Q1: The service economy, services systems, IT, and productivity

o The role of services in economic growth and why we study them

The service sector plays a **dominant** and **growing** role in economic growth and employment in most parts of the world.

But the service sector is less efficient than the manufacturing sector

In part because more is known about how to make products more efficient than how to make services more efficient

Therefore, the improved productivity and competitive performance of firms and nations relies on improving the productivity of the service sector and services innovation.

o Service productivity

Productivity is a measure of economic efficiency at various levels – firm, industry, sector, nation

Increased productivity is the ability to produce more with the same or less input

e.g. revenue vs income @IBM

Increased productivity leads to economic growth - firm, industry, sector, nation

e.g. per capita GDP (ratio of GDP to population)

Ways of increasing productivity in services

Optimizing

   Increasing productivity by changing the ratio of input to output as far as possible

      It can be achieved for example through:

         Process improvement, e.g. IT governance, CMMI, QA, IT service management (this is important for Newtown Bank)

            Computational processes can replace people

Innovating

   A radical new way of doing things e.g.

      Business analytics

      Smart services (the internet of things)

      New models of business

o The role of IT in optimization, innovation, and transformation in services

IT is a key enabler of increased productivity through innovation and optimization

IT as an enabler of economic growth (what does that mean?) It improves productivity in services

For example：

–   Business analytics

     • (Big data and the enterprise as laboratory e.g. what if? Football, expedia)

–   Smart services (the internet of things)

     • (Pacific Control in Dubai, China's smart grid)

–   New models of business

     • (Rolls-Royce, fishing in India, banking in Africa, Amazon, flying planes or flying passengers)

IT as a service

–Virtualization and data consolidation

–Cloud computing and the light switch - wrapping complexity in simplicity e.g.

     •Amazon Elastic Compute Cloud (EC2), facebook.

- •Animoto
- •Mobile money
- •Agricultural services in Kenya

–SaaS, utility computing (salesforce.com), IaaS, PaaS

–Service oriented enterprise and IT architecture

–The enterprise as a platform – the rise of the platform economy

使得service economy增长的原因

Core though, is the "algorithmic revolution"

–Service activities are changed when they can be decomposed to formalizable, codifiable, computable processes with clearly defined rules.

–Two important aspects to this

1. IT-centric optimization of services
2. IT-centric innovation in services (new models of business)

–BUT in decomposing processes and commoditising them we can bring its own complexities

E.g. Hyperdigitization

IT—service innovation

Smart services：

Auto insurance companies now are experimenting with networked sensors installed in cars that allow them to price insurance based on actual driving behaviors, **e.g. distance, speed, where the car is driven.** Rather than blunter demographic characteristics, **e.g. Age, where a customer lives**

Wearables

-- The internet of things (Cisco estimates this will increase US corporate profits by 21 percent in the next eight years)

-- Virtual reality (Myer and ebay 2016)

-- Dairies

-- Public utilities – electricity, water etc.

-- Green management

-- The connected car ecosystem (automakers, insurance companies, telcos, chip makers, anthropologists) the car as a digital platform

IT 使得 ERP 成为可能 对于传统 service 而言

This evolved into enterprise resource planning (ERP), which provides an information base for mathematically based advanced planning across an enterprise

Q2: Specialization and service-oriented models of business
o Traditional organizations and specialized organizations
In the past, practical limitations forced companies to build their business models around only one of these attributes, keeping significant achievement of the others an intense desire but impractical to implement. Competing on price, for example, tended to rule out highly differentiated products or top-notch customer service. Until recently, such tradeoffs were an undisputed reality of doing business. The barriers of time and distance limited the ability of companies to integrate internal and external capabilities.

Information and communications technologies have made the world a smaller place. Operations and financials are more visible, and the risks of collaboration have declined. Companies can now tap a much broader range of capabilities, regardless of where they reside. (Even distances of thousands of miles pose few problems.) Moreover, it is now much easier to find the best providers of the capabilities that fit their business needs

Typically, generalist organizations consisted of three kinds of business, because that achieved the lowest transaction costs. However the ongoing and capital costs of doing this can be high as the organization needs to specialize in all three kinds of business i.e. it is difficult to optimize scope, speed and scale simultaneously.
Advances in networks, standards, commoditization of processes and other barriers to interaction, are lowering the transaction costs of unbundling and partnering in the market

This will lead to agile, dynamic, specialized providers (and aggregators), i.e. services

o Enablers of specialization
The three interrelated, mutually reinforcing architectures that make up the global connectivity platform should be familiar to anyone who has followed the technology and business developments of the past decade. First, communication networks, specifically broadband and wireless technologies, have made digital connectivity faster and more affordable. Today, the number of worldwide broadband connections is estimated to swell 22 percent per year,3 while the number of worldwide wireless hotspots is growing by 40 percent per year.4 This rapid spread of communication networks is accelerating global interoperability among businesses and allowing more companies to access information in real time.

Second, information technology has evolved. With the consolidation of the enterprise software market (SAP currently owns 25 percent of the ERP market, while Siebel owns 45 percent of the CRM software market) 5 and the proliferation of business integration software, companies now have a common platform upon which broader and better functionality can be built. The emergence of these common solutions across the business environment is enabling firms to organize and seek partnerships more easily along their process flows. This is creating, in effect, a new, shared infrastructure.

Third, open standards – both technology and business – are optimizing interoperability and

In short, the dramatically lower transaction costs made possible by global connectivity are leading to a renaissance of business specialization

o The role of IT in specialization and the "as-a-service" model

o The nature and role of digital platforms

What is a digital platform?

Online structures that enable a wide range of human activities

Changes the way we work, socialize, create value and compte for profits

E.g. amazon,

The company's list of current and possible competitors, as described in its annual 埛 lings, includes logistics rms, search engines, social networks, food manufacturers and producers of "physical, digital and interactive media of all types". A wingspan this large is more reminiscent of a conglomerate than a retailer,

E.g. Uber

Q3: Service-oriented enterprise and IT architecture

o Purpose of enterprise architecture (EA)

The purpose of enterprise architecture is to optimize across the enterprise the often fragmented legacy of processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy.

o Domains of EA

There are four architecture domains that are commonly accepted as subsets of an overall enterprise architecture.

• The Business Architecture defines the business strategy, governance, organization, and key business processes.

• The Data Architecture describes the structure of an organization's logical and physical data assets and data management resources.

• The Application Architecture provides a blueprint for the individual applications to be deployed, their interactions, and their relationships to the core business processes of the organization.

• The Technology Architecture describes the logical software and hardware capabilities that are required to support the deployment of business, data, and application services. This includes IT Infrastructure, middleware, networks, communications, processing, standards, etc.

o Definition of a service in SOA

Service Oriented Architecture (SOA) is a style of IT architecture that delivers agility and Boundaryless Information Flow™. It is deployed on an increasing scale in enterprises today. Source: The Open Group

o Characteristics and benefits of Service-oriented architecture (SOA)

Business process execution language (BPEL) :

Business process service: A service that orchestrates other services according to a business process Implemented. E.g.:

Service registry / Repository: — Critical to the success of initiatives was the use of a UDDI registry. The registry facilitates service and component reuse by providing the architecture with the ability to look up services that exist and reuse them.

Enterprise service bus (ESB): — At the core is an Enterprise Service Bus (ESB) supplying connectivity among services.

Web Services (XML, WSDL, SOAP): — Service provider, who provides service functionality in the form of web services that are published by the Service Broker.

Modularity / loose coupling—The idea of SOA is to create a world of services being loosely coupled which can be flexibly combined to create dynamic business processes, new applications.‖

Implementation independence —Those independent services [...] can be accessed without any knowledge of their underlying implementation details.‖

(Open) standards —Services represent abstract software elements and/or interfaces [...] using widely applied standards.

Service description—create services that are modular, accessible, well-described, implementation-independent, and interoperable‖

Interoperability — For all participants, enhancing interoperability between existing systems was a

key aspect of the SOA effort.‖

Platform independence —The interface is defined in a neutral manner that should be independent of the hardware platform, the operating system, and the programming language in which the service is implemented.‖

Service contract —An SOA is a component model that interrelates the different functional units of an application, called services,' through well-defined interfaces and contracts between these services.‖

Business process choreography —Independent services with well-defined invokable interfaces which can be called in defined sequences to form business processes.‖

Encapsulate business function —Those services are clearly capsulated, and loosely coupled entities, which deliver a defined business functionality.‖

Align IT with business processes —Service-orientation is not only about building IT systems using SOA but also encompasses the transformation of an enterprise through the alignment of business and IT to be efficient and effective.‖

Decouple business from IT — SOA must decouple business applications from technical services and make the enterprise independent of a specific technical implementation or infrastructure.‖

- **IT benefits**

Integration —As shown by the study all respondents agreed to SOA making the integration easier than when using centralized system solutions‖

Reuse —better reuse‖ (Becker et al., 2009, p. 6; Schelp and Aier, 2009, p. 6; Yoon and Carter, 2007,

Scalability —Tony Bishop, vice president and director of product management at Wachovia, pointed out that their IT needed to be flexible, adaptable, and scalable.‖

- **Business benefits**

Business agility —shorter time-to-market‖

B2B integration —We provide empirical evidence from recent data that service-oriented architecture can indeed enhance organizational integration.‖ — Our findings indicate that integrating partners using SOA could prove challenging because of the lack of industry standards and mature tool.‖

Cost reduction 8 of 8 cases, IT cost reduction

Data quality —improved information quality and availability‖

Business/IT alignment —in some cases it appeared to have improved relationship with the business units‖

Straight through processing (STP)—One of the primary sources of strategic value for SOA is its role of enabling technology for application integration.‖

Process monitoring —automation and management of processes‖

Outsourcing —simplified outsourcing‖ (Becker et al., 2009, p. 7) supported 13

o Relationship between business processes and services in SOA

It is based on the design of services – which mirror real-world business activities – comprising the enterprise (or inter-enterprise) business processes.

• Service representation utilizes business descriptions to provide context (i.e., business process, goal, rule, policy, service interface, and service component) and implements services using service orchestration.

• It places unique requirements on the infrastructure – it is recommended that implementations use open standards to realize interoperability and location transparency.

• Implementations are environment-specific – they are constrained or enabled by context and must be described within that context

o Differences between SOA and MSA

• SOA a service may be composed of other services; in MSA we define a service as independent and self- contained, which implies that it cannot be composed of other services.

• Herein lies one of the main differences between the SOA and MSA architectural styles.

• In most part the frame of a micro service will in fact align with that of a service of the SOA architectural style, with the exception of how much of the business process it encapsulates, as many business processes contain many services in order to complete the task.

• MSA is really a subset or special architectural form of SOA. MSA provides an approach to delivering SOA in an effective manner for the right set of business drivers

What is MSA

• There is the advent of cloud computing and the Internet of Things (IoT)

• MSA is conducive to the DevOps paradigm and evolving cloud based architecture

• MSA is a style of architecture that defines and creates systems through the use of small independent and self- contained services that align closely with business activities.

• An individual micro service is a service that is implemented with a single purpose, that is self-contained, and that is independent of other instances and services.

• Micro services are the primary architectural building blocks of an MSA.