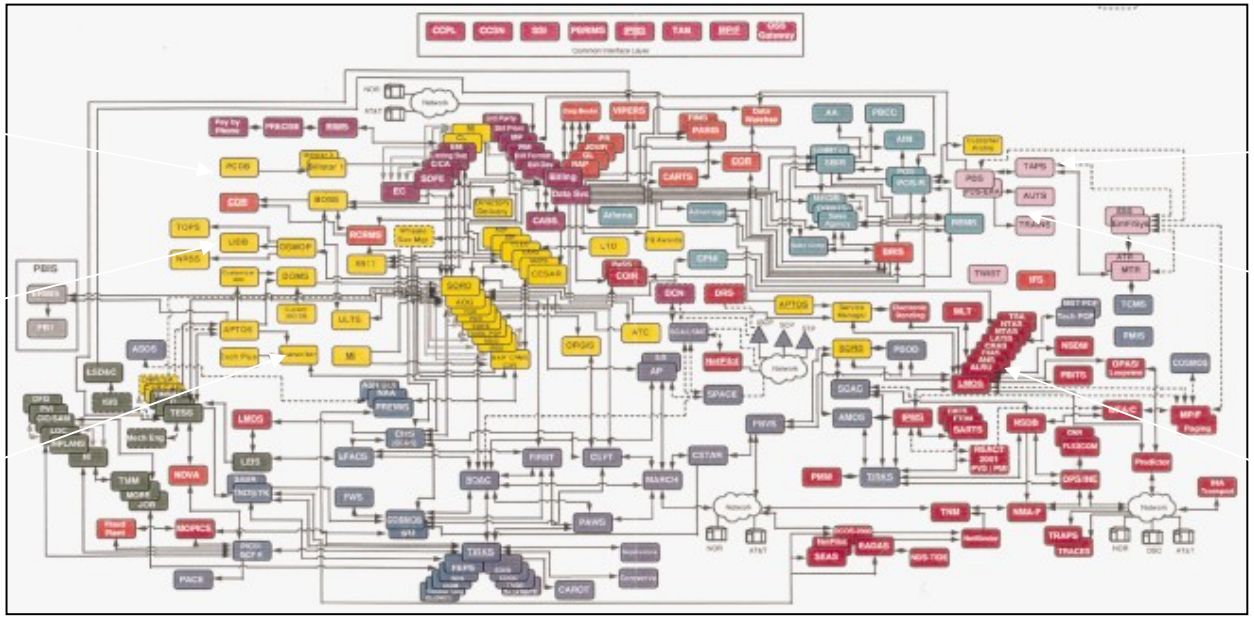
Business Pressures:

- Launch new and innovative products
- Shorter change cycles
- Customized products for niche markets

Partner

Customers

Channels



Employees

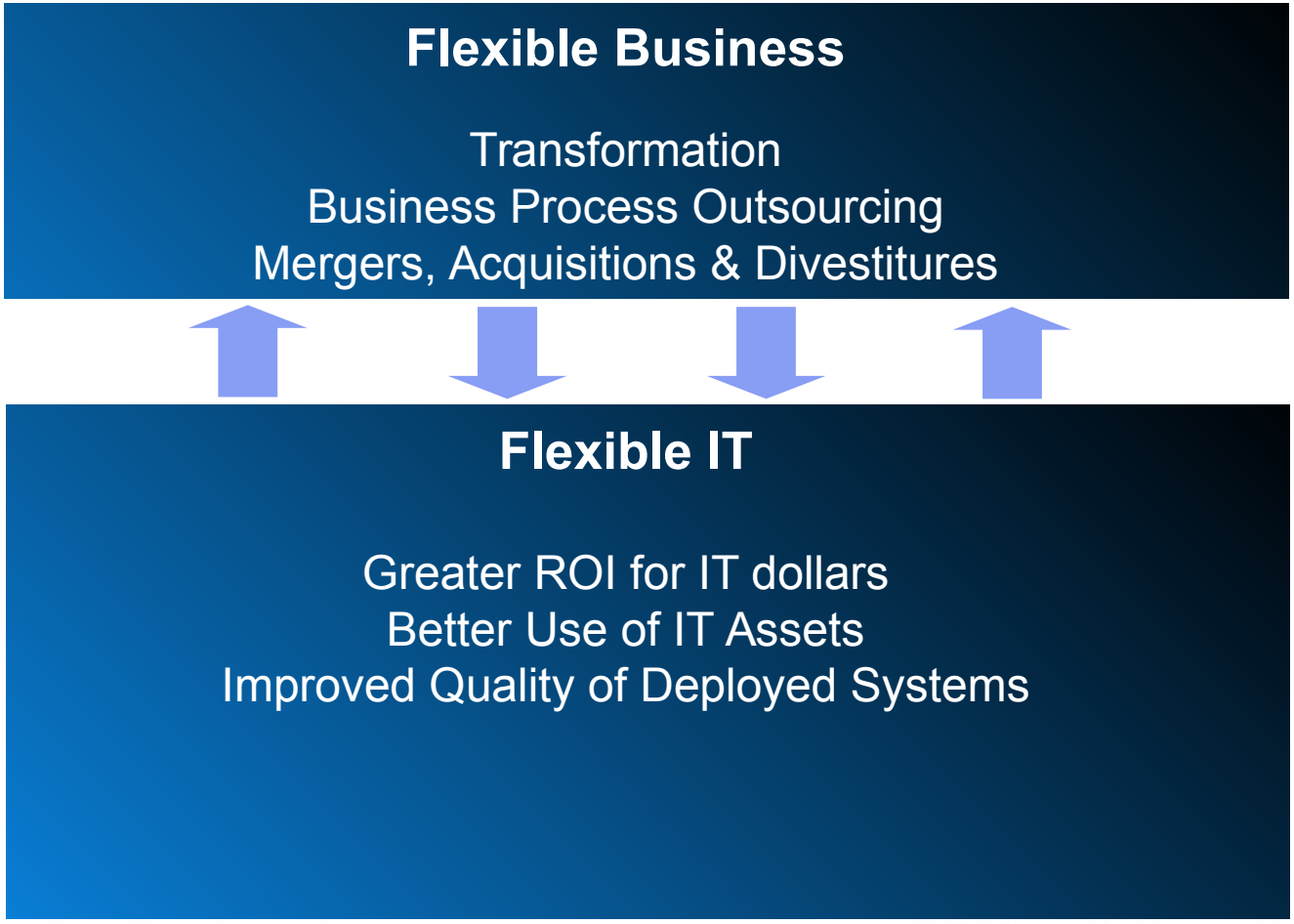
Suppliers

3rd Party Providers

IT Constraints:

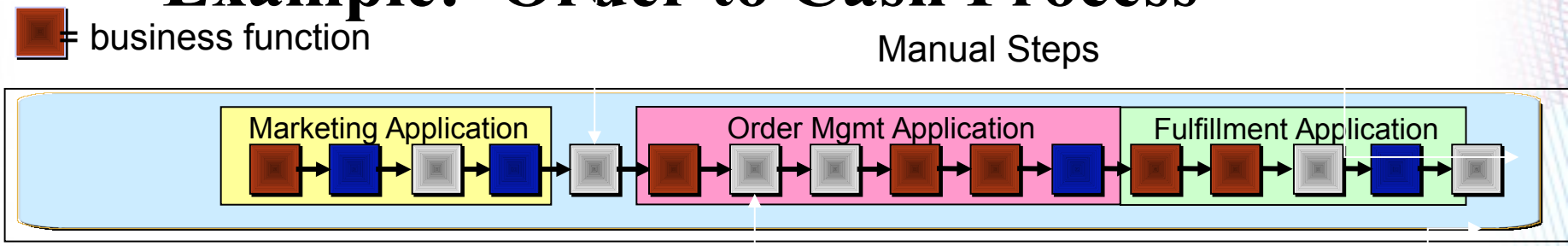
- Complex processes and systems
- Complex applications and interfaces
- IT budget priorities on maintenance, not new investments

Whatever you want are key drivers for SOA



Traditional Business Process

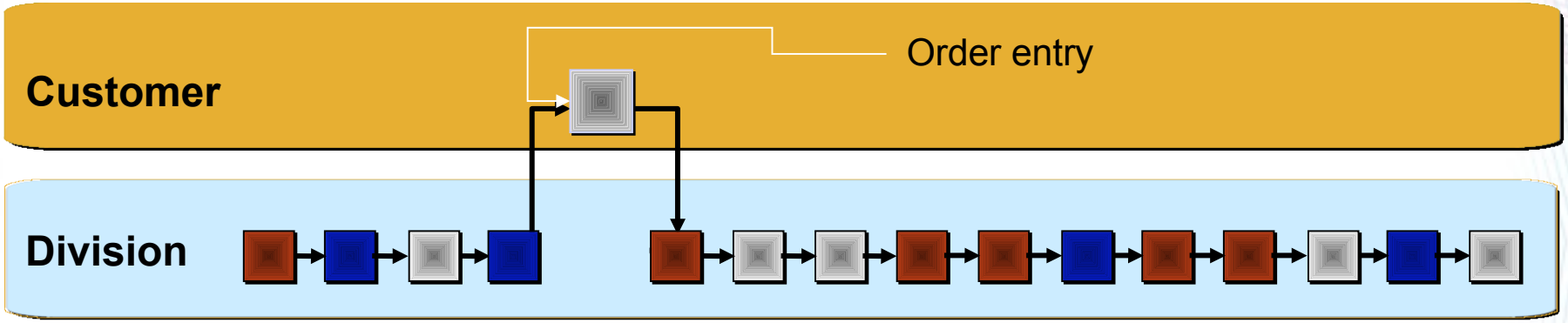
Example: Order to Cash Process



- Business process is embedded in three separate applications
- Changes to the process are difficult to implement
- New processes which are designed this way require long development cycles
- Business functions are tightly coupled within applications
- Process cannot be easily measured and managed

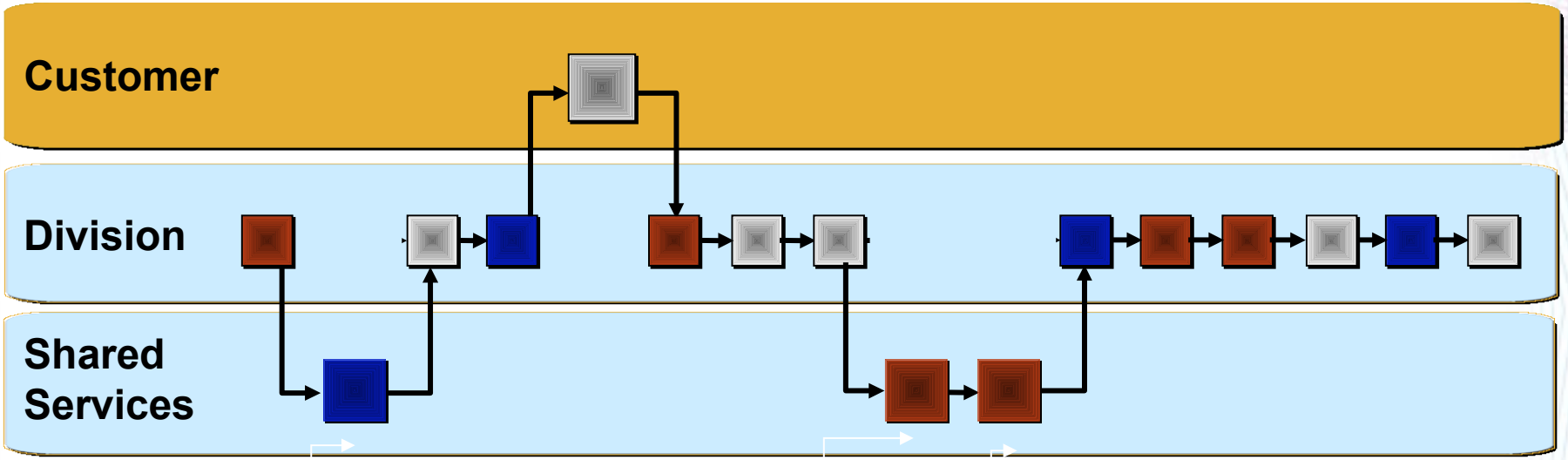
Result: Business cannot respond quickly to demand

On Demand Flexibility: Customer Self Service



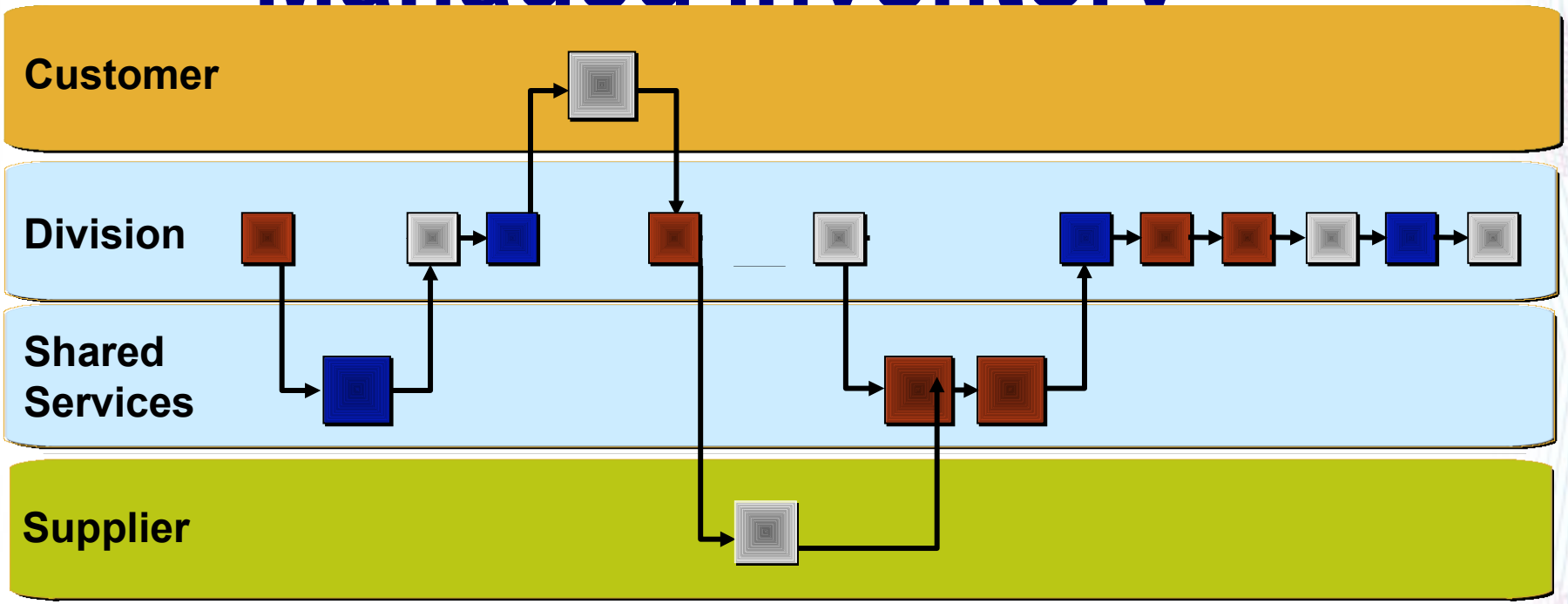
- Customers now order online using a web browser and the Internet
- Business partners can order using a web service call from their own process
- Customers are better served

On Demand Flexibility: Shared Services



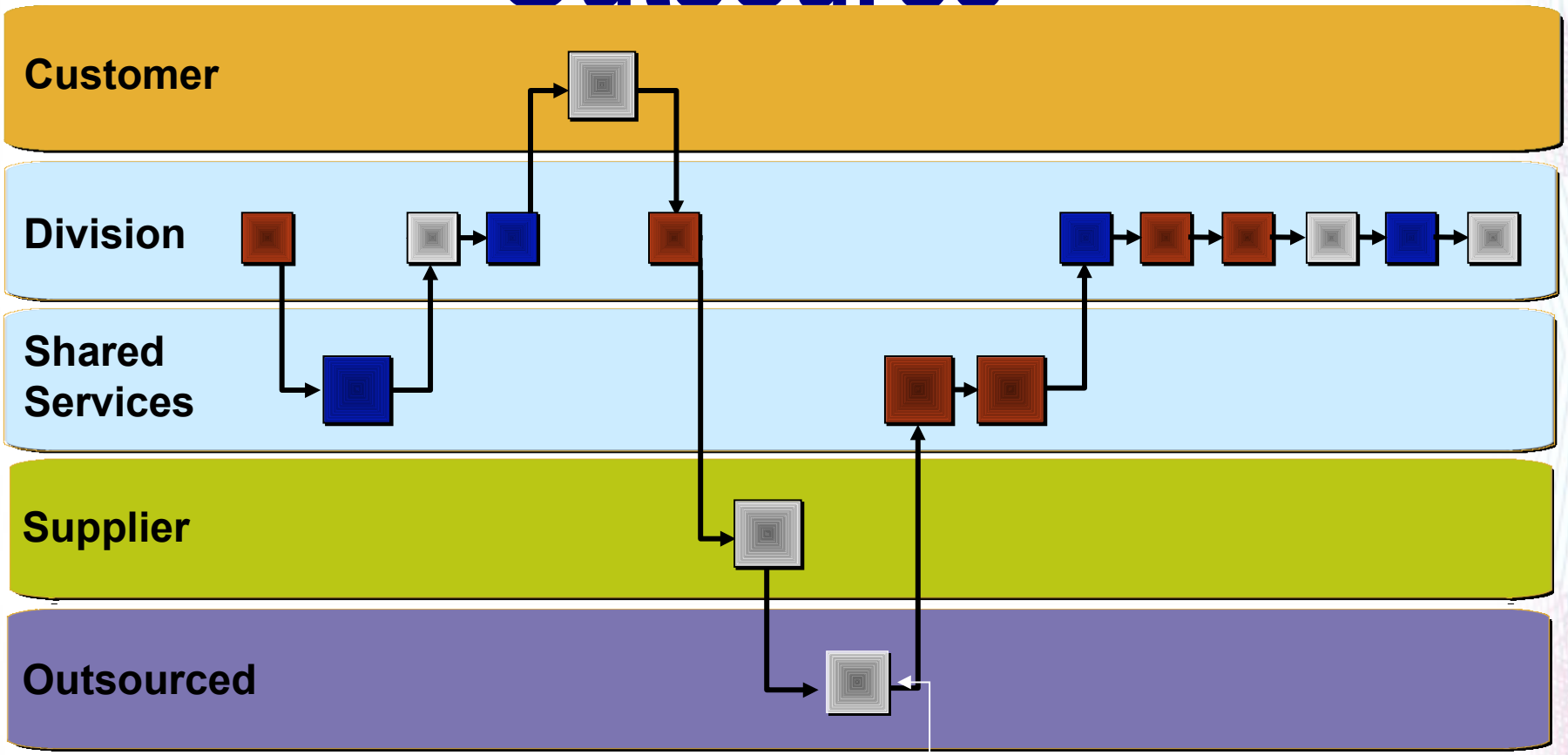
- Common business functions are shared across the enterprise
- Marketing, Billing, and Receivables are handled uniformly
- Enterprise can scale across divisions and lower costs

On Demand Flexibility: Vendor Managed Inventory



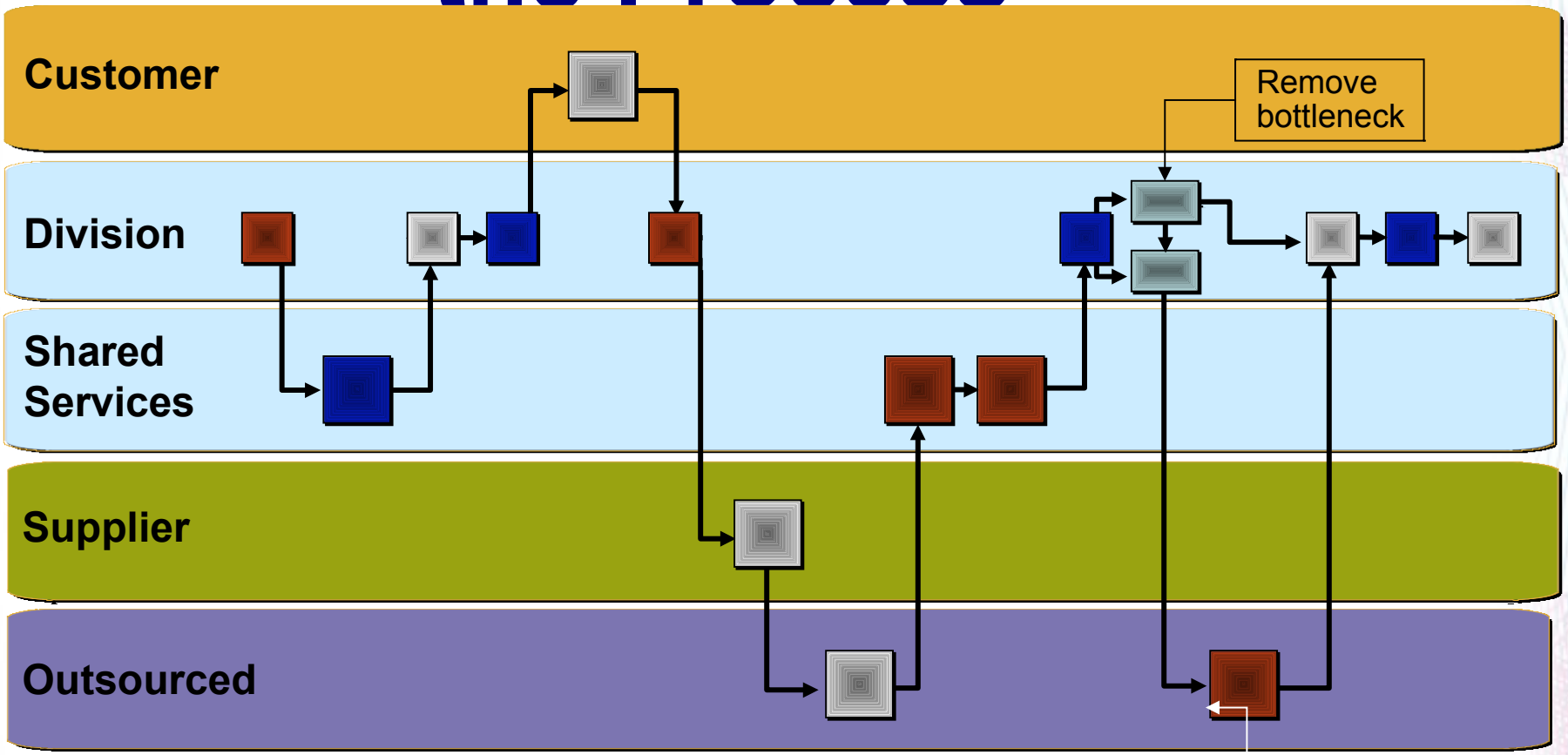
- Minimize or eliminate inventory management function
- Costs are reduced because less inventory is needed
- Inventory servicing is better because of supplier integration with the process

On Demand Flexibility: Outsource



- Shipping is not a core competency
- Shipping companies (e.g. FedEx, DHL, UPS) have more capabilities
- Reduce shipping infrastructure and overhead costs

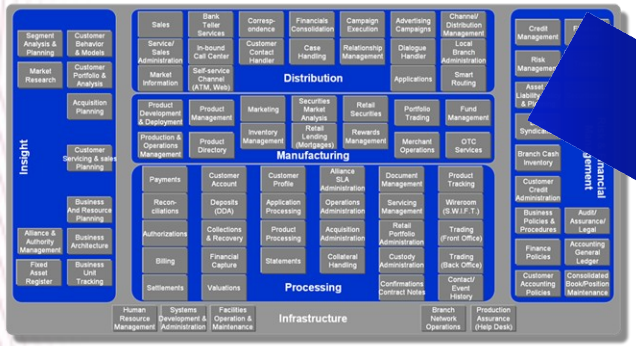
On Demand Flexibility: Improve the Process



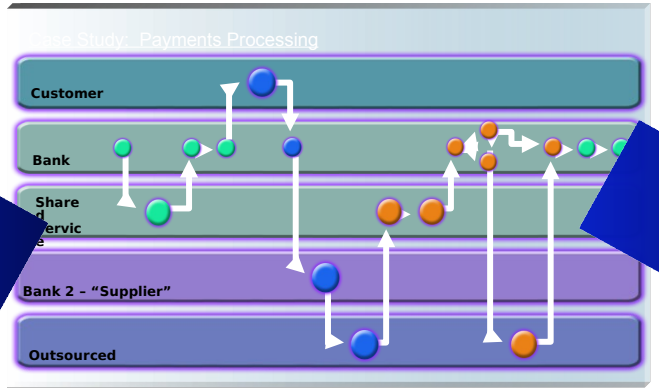
- Identify and remove bottlenecks in the process
- Customize the business rules and policies to better serve customers
- A more efficient business process costs less

Flexible business requires flexible IT

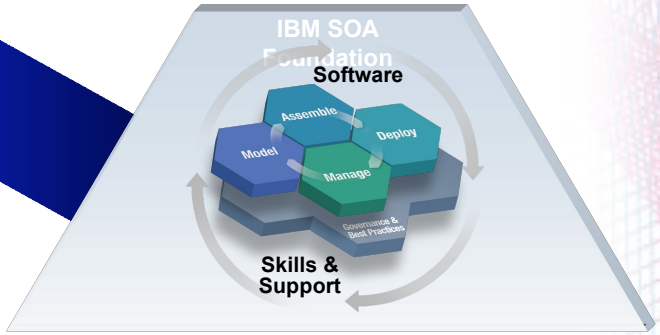
Full Business view



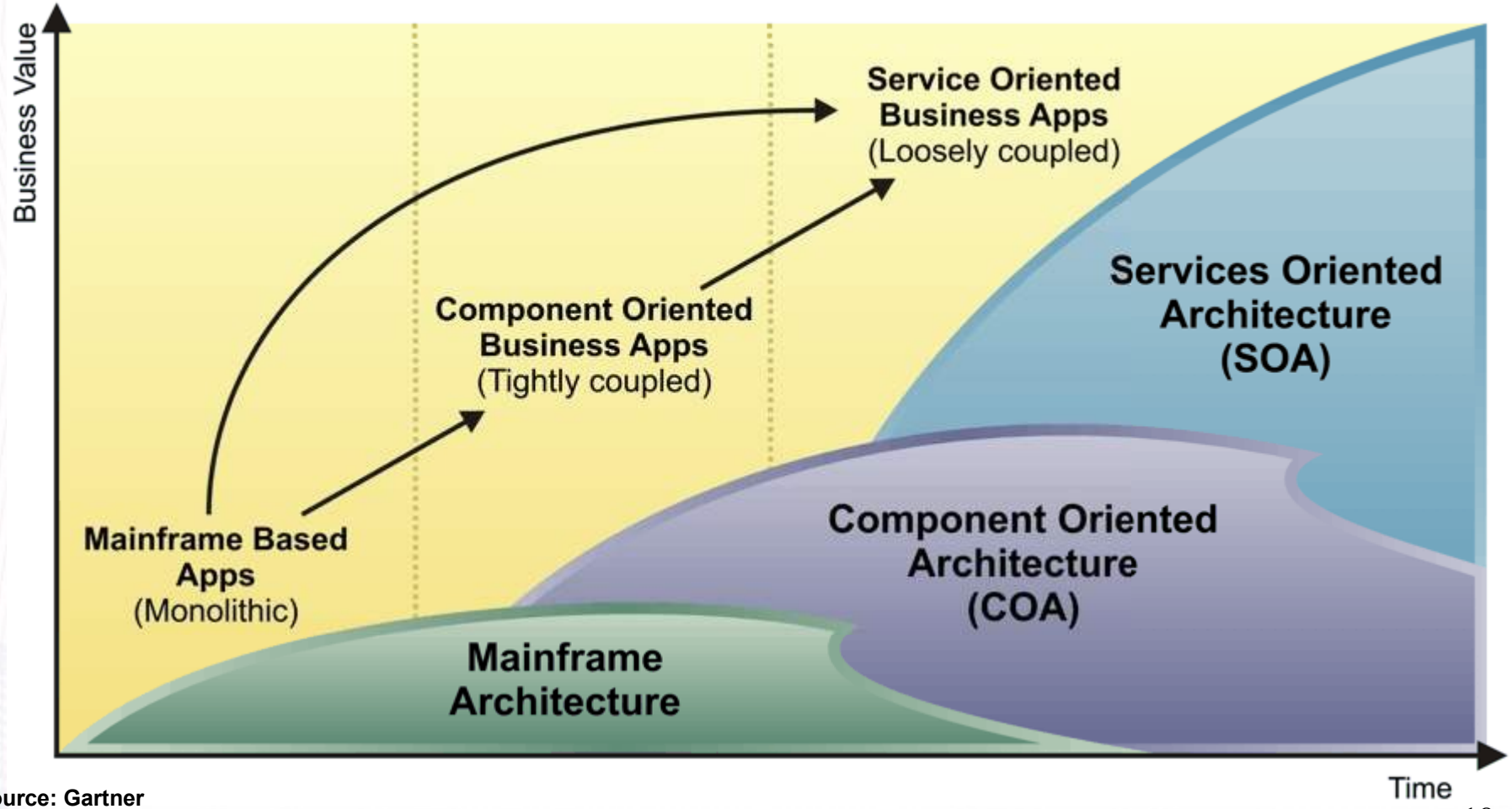
Process to optimize



Creating IT flexibility



SOA Represents the Next Evolutionary Step to Improve Business Agility and Flexibility



Source: Gartner

What is …..?

… a service?

A **repeatable business task** – e.g., check customer credit; open new account

… service orientation?

A way to integrate your **business as linked services** with their unique outcomes

… service oriented architecture (SOA)?

An IT **architectural style** that supports service orientation

… a composite application?

A set of **related & integrated** services that support a business process built with SOA

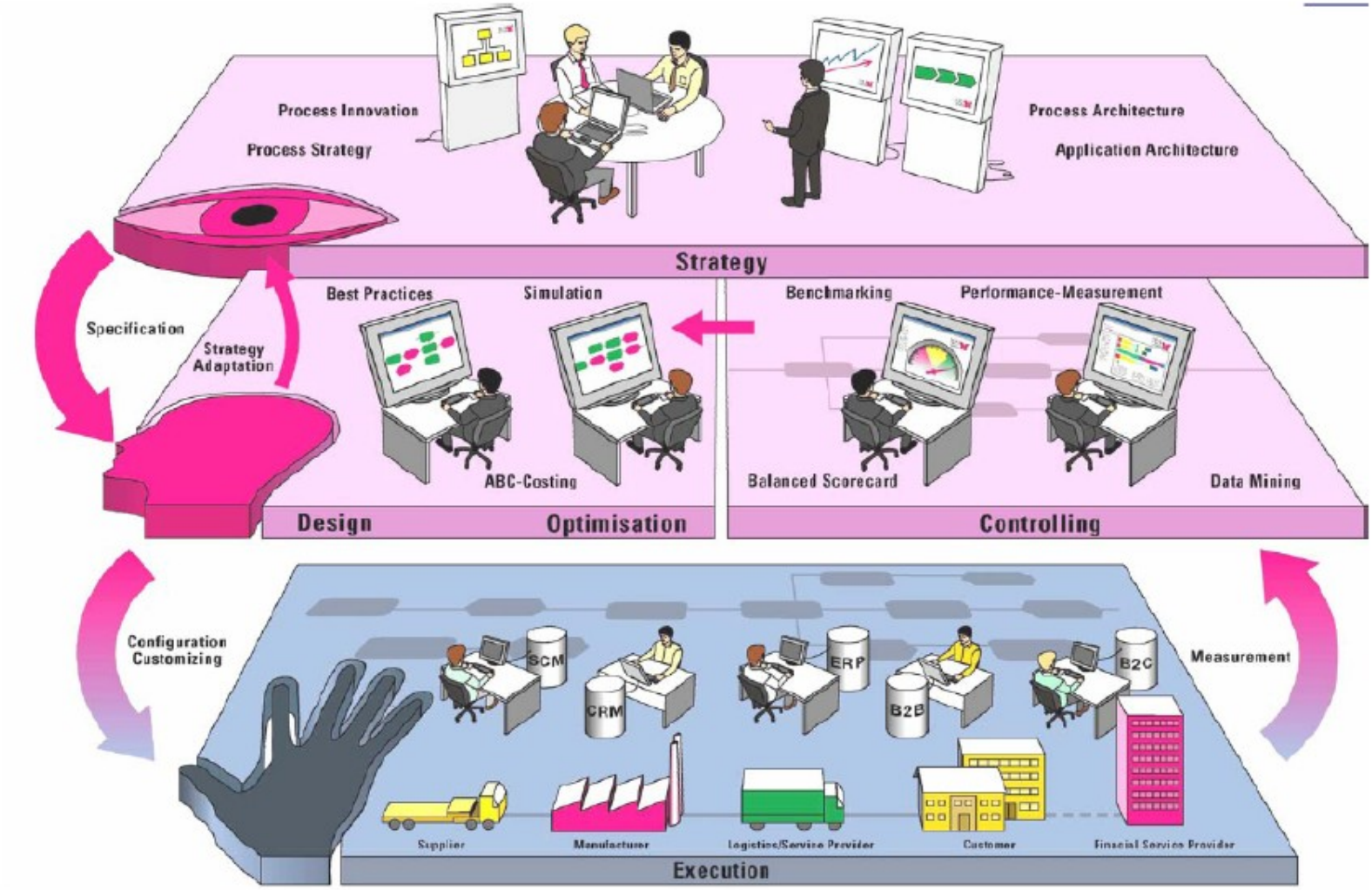
Key terms for SOA

- A *service* is representative of a repeatable business task. Services are used to encapsulate the functional units of an application by providing an interface that is well defined and implementation independent. Services can be invoked (consumed) by other services or client applications.
- *Service orientation* defines a method of integrating business applications and processes as linked services. we're talking about a thought process and a business philosophy not about technology.

SOA Defined

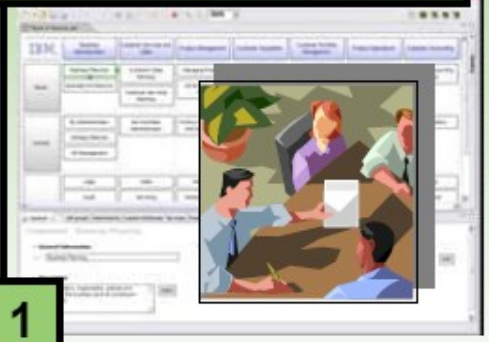
- From a **business perspective**, SOA defines a set of business services composed to capture the business design that the enterprise wants to expose internally, as well as its customers and partners.
- From an **architecture perspective**, SOA is an architectural style that supports service orientation. Architecture is an investment in process, technology, and interface standard for the purpose of improving the organization's capabilities, maximizing business agility, or reducing the cost of IT development and operations
- From an **operational perspective**, SOA includes a set of agreements between service consumers and providers that specify the quality of service, as well as reporting on the key business and IT metrics.

How Business Works?



Business Innovation & Optimization

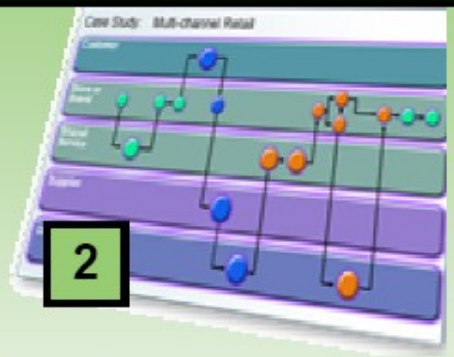
Identify Business Goals



1

Understand **core business goals** and their relationship with strategy and business operations

Align Business Measures with Goals



2

Align **key performance indicators** for the integrated set of processes, activities, and key components with the business goals.

Manage Performance

3

Gain **real-time visibility** and analysis of business information for timely and coordinated action

Result is a better understanding of the "State of the Business" so you can continuously innovate and optimize.

Achieving Business Agility

- Agile means able to move or change direction easily and quickly
- As the business transforms, the IT systems implementing transformations have to be agile enough to change quickly and cost effectively while still performing current business function.
- SOA provides business agility in three ways:
- ***Loosely coupled*** *services* are ones that no longer require the same technological implementation at each end of the connection. A simple mechanism connects applications regardless of the devices & location.
- ***Reuse*** The reuse of software, hardware, processes, code, services, and infrastructure provides some of the most measurable factors for an SOA return on investment (ROI) calculation
- ***Extensibility*** is defined as the ability to easily expand internal operations with new functions and to easily access organizations outside the enterprise.

Digital Model of Business with SOA - **Randy Heffner**

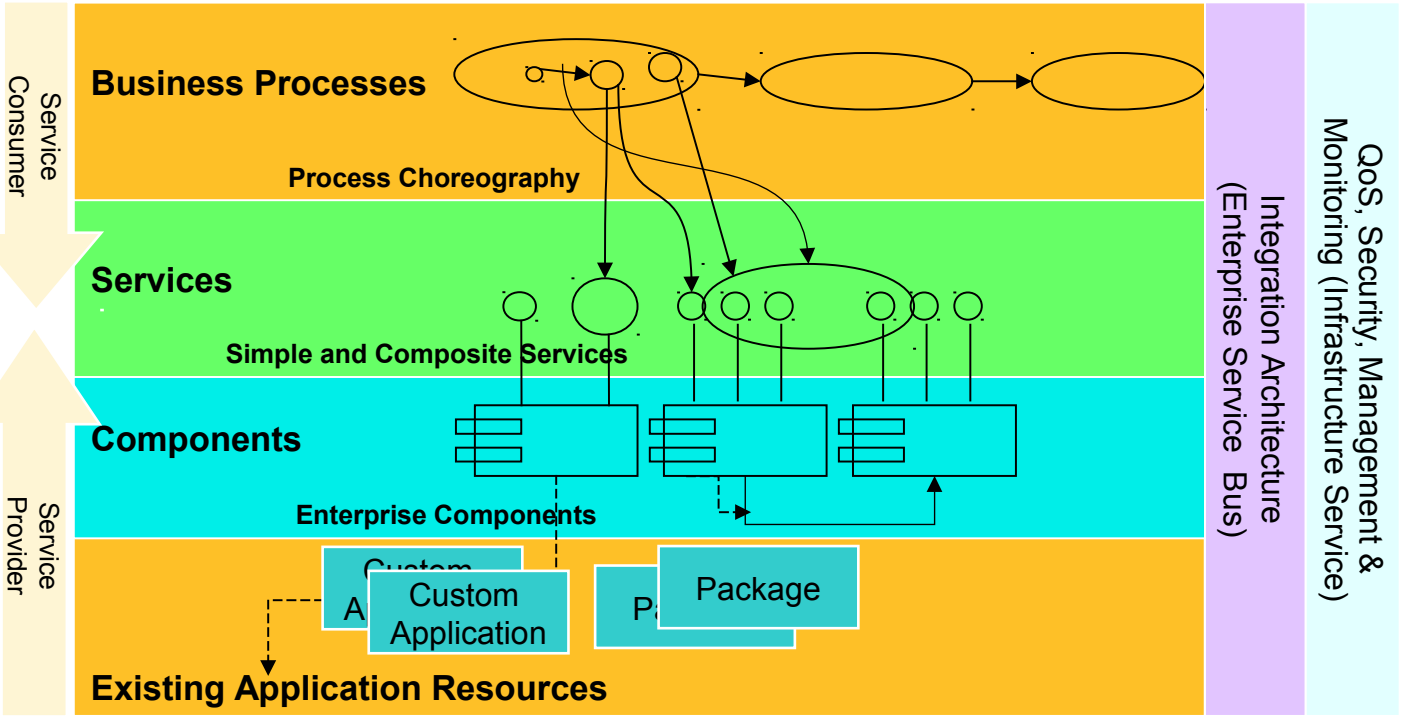
- **Business is done via business processes**.
- **Business processes tie to business measurements**.
- **Business process steps are delivered via IT applications.**
- **Business process steps align with business services**.
- **Business services create a digital model of the business**.

- This is powerful for two reasons –
  - As the business changes, that is, as you create new process steps and optimize existing steps by changing who does what, when many of the underlying services are stable and only the method of access needs to change.
  - The digital model provides a structure to collect, examine, and align business and IT metrics. Also provides correlation between IT costs and business process results.

SOA creates an agile business environment for competitive advantage

Service-Oriented Solutions – Architecture View

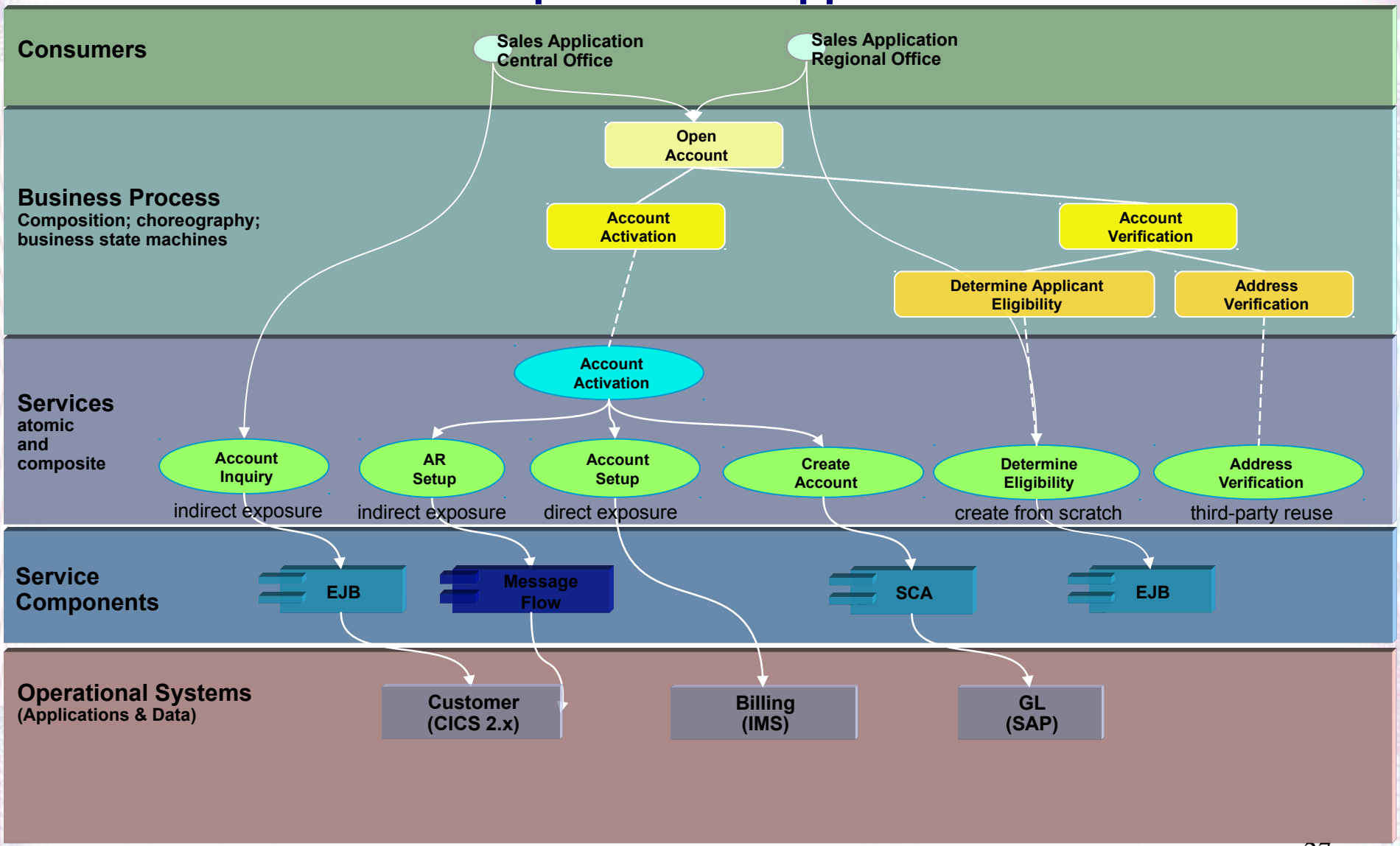
An SOA is composed of multiple layers.
At the heart of the SOA are Services, Components that realize services and Service Flows.



Service Modeling

Simple service

Example – Sales Application



Characteristics of a Service

- Services invoked through defined communication protocols
- Stress on interoperability and location transparency
- **Appear as a self-contained function**
- Use a **well-defined** interface
  - expose business functions
  - **hide underlying implementation** details
    - Loosely coupled
  - independent of any particular technology
- Services are not dependent on the context or state of other services.
  - Any dependencies between services are defined in terms of common business process, function and data models

Align Business with IT using SOA - **Randy Heffner**

- **Business services push IT to understand business processes.**
- **Which leads IT to examine business process metrics.**
- **Which leads IT to understanding the business in business terms.**
- **Giving IT a new way to prove its value: business results measurement.**

SOA can reduce or eliminate IT frustrations and provide a way to quantifiably measure IT business value.

Analysis	Questions to be asked to improve business processes
Cost, time and numbers	1. What processes, sub processes, activities have the biggest impact on cost, time and number? 2. Are there bottlenecks? Are there cost peaks? 3. What are the single steps (activities) that need to be changed in a process/sub process to achieve significant savings in cost and time of the overall process? 4. Which sub processes or actvities could be outsourced? 5. Where in the processes/sub processes are pre-defined business measures not met?
Paths	1. What processes/sub processes cases are taken how often or are never executed? 2. How expensive in cost and time are all the single process/sub process paths? 3. What process/sub process path is the best candidate for optimization? 4. What's the critical path in the process/sub process with respect to costs and durations? 5. Who's involved to perform the activities? What (input) data is received? What (output) data is generated?
Interfaces	1. How many different organizational units are involved in the process/sub process? Do we need them all? 2. Are there any redundancies/inefficiencies in the process/sub process? Are there bottlenecks? 3. Is something missing in the process? Does changing the sequence of activities improve the process?
Data flows	1. Who is the customer (internal as well as external)? What information does he receive? 2. Does the customer (internal as well as external) need more information? Is there too much information? 3. What do the customers expect from the overall process? Is there a key (sub) process? What's its impact? 4. Is the right information sent at the right time to the right performer?
Quality	1. What's the error rate of processes/sub processes and identified paths? What part generates the highest repair cost? 2. Does every process/sub process/activity really deliver an added value to the overall business process?

simulation

reports

View performance and modify dashboards in real time

- Scorecard view implemented through Key Performance Indicators
- Track and modify business process flows
  - Eliminate redundancies or inefficiencies
  - Identify bottlenecks – balance workloads
  - Reduce latencies
- View information the way you want to see it
  - Management dashboards and reporting capabilities,
  - trending information
  - Tools to customize or define new dashboards
- Monitor different perspectives of business process metrics
  - Cost, time, resources

SOA Benefits

- Saves money, time, and people
- Eliminates frustrations with IT
- Justifies IT investments
- Provides business executives with a clear understanding of what IT does and its value
- Eliminates IT's 6-6 answer (that is, the project will take 6 months and cost 6 figures)
- Provides a business and competitive differentiator

When a change in business process no longer requires a change to application programming logic, you have a successful SOA; your company has attained competitive business agility.

What will happen if you don't adopt it?

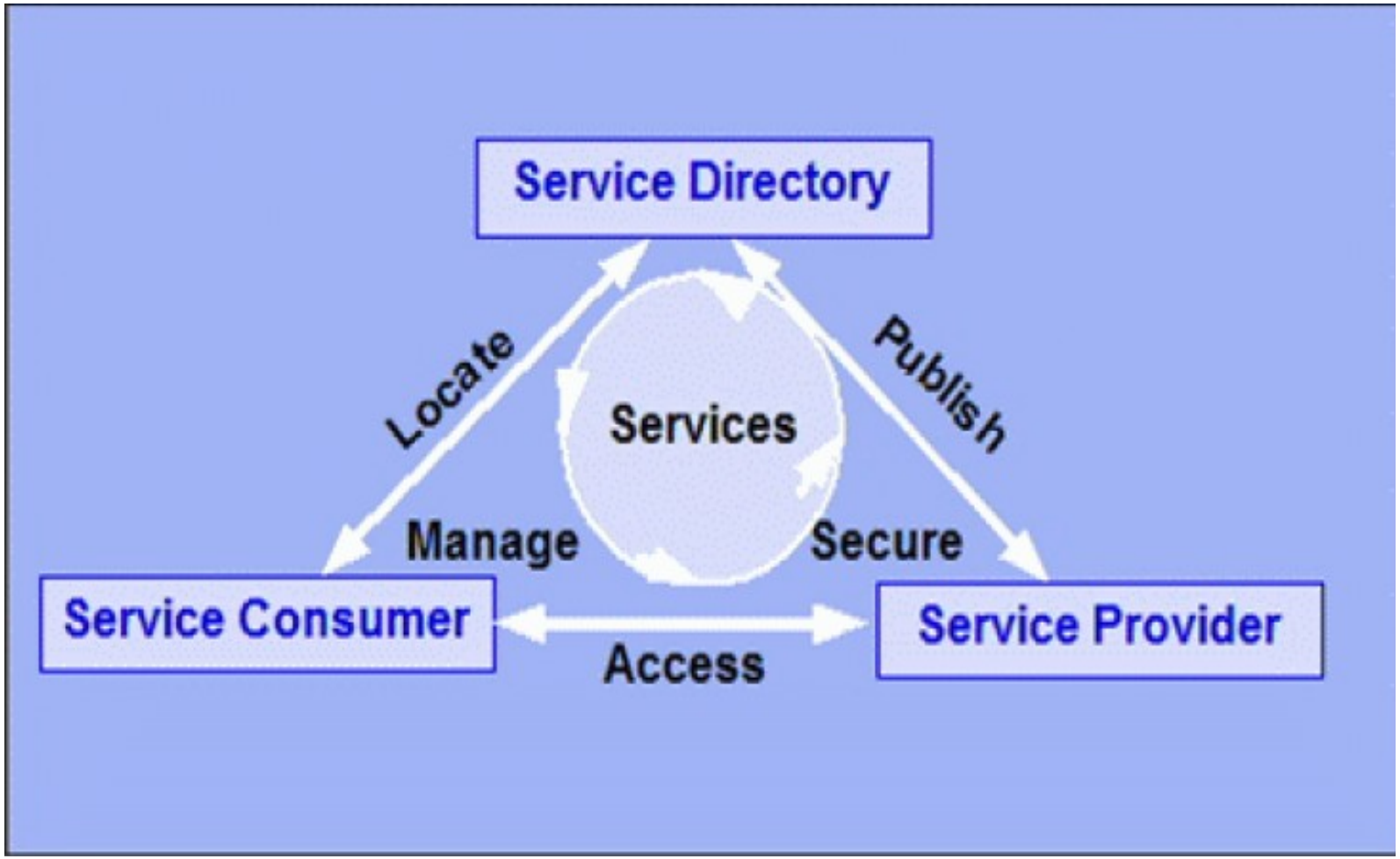
An SOA could be the difference between the success and failure of the next:

- Department, intra-company, or inter-company merger
- Acquisition
- Divestiture
- Product or service rollout
- Business partner, customer, or supplier addition
- Geographical expansion
- Competitive onslaught

When not to implement SOA?

- When you have a homogeneous IT environment
- When true real-time performance (nanoseconds response times) is absolutely critical
- When flexibility is not needed
- When tight coupling is needed
- If the organization isn't ready for it

Elements of SOA



Key principles of the SOA

- **Loose coupling** - Services maintain a relationship that minimizes dependencies and only requires that they retain an awareness of each other.
- **Service contract** - Services adhere to a communications agreement, as defined collectively by one or more service descriptions and related documents.
- **Autonomy** - Services have control over the logic they encapsulate.
- **Abstraction** - Beyond what is described in the service contract, services hide logic from the outside world.
- **Reusability** - Logic is divided into services with the intention of promoting reuse.
- **Composability** - Collections of services can be coordinated and assembled to form composite services.
- **Statelessness** - Services minimize retaining information specific to an activity.
- **Discoverability** - Services are designed to be outwardly descriptive so that they can be found and assessed via available discovery mechanisms.

This completes Introduction of SOA