A Systems Approach to Service Science Research

Service Science Faculty Workshop

National Tsing Hua University

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Plan for Today's Talk

Motivating the Concept of "Service System"

Making Sense of the Service System Concept

Modeling Approaches for Service Systems

"Point of View" in Service Systems

Bridging the Front Stage and Back Stage in Service System Design

Motivating "Service Systems"

Traditional concepts of service management and design emphasize person to person interactions

This approach focuses on the "touch points" or "encounters" or "moments of truth" where the service is delivered to or experienced by the customer

It de-emphasizes activities or processes that are invisible to the customer

It is inadequate for understanding today's more complex mix of services that include self-service, multichannel services, and intra- and inter- enterprise automated services

The Hotel Service Encounter

What's the Quality of this Service Encounter?

HOTEL RECEPTION EMPLOYEE: Welcome, Dr. Glushko, it is good to see you again. You said you liked room 321, the corner room with the bridge view, so we've reserved it once again for you. And last fall when you were here you had us get some tickets because your home team was playing, and it just happens that they're here again tomorrow night so we got some good seats for you.

CUSTOMER: Thanks.

What's the Quality of this Service Encounter?

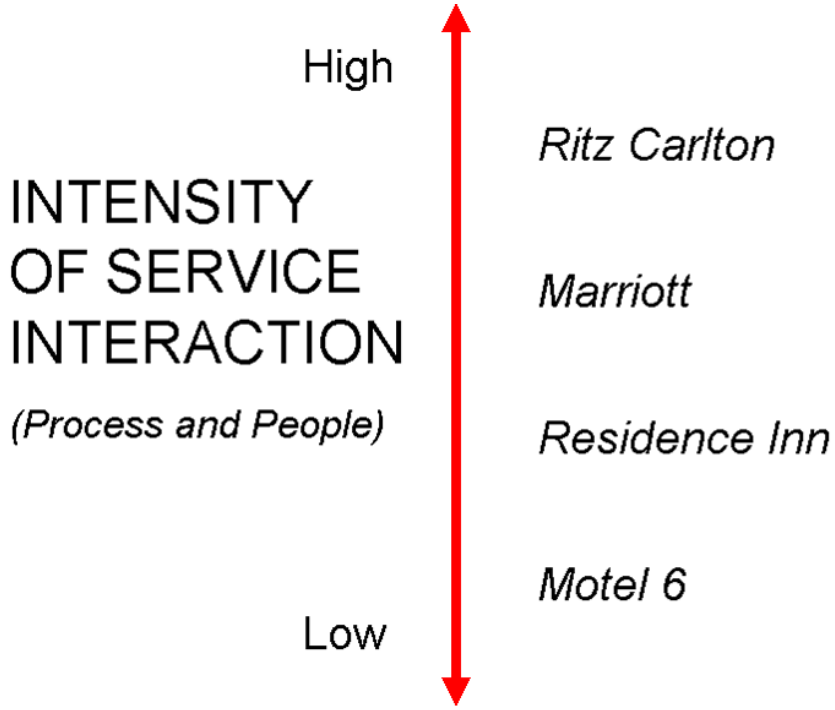
HOTEL RECEPTION EMPLOYEE: Last name?

CUSTOMER: Glushko

HOTEL RECEPTION EMPLOYEE: You're in room 321. Here's your key.

CUSTOMER: Thanks.

Simplistic View of Service Quality



An Intense but Low Quality Encounter

HOTEL RECEPTION EMPLOYEE: Your name, sir?

CUSTOMER: Glushko

HOTEL RECEPTION EMPLOYEE: I'm sorry, sir. We have no reservation under that name, and we're completely booked tonight.

CUSTOMER: That's ridiculous. Here's my web confirmation page.

HOTEL RECEPTION EMPLOYEE: I'm sorry, sir. We have no reservation for you. We are profoundly sorry. Why don't you wait in the lounge while we call one of our partner hotels and get a room for you...

CUSTOMER: This is completely incompetent. I'm tired...

HOTEL RECEPTION EMPLOYEE: I'm sorry, sir. We will pay for your room tonight at our partner hotel or give you a voucher for a free night here on your next stay.

Self-Service Hotel Check-In

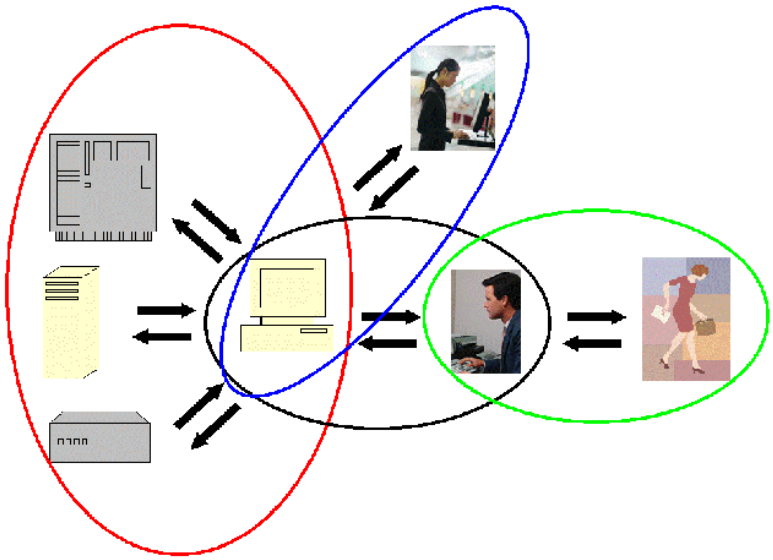
What's the Quality of this Service Encounter?

AUTOMATED CHECK-IN SERVICE: (screen display) Please insert your credit card

CUSTOMER: (Inserts credit card)

AUTOMATED CHECK-IN SERVICE: (issues digital key card) Room 321. Here's your key.

Four Types of "Encounters" in Hotel Check-In



From "Service" to "Service Systems"

There may be a “moment of truth” when the quality of the service experience becomes apparent, but that quality is enabled or constrained by many other encounters

...even though many of these encounters don't involve or are invisible to the customer, and some of them are even invisible to the frontline service provider

Examples like "hotel check in" demonstrate that service quality can best be understood with an "end-to-end" view of how a service is defined and delivered

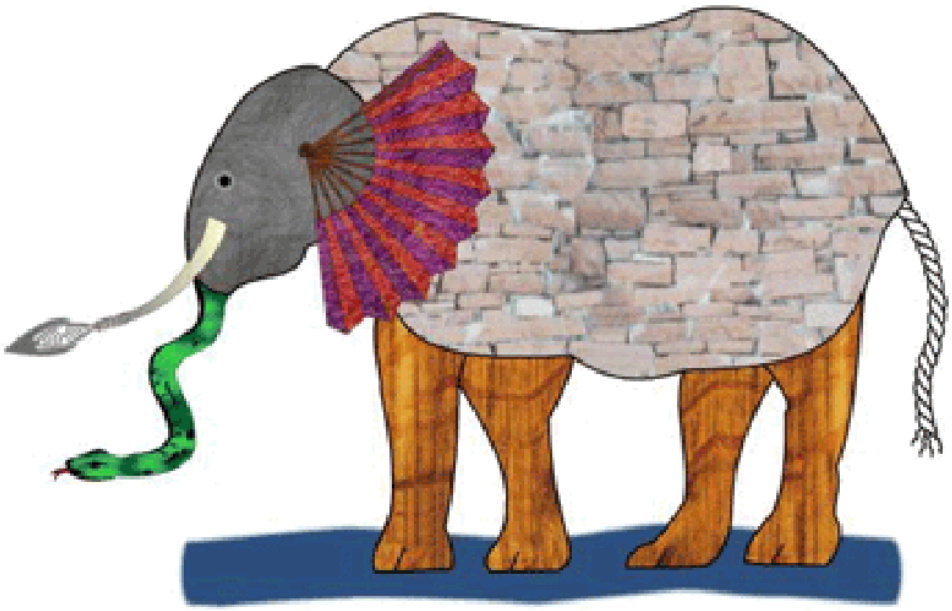
Making Sense of the "Service System" Concept

What is the vocabulary of concepts or characteristics for describing service systems?

What representational formalisms or notations are needed?

How do these enable analysis, optimization, and innovation in service systems?

Definitions of "Service System" Are Like...



IBM's "Service System" Definition (Spohrer, Maglio, et al)

A value co-production configuration of people, technology, internal and external service systems

...connected to other systems by value propositions

...and shared information

IBM's Examples of Service Systems

- People
- Families
- Businesses
- Cities
- Nations
- Hospitals
- Universities
- Call Centers
- Data Centers
- Professional Associations
- Disciplinary Associations
- Government Agencies
- PACs
- NGOs
- Non-Profits
- Foundations
- On-line Communities, MMORPGs, Virtual Worlds

Unanswered Questions in the IBM Definition

If service systems can be composed from other service systems, what are the primitive components of service systems?

What rules or patterns govern the composition of service systems?

Is the "shared information" explicitly specified? What rules or patterns govern specifications?

Service System Components

Fundamental to the service system concept is the assumption that the differences between types of services and "service encounter types" are less important than what they have in common

But this begs some questions: How do we classify types of services and service encounters?

Contrasts Among the "Encounter Types"

A service provider or service consumer can be a person

Or a computational or automated process

The service provider and consumer can have pre-existing relationships, or ad hoc ones

The service can be highly predictable, or highly variable

Service variability can be desirable or undesirable

Commonalities Among the "Encounter Types"

There are service producers and service consumers

Each service provider has an interface through which the service consumer interacts to request or obtain the service

Value or quality is created/co-created by the interactions and interchanges between the provider and consumer

Why Emphasize the Commonalities?

It makes it much easier to consider alternative service system designs like:

-- Replacing or augmenting a person-to-person service with self-service

-- Substituting one service provider for another in the same role

-- Eliminating a person-to-person interaction with automation

-- Delivering similar or complementary services through multiple channels

Models of Service Systems

Because of the great range and diversity of domains we want to describe as service systems, no single modeling approach or descriptive formalism is adequate

The simplest descriptions involve qualitative properties of connectivity and intensity

Other approaches describe the relationships and interactions among the components in the service system in more formal and quantitative ways

Modeling approaches also differ in whether they describe static or dynamic aspects of the service system

Modeling Approaches for Service Systems

Value chain or structural models

Models with richer "forms of relationships," including functional ones that enable simulation and optimization

Models for describing classes of service systems

Information flow and exchange models

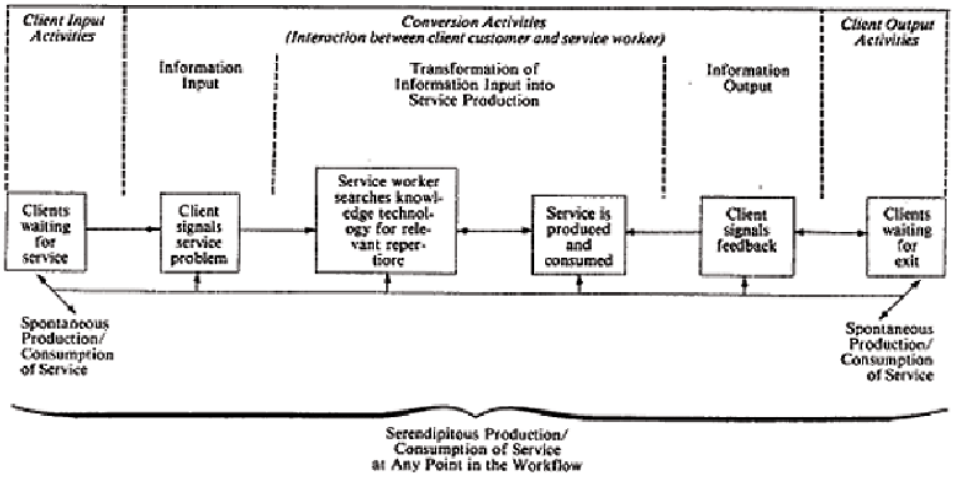
Value Chain / Structural Models of Service Systems

These models contrast and extend the concepts of manufacturing systems and supply chains to service design and delivery

A classic paper by Mills and Moberg -- "Perspectives on Technology of Service Operations" (1982) -- introduced the concept of the "service production system" that foreshadows today's definitions for "service system"

Service systems fall on a structure continuum from "Full" to "Restricted" service based on the number and nature of the component services

Mills & Moberg's
Service Production System



Principles for Service Production Systems

Services are co-produced by the "service worker" and the customer

The service worker is a "mini-factory" because he both helps produce the output and is simultaneously involved in selling it

The interactions between the service worker and the customer are "transactions" in which they exchange information and commitment

The information provided by the customer "constitutes the raw material" to be transformed by the service worker

Because services can't be stored, the input and output inventories in a manufacturing system become depositories or queues of customers waiting to enter and exit the service system

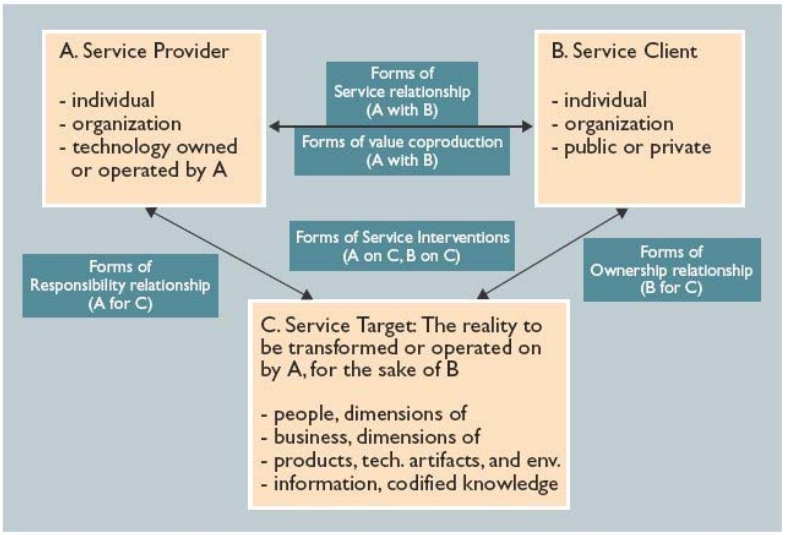
Refining the Value Chain Model

The simple "chain" between service components fails to capture the idea that not all of the relationships between connected providers and consumers are the same

We need more extensive vocabulary for describing the relationships

Put another way, we need "typed" links or relationships

Service as a System of Relationships



"Forms of Relationship"

Is the relationship between Provider A and Client B:

-- Ad hoc or contractual

-- Static or dynamic

-- Transactional or relational

-- Symmetric or asymmetric

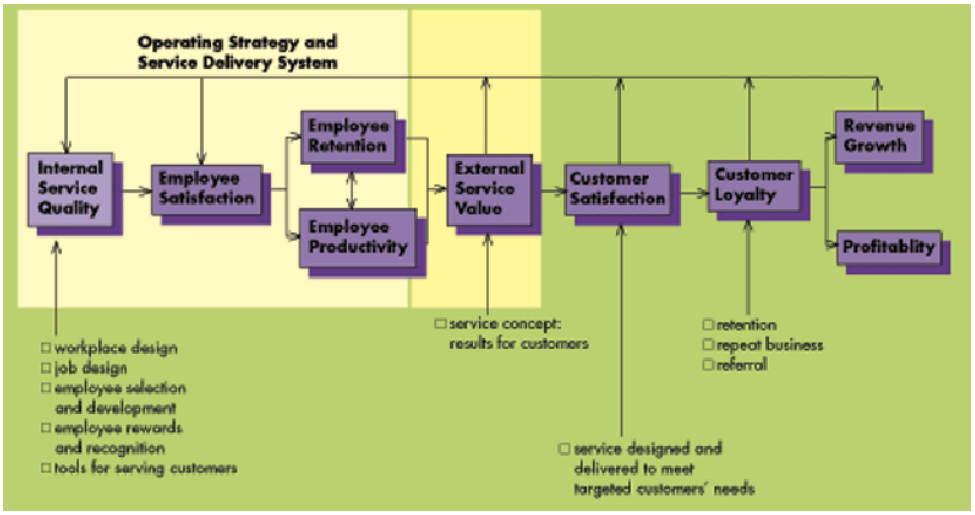
-- Governed by a "service level agreement"

-- Governed by some broader authority

-- Functionally describable

The Service-Profit Chain

"Putting the Service-Profit Chain to Work," James Heskett, Thomas Jones, Gary Loveman, Earl Sasser, and Leonard Schlesinger, Harvard Business Review (March 1994)



Service System Simulations

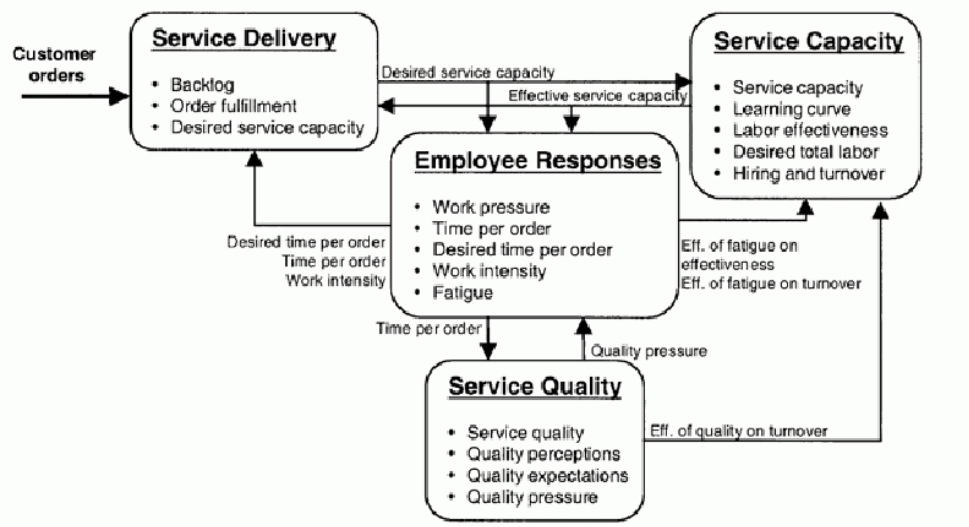
"Cutting corners and working overtime: Quality erosion in the service industry," R. Oliva and J. D. Sterman, Management Science (2001)

Heskett and others have studied many factors and relationships that affect service quality, but Oliva and Sterman built a dynamic model that simulates their simultaneous interaction

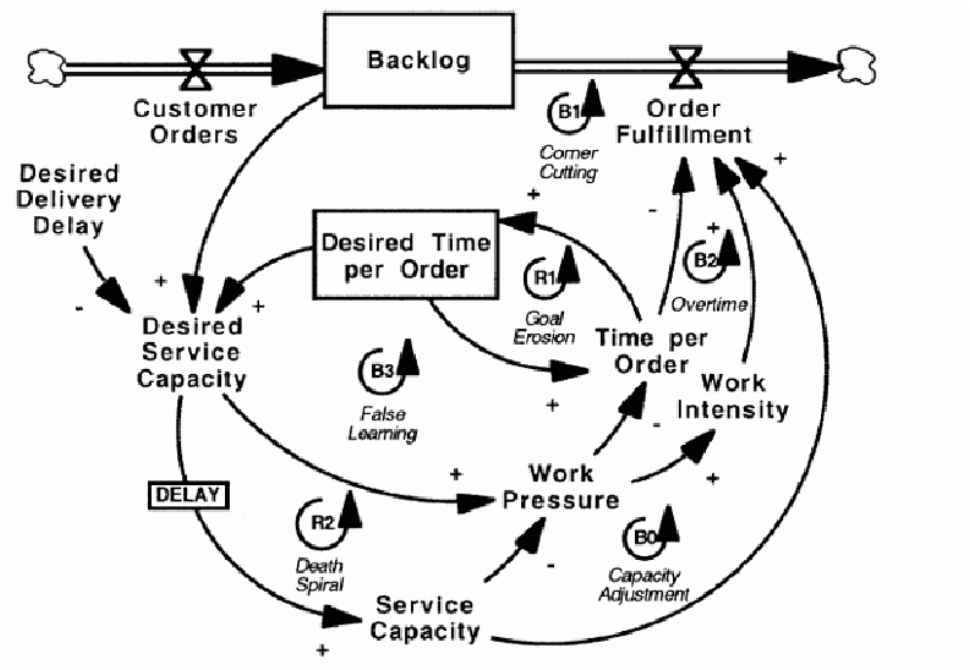
The parameters or values or "stocks" in the service system have positive or negative feedback as the system operates

This model fits observed data about the erosion of service quality and thus can explain the mechanisms that cause it

Oliva & Sterman's Service System Model



Feedback Structure in the Model



Simulation to Estimate Economic Value of a Service System

Estimating value in service systems: A case study of a repair service system

N. S. Caswell
C. Nikolaou
J. Sairamesh
M. Bitsaki
G. D. Koutras
G. Iacovidis

The economic structure of service systems has steadily increased in complexity in recent years. This is due not only to specialization in direct material production and services offered, but also in the ownership and management of resources, the role of intangible assets such as process knowledge, and the context in which goods and services are consumed. This increase in complexity represents both a challenge and an opportunity in a service-oriented economy. In this paper, we offer a descriptive structure for the analysis of this complexity which combines graph theory and network flows with economic tools. Our analysis is based on publicly observable information and can be used to analyze service systems in terms of the value they deliver, how they

Value Creation in Auto Repair Service System

Models of Classes of Service Systems

Some modeling approaches attempt to describe a class of service systems rather than a particular one

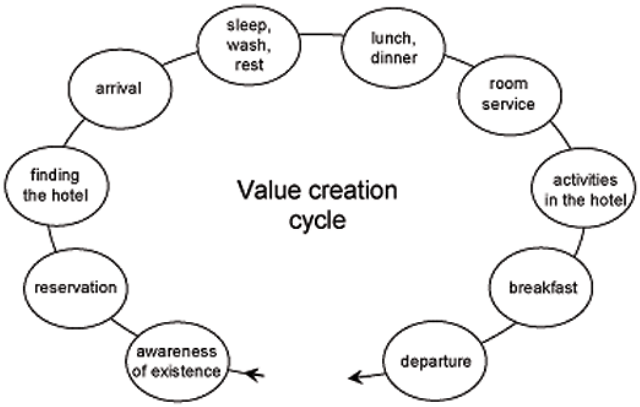
A "generic value chain" describes the potential or conventional set of components in a service system in a domain

Specific instances of service systems in the domain are then modeled with respect to the generic model

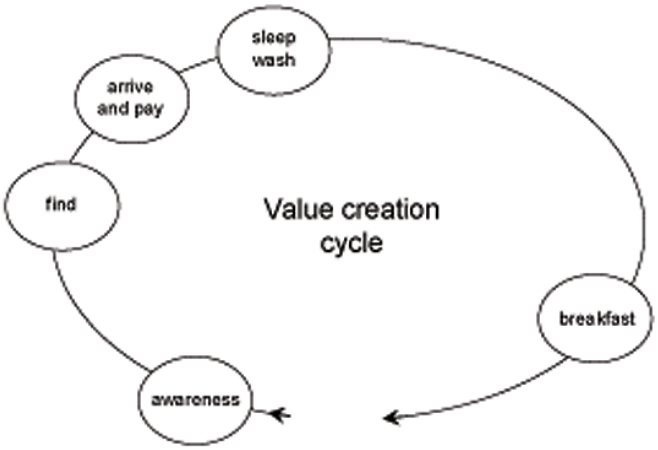
These differ in how many of the components are incorporated, or in the intensity of interaction and customization with the customer at each component service

This approach lets us model design choices that reflect customer or provider segmentation

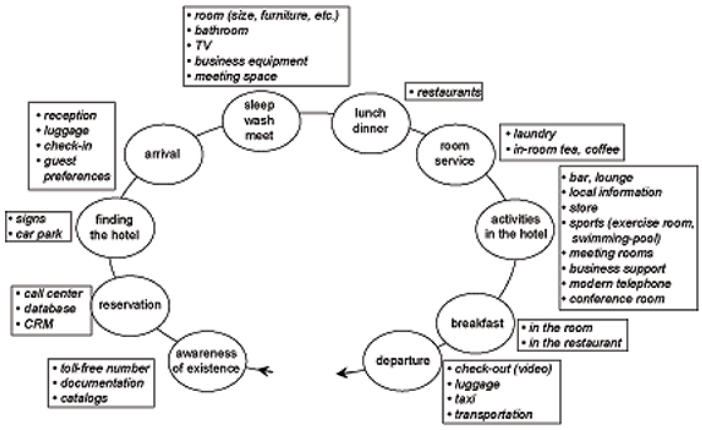
Generic Service System in the Hotel Business



Value Creation Cycle - Budget Service



Value Creation Cycle - Full Service



The Front Stage / Back Stage Distinction

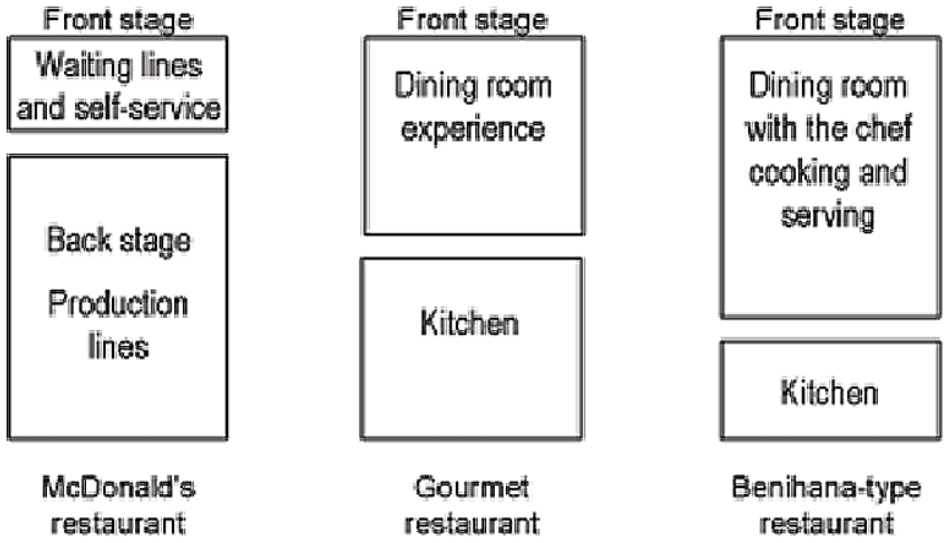
Another structural concept that enables a service system description to apply to a class of service system models in the distinction between the FRONT STAGE and BACK STAGE

The FRONT STAGE represents the interaction the customer or service consumer has with the service system or component

The BACK STAGE is the part of the service value chain that the service consumer can't see

The boundary between the two stages is the LINE OF VISIBILITY

Different "Lines of Visibility" in Restaurants



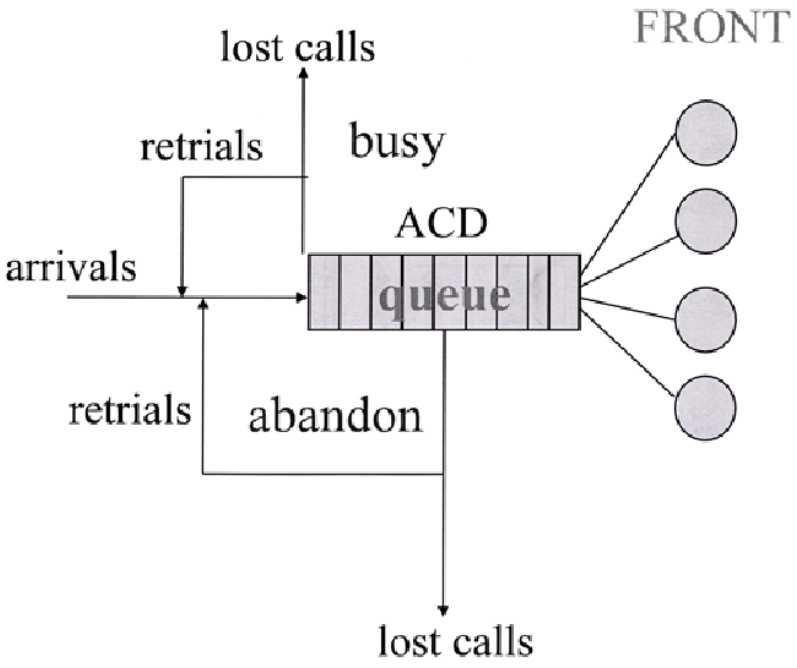
Queuing Theory as a Generic Model for Service Systems

Queuing theory provides a generic framework for describing service systems where people wait to be served

The parameters of these models – arrival rates, waiting time, number of service providers, etc. – explicitly represent the quality of the "customer service" experience

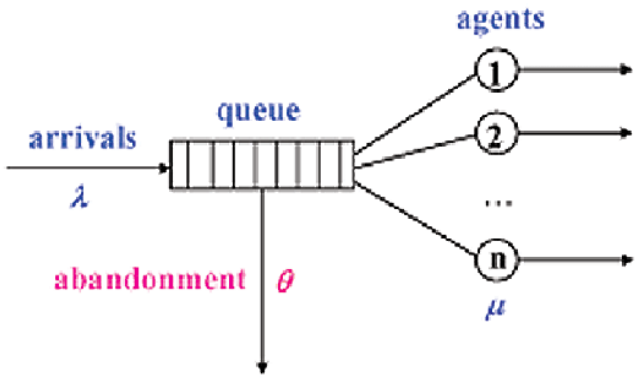
The formal rigor of queuing models has created a rich body of knowledge about different queue structures and who-gets-served-when disciplines that enable designers to maintain a desired quality of service in the service system.

The Call Center Service System Model



Queuing Model of the Call Center

Simple Model: Palm/Erlang-A

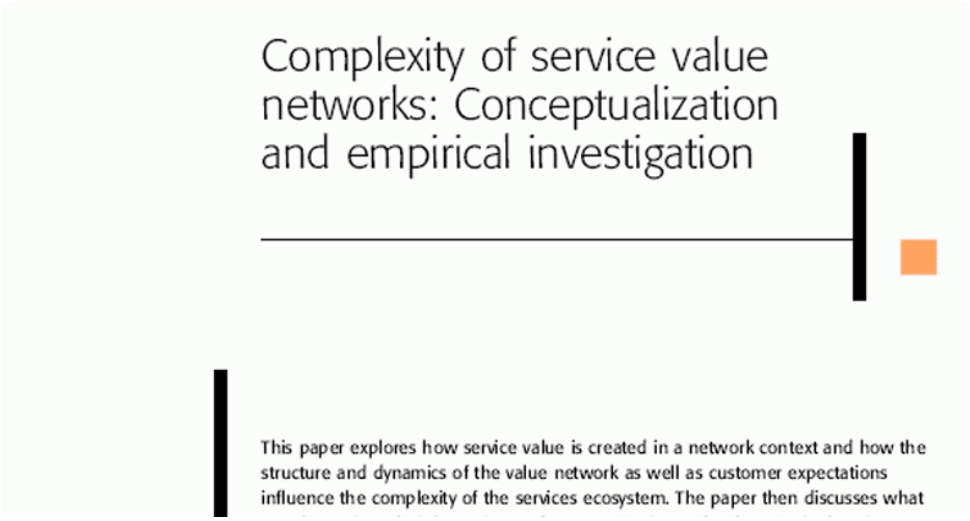


Erlang-A Parameters (Math. Assumptions):

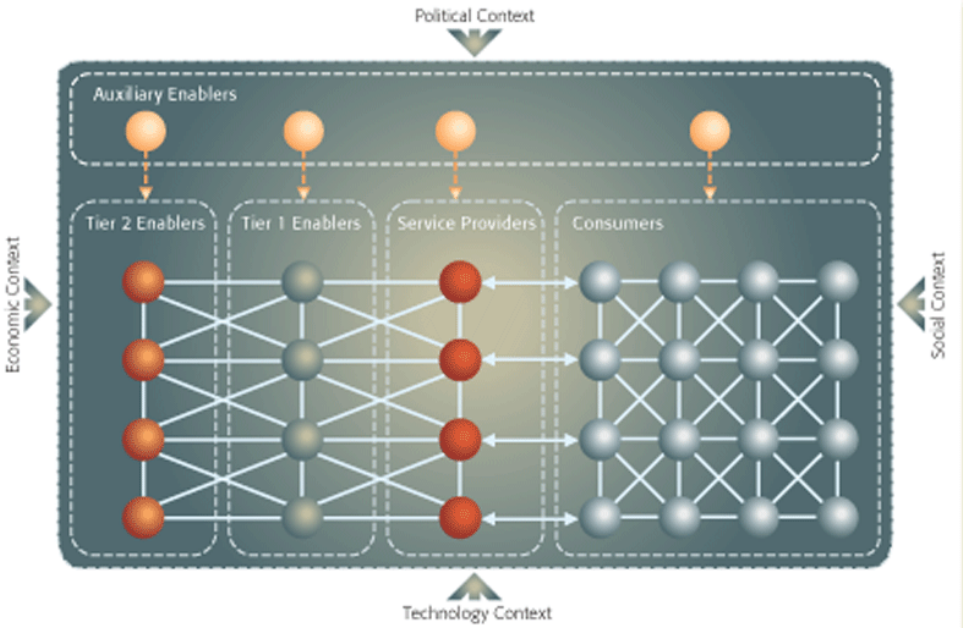
- λ – **Arrival** rate (Poisson)
- μ – **Service** rate (Exponential)
- θ – **Impatience** rate (Exponential)
- n – Number of **Service-Agents**.

Modeling Structural Complexity in Service Systems

Basole & Rouse combine many concepts about service value chains, service system structure, and the front/back stage distinction



Generic "Ecosystem" Model of a Service System



Calculating Value in the Service System

We define the state of a value network as the set of nodes that participate in any given consumer transaction. We then define the complexity C of a value network to be

$$C = \sum_{i=1}^{T} pt_i \sum_{j=1}^{N} -(pn_j|pt_i)\log(pn_j|pt_i),$$

where T is the number of types of transactions in the network, N is the number of nodes in the network, pt_i is the probability of a type i transaction, $pn_j \mid pt_i$ is the conditional probability that the j^{th} node is involved given the transaction is type i, and the logarithm is to the base 2.

Information Flow and Exchange Models of Service Systems

For many services, especially those with a significant technology / information component, the information exchanged through the service interface is the primary determinant of the value received or experienced by or co-created with the service consumer

This treats the service system as a network of provider-consumer relationships and the flow of information through them

The choreography with which the provider and consumer exchange information to initiate and deliver the component services and operate the service system as a whole can often be described using design patterns

Information Exchange Patterns

Businesses have long dealt with each other by exchanging documents

Concepts like "supply chains" and "distribution channels" are metaphors for the coordinated flow of information and materials/products

The processes are "glued together" by overlapping information components in the documents

The "Stack" of Information Exchange Patterns

Business model or organizational
patterns: marketplace, auction, supply chain, build to order, drop shipment, vendor managed inventory, etc.

Process patterns: procurement, payment, shipment, reconciliation, etc.

Document patterns: catalog, purchase order, invoice, etc

Component
patterns for the pieces of information that are the semantic building blocks for documents: party, item, quantity, date, address, etc.

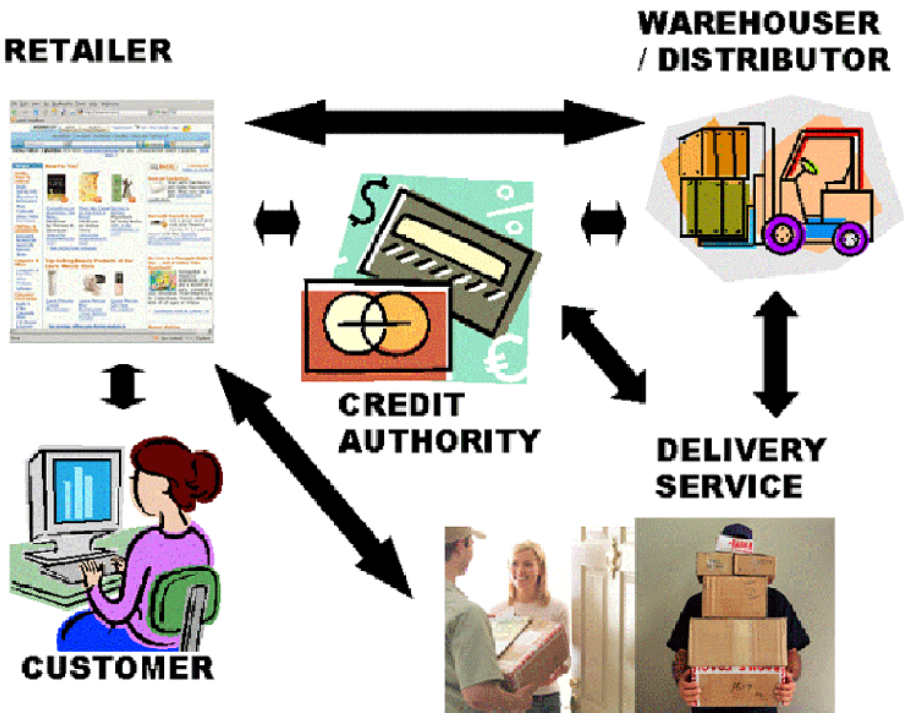
Design Choices for Service Systems Dominated by Information Exchange

What information is exchanged?

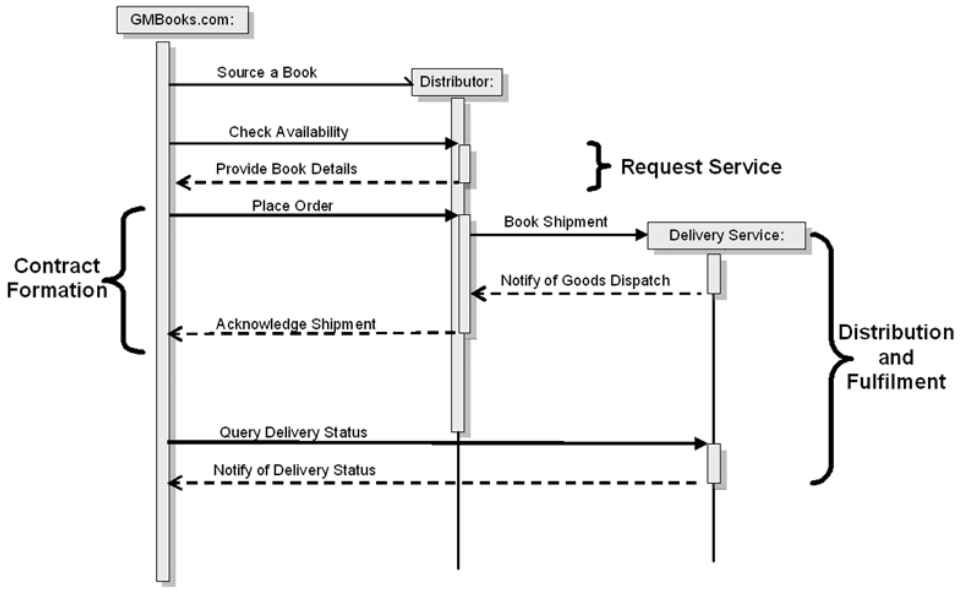
Which entities in the supply chain are able to exchange information?

What is the frequency of this information exchange?

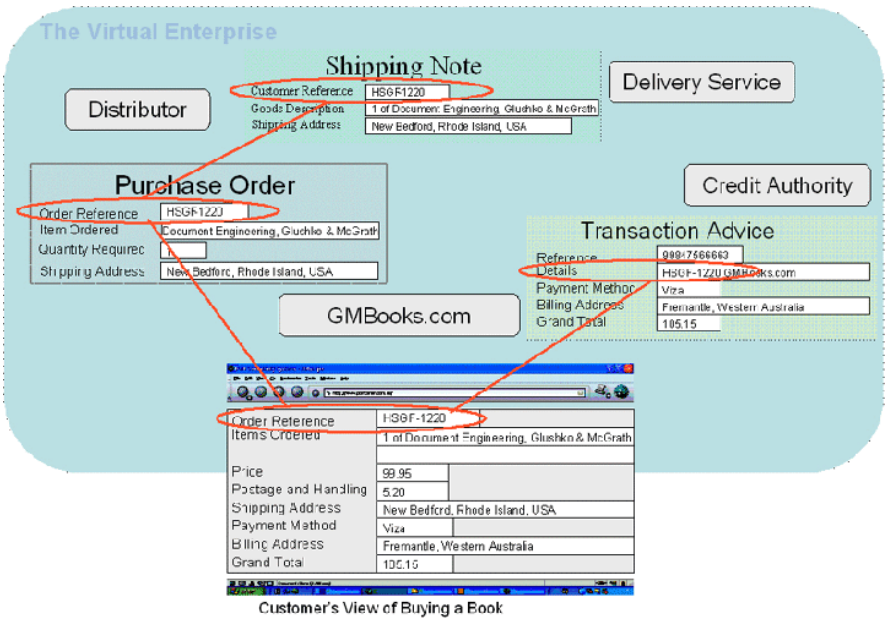
"Drop Shipment" Pattern



The Drop Shipment Choreography



Overlapping Information Models in Drop Shipment



Customer's View of Buying a Book

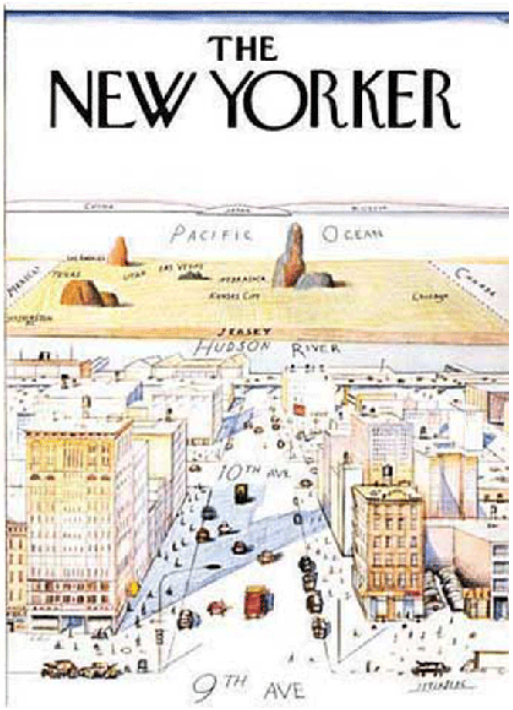
"Point of View" in Service Systems

All of the modeling approaches we've discussed define some component of the service system as the ultimate consumer or customer

This often appears to be the end of a value chain or information flow in the model

But this point of view or perspective is often arbitrary, and it is possible to take a different POV in the same service system

A New York Point of View



Front Stage and Back Stage Inversion: Cooking School, or Restaurant?

KITCHEN

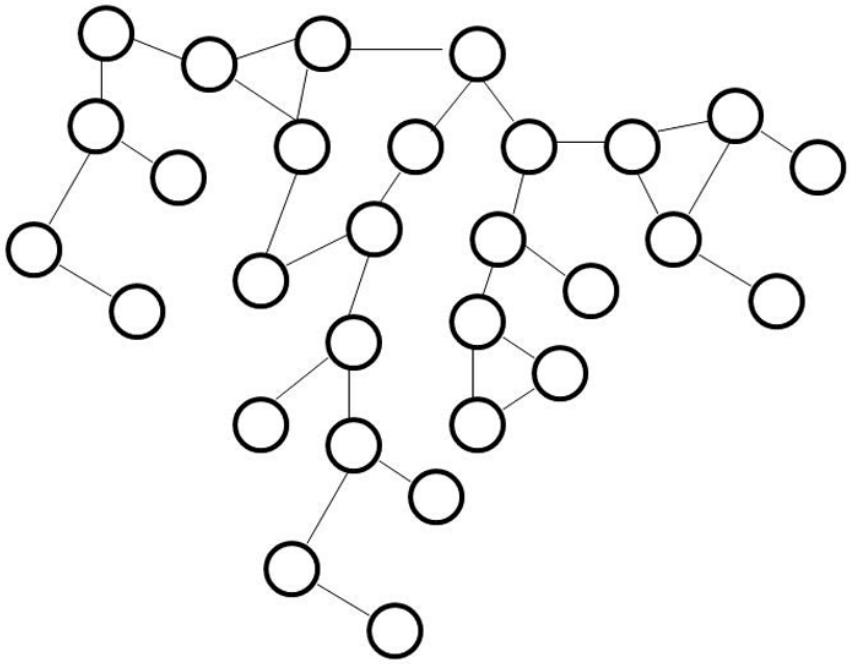
Front Stage for the Cooks
Back Stage for the Customers

DINING ROOM

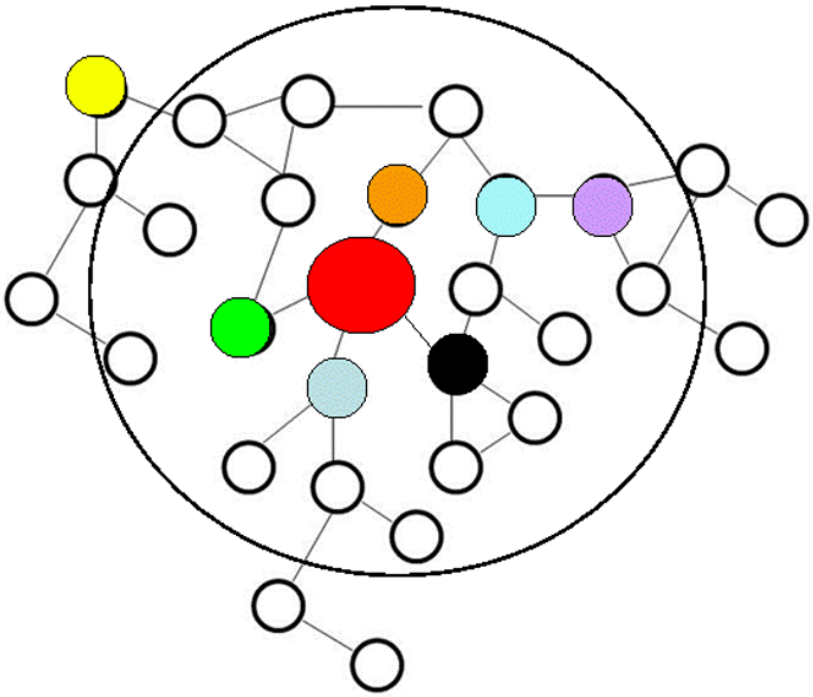
Front Stage for the Customers
Back Stage for the Cooks

Who's the Service "Consumer" in a Teaching Hospital?

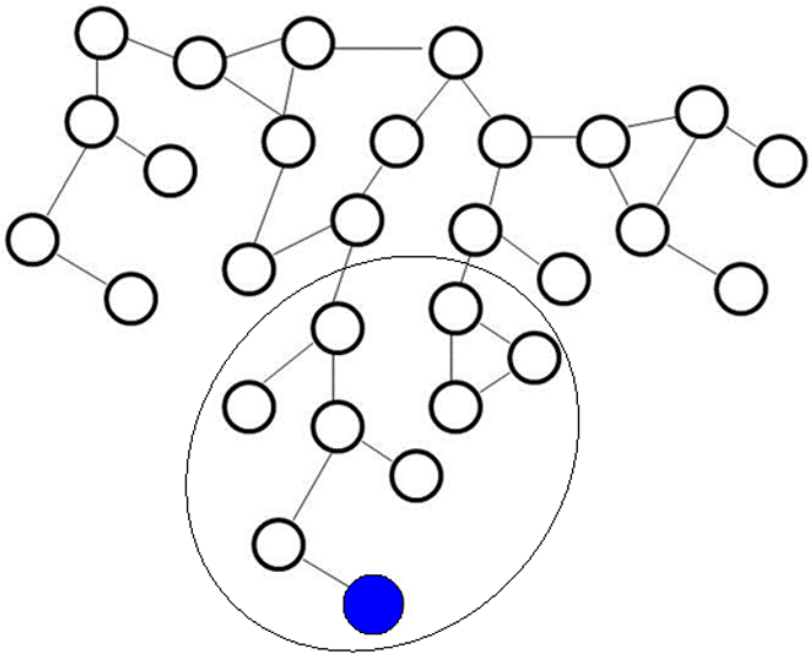
Visualizing a Service System



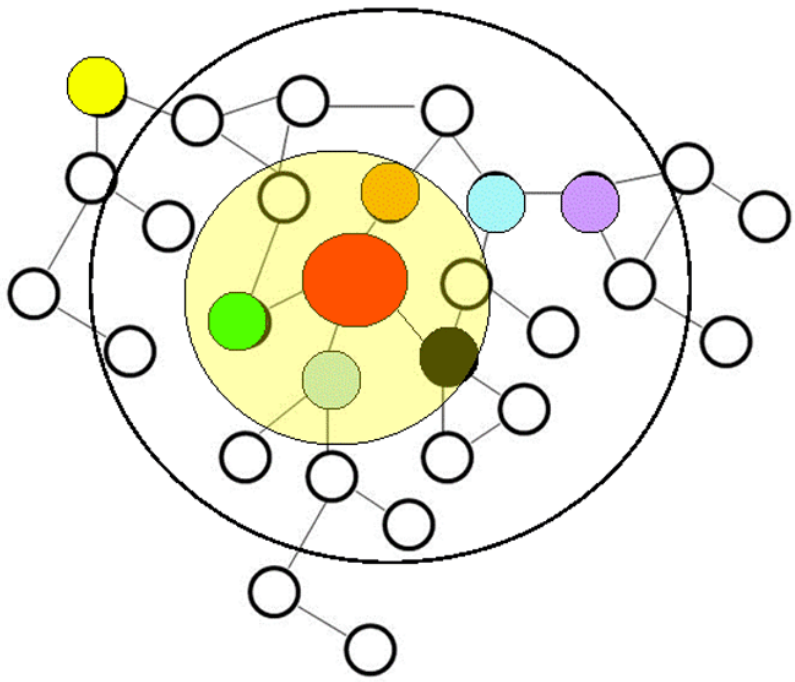
A Point of View in a Service System



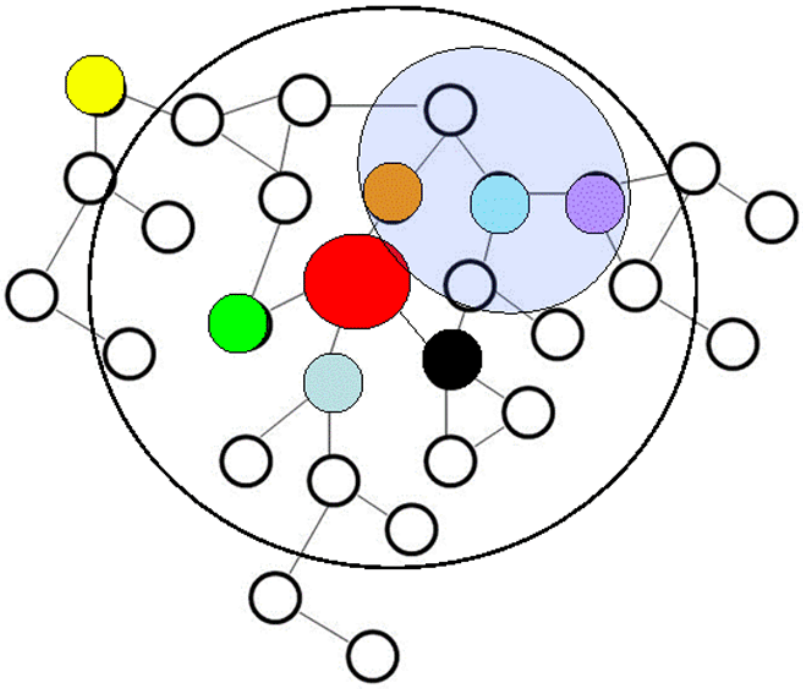
Different POV in a Service System



Visualizing the Front and Back Stages



Front and Back Stages with Different POV



Bridging the Front Stage and Back Stage in Service System Design

Robert Glushko & Lindsay Tabas, Proceedings of the 41st Hawaii International Conference on System Sciences, January 2008

Front stage / back stage is not an architectural distinction

It is just a point of view and bounded scope in a service system

It embodies some design biases that cause problems in service system design

But if we design the service system as a whole rather than as front stage + back stage, we can overcome these problems

Summary

"Service System" is an intuitively sensible and appealing idea, but we need much more research to make it useful

We have developed some concepts and characteristics for describing service systems

We have employed a variety of representational formalisms or notations

We are using them to analyze, optimize, and innovate in service systems

But we need new approaches for designing service systems that bridge the traditional disciplinary approaches for front and back stage design