

Bridging the “Front Stage” and “Back Stage” in Service System Design

Robert J. Glushko

Lindsay Tabas

University of California, Berkeley
School of Information

ISchool Report 2007-013

15 June 2007

Abstract

Service management and design has thus far primarily focused on the interactions between employees and customers. This perspective holds that the quality of the “service experience” is determined by the customer during this final “service encounter” that takes place in the “front stage.” This emphasis discounts the contribution of the activities in the “back stage” of the service value chain where materials or information needed by the front stage are processed.

However, the vast increase in web-driven consumer self-service applications and other automated services requires new thinking about service design and service quality. It is essential to consider the entire network of services that comprise the back and front stages as complementary parts of a “service system.” We need new concepts and methods in service design that recognize how back stage information and processes can improve the front stage experience. This paper envisions a methodology for designing service systems that synthesizes (front-stage-oriented) user-centered design techniques with (back-stage) methods for designing information-intensive applications.

Contents

1. Traditional Concepts in Service Design and Service Quality.....	2
2. Problems with the Traditional Concepts Raised by Automated Services.....	3
3. The “Front Stage” and “Back Stage”.....	4
4. The Challenge of Bridging the Front and Back Stages.....	6
5. The Front and Back Stages as Components of Service Systems.....	7
6. Preliminary Steps Toward a Methodology for Service System Design.....	8
7. Summary.....	11
8. References.....	11

1. Traditional Concepts in Service Design and Service Quality

The services sector was initially considered as a tertiary and residual economic category after agriculture and manufacturing. Many classification systems for services contained long lists of categories in which one person provides a service to another. As a by-product of this approach, we use words like “experience,” “performance,” “empathy,” and “dramaturgy” to describe person to person service interactions.

1.1. Service Quality

For person to person services, a central idea is that the quality of the service is determined in the service encounter at the “moment of truth” when the service is delivered or “co-produced.”

- *"In most services, quality occurs during service delivery, usually in an interaction between the customer and contact personnel of the service firm" [1].*
- *"Service encounters are critical moments of truth in which customers often develop indelible impressions of a firm... From the customer's point of view, these encounters ARE the service" [2].*

This framework makes service quality highly subjective because it is measured from the perspective of each service consumer. Service quality is typically defined as the difference between the level or nature of service that the customer expected and the level or nature that the customer perceives [1].

1.2. Service Intensity

A subjective perspective on service quality implies that many of the key design decisions relate to the intensity of the service, which is conventionally defined in terms of the number of actions initiated by the service provider or the duration of the service encounter. Intensity strongly influences how usable, enjoyable, and responsive the service appears to the service consumer.

Intensity is a useful though somewhat coarse measure of service design. It can also be employed as an assessment of the complete set of services offered by some service provider like a hotel: Budget hotels provide a lower level of service intensity than luxury ones because they offer fewer services, and each of the services is likely to be of lower intensity than the comparable service offered by luxury hotels.

1.3. Service Variability

Most consumers of person-to-person services expect some flexibility or customization because limited choices can give a service a “take it or leave it” character that customers perceive as a low quality experience. Therefore, a traditional concept in service design is to “empower” the service provider/employee to adapt the service or provide additional services to meet contingencies, unexpected events, or just so that the customer can “have it his way” [3]. This view treats variability in service delivery as inevitable and perhaps even desirable.

1.4. Service Encounters that Illustrate these Traditional Concepts

We can illustrate these concepts with two versions of the “checking into a hotel” experience:

- **Hotel Check-In Scenario 1**

RECEPTION EMPLOYEE: *Last name?*

CUSTOMER: *Johnson.*

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

CUSTOMER: *Thanks.*

- **Hotel Check-In Scenario 2**

RECEPTION EMPLOYEE: *Welcome, Dr. Johnson, it is good to see you again. We know you like room 321, the corner room with the bridge view, so we've reserved it for you. And last fall when you were here you had us get some baseball game tickets because the Red Sox were in town, and it just happens that they're playing again tomorrow night so we got some good seats for you.*

CUSTOMER: *Thanks.*

In Scenario #1, which might take place at a budget hotel chain, the front desk clerk at the hotel doesn't recognize a returning customer, shows little empathy toward him, and delivers a low-intensity experience with no variability that the customer probably perceives as low quality. In contrast, in Scenario #2, which might take place at a luxury hotel, the front desk clerk creates a much richer and customized service experience that demonstrates knowledge about and concern for the customer. The customer probably perceives this as a high-quality service experience.

Examples like these with hotel check-in suggest that the design dimension of service intensity has a simple monotonic relationship to service quality – namely, that more intense services (like extensively personalized ones) are of higher quality.

2. Problems with the Traditional Concepts Raised by Automated Services

These two contrasting hotel check-in scenarios seem to validate the traditional notions of how intensity, variability, and a focus on the service encounter contribute to quality in person-to-person services. But this traditional view doesn't fit well when person-to-person services are replaced or complemented by automated services. This is easy to see in two more examples of the “checking into a hotel” experience.

- **Hotel Check-In Scenario 3**

RECEPTION EMPLOYEE: *Your name, sir?*

CUSTOMER: *Johnson*

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 online booking confirmation page.*

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...*

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*

- **Hotel Check-In Scenario 4**

AUTOMATED CHECK-IN SERVICE: *Please insert your credit card*

CUSTOMER: *(Inserts credit card)*

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

Scenario #3 might have taken place in the same luxury hotel as scenario #2. The service intensity is the same or greater as that in scenario #2, and the hotel reception employee is empowered and acting in a highly empathetic and responsive manner to make the customer's experience a good one. But the customer will perceive the quality of the service encounter to be poor, much lower than even that in scenario #1.

Scenario #4 is as a “self-service” check-in application where the former encounter with the hotel reception employee has been replaced with an automated system or kiosk. The service intensity, if measured in terms of the number of steps and information exchanges, is nearly identical to that of scenario #1. But most customers would rate the quality of the service encounter in scenario #4 to be significantly higher than that in scenario #1 because they expect less of a machine than of a person.

2.1. More Intensity isn't Necessarily Better

The successful deployment of self-service applications like the automated check-in service in Scenario #4, bank ATMs, and millions of web sites demonstrate that people sometimes don't want to deal with a person to obtain a service, or they desire service at times and in locations when it wouldn't be economical for a person to provide it. But in most self-service applications, intensity according to the traditional measures of the number of interactions or duration is lower than for person-to-person services. The notion that intensity per se determines quality is too simplistic, and we need to revise its definition so that it applies to self-service applications.

2.2. Predictable Service Outcomes are Preferred to Variable Ones of Higher Quality

If intensity alone determined quality, no rational person would prefer self-service. But, if the perceived quality of service reflects the extent to which the service encounter meets expectations, then some customers must prefer the predictable experience in a self-service encounter. This preference may indicate that while there is potential for a higher quality of service in a person-to-person encounter, the higher variability and potential for a low quality one is purposefully avoided.

This somewhat counterintuitive result calls into question the traditional view that variability in the delivery of service is inevitable and desirable. Instead, we are reminded of the mantra from "Six Sigma" quality programs that "Variability is the Enemy" [4].

Furthermore, studies suggest that deviations from expected quality in a service encounter have asymmetric effects on customer perceptions [5]. A bad experience negatively affects longer-term quality measures like intention to return and likelihood of communicating positively about the service. Customers might need as many as twelve positive experiences to compensate for the effects of one bad experience, and they might not be willing to give the firm the twelve chances.

2.3 Multichannel Services Change the Calculation of Service Quality

Self-service applications like the automated hotel check-in in scenario #4 often complement or supplement rather than replace a person-to-person service. These "multichannel" services have both person-to-person contact and self-service or "virtual" channels [6].

Recent studies on quality for multichannel services confirms that customer expectations for the virtual channel are often different than for the person-to-person (or "physical") channel. Furthermore, customers are influenced by the extent of integration and consistency between the two channels. These factors are becoming even more important because functions are increasingly being copied, reallocated, or adapted between the virtual and physical channels; consider how books can be "browsed" in an online bookstore and how physical bookstores now commonly enable their customers to search online catalogs [7].

3. The "Front Stage" and "Back Stage"

We've now noted some inconsistencies about fundamental concepts in service design like quality, intensity, and variability. We can begin to reconcile them if we introduce a distinction between the "front stage" and "back stage" of service delivery.

A focus on the service encounter implies a sharp distinction between the interactions between the customer and provider that are part of the service encounter and other activities that precede it to make it possible. The former comprise the "front stage" and the latter the "back stage," which are separated by the "line of visibility," so-called because, by definition, any activities or services that are invisible to the customer are behind the line [8].

This framework makes a key decision in service design the placement of the line of visibility in the chain of activities that process the materials or information needed in the service encounter. The classic illustration of this idea is in the design of restaurants; fast food outlets, gourmet restaurants, and “entertainment” establishment like Benihana where meals are prepared at the customer’s table can be contrasted in terms of the line of visibility that separates food preparation and delivery [8]. Indeed, Benihana advertises that it provides not just food but “an experience at every table,” highlighting the theme that it has moved back the line of visibility to enlarge the front stage as much as possible.

3.1. The Front and Back Stages of Hotel Check-In

When we first looked at the four scenarios of checking into a hotel, we did so with a focus on the service encounter taking place in the front stage. If we revisit each scenario with the front/back stage distinction in mind, we can see that the customer experience is substantially enabled by back stage activities and information.

Scenario #1: After the customer provides his last name, we can infer that the reception employee looks up the customer’s name in a back-stage reservation system or on a check-in list extracted from it that indicates the room assigned to the customer.

Scenario #2: At first glance we might have attributed this intense and highly customized check-in experience to the excellent memory of an empowered employee who wants to please the customer. But it is unlikely that this particular employee was on duty when the customer checked months before when the customer praised room 321 or asked about baseball tickets. Instead, the reception employee is more likely retrieving institutional knowledge about customer room and entertainment preferences. At hotels that pride themselves for high quality service, employees are trained to record and retrieve this kind of information so that they can enhance customer experience in front stage encounters. But the information is managed in back stage applications, and if it isn’t there, the front stage employee is less empowered.

Scenario #3: Here it is obvious that despite the intense efforts of the reception employee in the front stage, the negative quality of this service encounter is clearly being determined by the failure of a back stage process. The customer had perceived his self-service hotel reservation experience to be successful – when his interaction was in the online booking service’s front stage – but the reservation was not successfully transmitted from their back stage to the hotel’s back stage.

Scenario #4: Some aspects of the customer’s quality perception in the check-in experience are based on front stage characteristics like the usability, aesthetics, or responsiveness of the check-in application. But as we see in comparing scenario #1 to scenario #3, without an effective back stage reservation system quality would be poor. And perhaps the assignment of room 321, the customer’s preferred room, is a result of effective use of the back stage knowledge management system we inferred in scenario #2.

3.2. Refining Our Notions of Intensity and Variability

The front stage / back stage distinction helps to resolve some of the apparent inconsistency in the concepts of service intensity and variability. Intensity is not an intrinsic property of how some type of service is provided. Instead, we should treat it as a design parameter whose value reflects decisions about whether some component activity in a service value chain should be exposed in the front stage or hidden in the back stage. Self-service and full service experiences are endpoints on a design continuum [9], and as each of us knows from our own experience with hotel check-in and restaurants, a person might prefer low intensity self-service sometimes and high intensity full service at other times [10].

Likewise, the front stage / back stage distinction reconciles the conflicting views about the desirability or inevitability of variability in service delivery. Variability in the front stage often arises when an empowered employee improvises or innovates to satisfy a customer, as when a hotel reception employee offers a free upgrade to a higher quality room than the customer reserved. This kind of opportunistic variability that improves a service experience is fundamentally different from outcome variability caused by a failure in the back stage. The former is almost always desirable, while the latter – like the missing room reservation in scenario #3 -- is always undesirable because when it propagates into the front stage there is little even the most empowered employee can do to remedy it.

Finally, there is often an inverse correlation between the potential for intensity and variability in the front stage and the extent to which variability is eliminated in the back stage through standardization or process controls. This tradeoff is embodied in our restaurant example. Moving food preparation activities to the back stage results in production efficiencies and economies of scale in fast food restaurants, but simplifies or constrains what can be offered in the front stage services.

4. The Challenge of Bridging the Front and Back Stages

Revisiting the four hotel check-in scenarios with the complementary perspectives of the front and back stages in mind gave us insights that we missed with the narrower approach of focusing on the front stage encounter. This suggests that service designers should adopt a more comprehensive approach that considers the relationships and tradeoffs between the front and back stages from the outset. But this is easier said than done, because we've observed that service designers tend to adopt either a front stage or back stage mindset.

4.1. The Front Stage Mindset

Service designers with a "front stage mindset" strive to create service experiences that people find enjoyable, unique, and responsive to their needs and preferences. Front stage designers use techniques and tools from the disciplines of human-computer interaction, anthropology, and sociology such as ethnographic research and the user-centered design approach to specify the desired experience for the service customer. They capture and communicate their service designs using modeling artifacts that include personas, scenarios, service blueprints, and interactive prototypes.

4.2. The Back Stage Mindset

Service designers with a "back stage mindset" follow different goals and techniques. They strive for efficiency, robustness, scalability, and standardization. Even though some back stage activities are carried out by people, and others carried out by automated processes or applications, the back stage mindset tends to treat people as abstract actors.

So instead of modeling the preferences and interactions of people, back stage designers identify and analyze information requirements, information flows and dependencies, and feedback loops. They use concepts and techniques from information architecture, document engineering, data and process modeling, industrial engineering, and software development. Their typical artifacts include use cases, process models, class diagrams, XML schemas, queuing and simulation models, and working software.

4.3. Conflicts and a Lack of Collaboration

If our characterizations of the front and back stage mindsets seem somewhat caricatured, this is done on purpose to make the contrasts stand out. But front and back stage designers usually look at service design from vastly different perspectives. There is often little collaboration and communication between front and back stage designers in service design projects -- sometimes for organizational reasons, sometimes for ideological ones, and sometimes simply because it is hard to work effectively with someone who thinks so differently even when you try. The results are predictable:

Front stage designers might say:

- *"Those software developers build systems that constrain our ability to deliver the services the customer wants"*
- *"Sure, standards are good... but people have different capabilities and preferences and they need different user interfaces"*

Back stage designers might say:

- *"Those interaction designers always propose services that the back end can't support"*

- *"They should just study the service interfaces to the ERP system... can't they all read XML schemas?"*
- *"If every experience has to be different, how can our implementation be robust and scalable?"*

We don't believe that these tensions and conflicts between front stage and back stage designers are intrinsic or fundamental. But to avoid them, we need a more comprehensive and end-to-end conception of services that treats the entire network of services that comprise the back and front stages as complementary parts of a "service system."

5. The Front and Back Stages as Components of Service Systems

A recent paper by Jim Spohrer, Paul Maglio and other IBM researchers in service science defines a service system as "a value-coproduction configuration of people, technology, other internal and external service systems, and shared information (such as language, processes, metrics, prices, policies, and laws)." [11] This new concept in service design has roots in classic work by Mills and Moberg [9] to apply manufacturing system concepts to services and by Heskett et al [12] that analyzes the mechanisms and interdependences in what they call the service profit chain.

The service system concept underlies the essential claim of this paper that a service outcome is never the result of a single encounter between a service provider and service consumer. Instead, it emerges from the service system of back and front stage services that establish the context and satisfy the preconditions for the final service encounter to take place. There may be a "moment of truth" in which the quality of the service experience becomes apparent to the service consumer, but that quality was enabled or constrained to a greater or lesser extent by the entire service system.

We might describe the hotel check-in experience in a coarse way as a service system consisting of several interrelated sub-systems: hotel employee-to-customer, customer self-service in the hotel, employee-to-hotel systems, customer self-service to third party services (like Expedia), and hotel systems to third party services. This end-to-end view shows that the quality of the experience for the customer is enabled or constrained at many points, including many in the back stage that are invisible to the customer. Indeed, some of them are even invisible to the hotel employees.

Service systems can be described in terms of their qualitative properties like connectivity and intensity as we've done with our hotel check-in example, or more rigorously and quantitatively using mathematical models or simulations.

5.1. Quality in Service Systems

The idea that service quality is a property of a service system rather than of a service encounter is especially easy to see in self-service Internet commerce. A service designer with a front stage mindset might work diligently to improve the customer's online ordering experience, but the customer's quality of service is only in a very small part determined there. The complexity and deferred nature of physical fulfillment when goods are ordered online provide many ways for the service to fail (the goods to be out of stock, they might fail to arrive when promised, they might arrive damaged, and so on). The customer's perception of the service quality will mostly depend on the fulfillment outcome, and measures of the quality of service during the online service encounter are insufficient or even irrelevant.

Because a service system takes an end-to-end view rather than focusing on the last service encounter, the concept of quality in service systems turns out to be similar to that embodied in the "quality movement" and statistical process control for industrial processes [4]. Their central idea is that quality can't be "tested in" by inspecting the final products. Instead, quality is achieved through process control -- measuring and removing the variability of every process needed to create the products.

The analogy to service systems is straightforward. The quality of a service experience can't be guaranteed by the actions of the front stage employees. It is essential to train and evaluate the employees -- back stage activities -- to prepare them to be effective in the service encounter by eliminating unplanned variability in their actions. It is also essential that the front stage employees understand the rest of the service system so they can make appropriate decisions and align their efforts to make the best use of every other part of the service system.

5.2. Service Encounters as Information Exchanges

A key tenet in the service system perspective is that it emphasizes what is common to person-to-person services, self-service, and services where the provider and consumer are both automated processes rather than focusing on their differences. Each of these types of service encounters requires a service provider and a service consumer, and each provider has an interface through which the service consumer interacts to request or co-produce the service. This level of abstraction highlights the information requirements, inputs and outputs for the service and the choreography with which the provider and consumer exchange information to initiate and deliver the service.

Treating services abstractly also makes it much easier to consider alternative service system designs. These might involve moving some services from the front stage to the back stage (or vice versa), replacing or augmenting a person-to-person service with self-service or eliminating it completely through automation, substituting one service provider for another (e.g, through outsourcing) to improve quality or reduce cost, and so on.

5.3. Service Intensity {and,or,vs} Information

The concept of a service system and the abstract way in which it treats service encounters as information exchanges requires a corollary generalization in the concept of service intensity. In section 1.2 we described service intensity in person-to-person service encounters for physical channels in terms of what the (human) service provider does. In section 2.1, acknowledging that there was no human provider in self-service or virtual channels, we suggested that intensity had to be measured differently. The service system perspective now makes it clear that intensity might better be measured in terms of the amount of information exchanged in a service encounter.

- If a human service provider asks a customer for information, how does the intensity compare when the customer provides the same information by filling out a self-service form?
- If the customer is asked for information during a series of service encounters, how does this compare in intensity to asking for all the information in a single longer encounter?
- Instead of asking the customer for information, suppose a service provider uses information it already has (from previous encounters or from other sources) to make it unnecessary to collect information from the customer. Is there no intensity?

6. Preliminary Steps Toward a Methodology for Service System Design

Methods for designing traditional person-to-person services are well established and taught in numerous business schools in service marketing and operations courses. But since much of the service economy's fastest growth is taking place in Internet-based self-service and Web-based computer-to-computer services, many have called for a new discipline of services design that extends the existing design methods to these new domains. This new discipline has been called Service Engineering [13], Service Science, Management and Engineering (SSME), [14], and Service Systems Engineering [15].

Our approach to developing methods for designing services directly follows from our analysis in this paper of the complementary roles of the front stage and back stage in a service system. We have started with several methodologies that emphasize front stage or back stage design and are attempting to extend and apply each into the other stage. Our hope is that the merged methodology will be able to span from end-to-end of service systems and be robust enough to accommodate person-to-person, self-service, and computer-to-computer components. Our combined methodology draws primarily from document engineering [16] and user-centered design [17] with some consideration for the new product development process, principles of service-oriented architecture and recent service design literature.

We can't present the complete methodology in this short paper, but we will briefly sketch the core ideas, especially those that most explicitly concern the interactions and tradeoffs between front and back stage design.

6.1 Merge the Mindsets with Multidisciplinary Design Teams

The design of person-to-person services was traditionally carried out in the marketing or customer service units of firms by designers with front stage perspectives. Now that technology and information systems have become essential foundations for many services, information systems personnel are often members of service design teams. We think it is essential to create multidisciplinary design teams that explicitly include designers with front and back stage biases but who are motivated to teach and learn from each other. That's because many of the most important design issues in service systems involve tradeoffs or potential conflicts between front stage and back stage goals, as we described in section 4.3.

A multidisciplinary design team can identify and close the gaps of understanding in both the front-stage's model of the back stage and the back-stage's model of the consumer experience. This will eliminate or substantially reduce their conflicts and misconceptions.

A multidisciplinary design team will perform more complete analyses and make better decisions about service intensity and where to set the line of visibility between the front and back stages. It will also be better able to determine the mixture of person-to-person and self-service components in the service system. Collaborative decision making is especially important because service designers are only beginning to understand the intensity/quality tradeoffs in the transformation of services from physical to virtual channels [6, 7]. Different customer types have different preferences and presumably different tradeoff functions [3].

Designers with a back stage mindset might have a bias to reduce the variation in service delivery by replacing person-to-person services with self-service wherever it is technically possible. Front stage designers will remind them that customers don't always prefer self-service, and that it may be necessary to maintain multichannel alternatives in the service system.

6.2 Create Information Flow and Process Models that Connect the Front and Back Stages

The related themes that service quality is a emergent property of an entire service system (section 5.1) and that service encounters can be viewed as information exchanges (section 5.2) come together to suggest an important design activity of creating models that connect the front and back stages.

This idea is presented in an elegant and practical way in a paper titled "Staple Yourself to an Order"[18]

"...every customer's experience is determined by a company's order management cycle (OMC): the ten steps, from planning to postsales service, that define a company's business system. The order management cycle offers managers the opportunity to look at their company through a customer's eyes, to see and experience transactions the way a customer does."

"The moment of truth occurs at every step of the OMC, and every employee in the company who affects the OMC is the equivalent of a frontline worker."

Creating a model of the how information flows between the steps in a service system is essential in preventing problems in the "cracks" between the organizations carrying them out. Employees in different business units within the firm might otherwise have different priorities and perspectives about what it is important to the customer, and an end-to-end model that they all share can ensure that they act in the customer's interests.

Queuing theory provides a framework for describing service systems where people wait to be served (e.g., by bank tellers, telephone call centers, repairmen, etc.) in which the parameters of these models – arrival rates, waiting time, number of service providers, etc. – explicitly represent the quality of the "customer service" experience using both back stage and front stage aspects. 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.

6.3 Implement "Model-Based User Interfaces"

Creating information and process models is a significant investment in capturing context-specific (or application-specific) requirements in a technology-neutral and robust way. It comes naturally to back stage designers to explicitly use models represented as UML class or sequence diagrams, database schemas, or XML schemas models as specifications for generating code or configuring an application (e.g., [19, 20, 21]).

In contrast, methods used by front stage designers to design and implement user interfaces are dominated by iterative and heuristic techniques. To many back stage designers, these non-deterministic methods seem inefficient and unnecessary. Many "back stagers" have attempted to apply model-based implementation techniques to user interfaces, especially for information-intensive transactional applications where the essence of the user's task is to provide information that conforms to a model of an order or other standard business document type [22].

Model-based implementation isn't appropriate for all user interfaces, but seems especially promising for multichannel services that are offered across a range of contexts or devices. Model-based techniques would make it possible to generate a consistent set of self-service user interfaces for web browsers, cell phones, and voice systems with little of the "hand crafting" usually employed by front stage designers [23].

6.4. Exploit Back Stage Information to Improve the Front Stage Experience

In section 3.1 we explained how information about prior service encounters from the back stage of the hotel check-in service system was used to improve the immediate experience for a specific customer. In those examples, however, the information about the customer's preferences and goals was explicitly recorded by hotel employees who learned it in face-to-face encounters with the customer.

In contrast, many consumer appliance and entertainment devices, self-service and other technology-driven applications are capable of completed automatic capture of customer interaction history and behavior. Manufacturers have long exploited this kind of information to design new and improved products, and service providers like airlines, hotel chains, and car rentals use it to offer enhanced services to their most loyal customers. In addition, data mining, business intelligence, and recommendation system techniques can extract behavior or preference patterns from transaction histories to tailor and improve services.

The limiting factor in the use of this kind of customer information may well be privacy concerns. Moed [24] argues that it should be up to users themselves to determine which analyses and applications of their interaction histories are worthwhile enough to permit them.

6.5. Exploit Design Patterns that Satisfy Joint Front and Back Stage Goals

In section 4 we pointed out that the goals and quality criteria for front and back stage designers are sometimes in conflict, which is why tradeoffs are often required. Fortunately, there is an important set of design patterns for service systems whose purpose is to satisfy apparently incompatible front stage and back stage goals.

Many techniques for managing demand are designed to influence or shift customer requests for service from periods when the service provider's capacity is exceeded to periods of underutilized capacity. This allows the provider to maintain a satisfactory quality of service without the cost of additional capacity. Price discounts for off-peak periods and bundling a combination of services at a reduced rate are familiar examples of demand management techniques.

7. Summary

A service outcome is almost never the result of a single encounter between a service provider and service consumer. Instead, it emerges from the service system of back and front stage services that establish the context and satisfy the preconditions for the final service encounter to take place. There may be a “moment of truth” in which the quality of the service experience becomes apparent to the service consumer, but that quality was enabled or constrained to a greater or lesser extent by the entire service system.

The design conflicts and tradeoffs between front and back designers are lessened by a service system perspective. Front stage service providers need capabilities for capturing information about front stage preferences, contexts, and events. This and other back stage information can then be exploited by the front stage to enhance the service experience.

8. References

[1] Zeithaml, Valarie A., Leonard L. Berry, and A. Parasuraman. “Communication and Control Processes in Delivery of Service Quality.” *Journal of Marketing* 52 (April 1988), pp. 35-48.

[2] Bitner, Mary Jo, Stephen W. Brown, and Mathew L. Meuter. “Technology Infusion in Service Encounters.” *Journal of the Academy of Marketing Science* 28(1) (2000).

[3] Frei, F. X. “Breaking the Trade-Off Between Efficiency and Service.” *Harvard Business Review*. Nov. 2006.

[4] Juran, Joseph and A. Blanton Godfrey. *Juran's Quality Handbook*. Fifth Edition. McGraw Hill. 1998.

[5] Smith, Amy K., Ruth N. Bolton, and Janet Wagner, “A Model of Customer Satisfaction with Service Encounters Involving Failure and Recovery,” *Journal of Marketing Research*, 36(3), 1999, pp. 356-372.

[6] Sousa, Rul and Christopher A. Voss. “Service Quality in Multichannel Services Employing Virtual Channels”. *Journal of Service Research* 8(4) (May 2006).

[7] Al Shamsi, Saud. “Service Quality in the Physical and Virtual Marketplace,” *University of California School of Information Report* 2007-003, February 2007.

[8] Teboul, J. *Services is Front-Stage*. Palgrave Macmillan, 2006.

[9] Mills, Peter K. and Dennis J. Moberg. “Perspectives on the Technology of Service Operations,” *The Academy of Management Review*, Vol. 7, No. 3. (Jul., 1982), pp. 467-478.

[10] Meuter, Matthew L, Amy L. Ostrom, Robert I. Roundtree, and Mary Jo Bitner, “Self-Service Technologies: Understanding Customer Satisfaction with Technology-Based Service Encounters,” *Journal of Marketing*, 64 (3), July 2000, pp. 50-64.

[11] Spohrer, J., Maglio, P., Bailey, J. & Gruhl, D. “Steps Toward a Science of Service Systems.” *IEEE Computer*. Volume 40, Issue 1. (2007), p. 71-77.

[12] Heskett, J.L., Jones, T.O., Loverman, G.W., Sasser Jr., W.E., & Schlesinger, L.A. “Putting the Service-Profit Chain to Work.” *Harvard Business Review*. 1994.

[13] Bullinger, H.J., Fahrnick, K.P., & Meiren, T. “Service Engineering – Methodical Development of New Service Products.” *International Journal of Production Economics*, 85, 2003, 275-287.

[14] Maglio, P., Srinivasan, S., Kreulen, J., & Spohrer, J. “Service Systems, Service Scientists, SSME, and Innovation.” *Communications of the ACM*, July 2006, Vol. 49, No. 7. p. 81-85.

- [15] Tien, J. and D. Berg. "A Case for Service Systems Engineering," *Journal of Systems Science and Systems Engineering*, 12(1), March 2003, 13-38.
- [16] Glushko, R., & McGrath, T. *Document Engineering: Analyzing and Designing Documents for Business Informatics and Web Services*. The MIT Press, Cambridge, MA, 2005.
- [17] Nielsen, Jakob. *Usability Engineering*. Morgan Kaufman, 1994.
- [18] Shapiro, Benson P., V. Kasturi Rangan, and John J. Sviokla. "Staple yourself to an order" *Harvard Business Review* (1992).
- [19] Carlson, David. *Modeling XML Applications with UML*. Addison-Wesley, 2001.
- [20] Bean, James. *XML for Data Architects*. Morgan Kaufmann, 2003.
- [21] Daum, Berthold. *Modeling Business Objects with XML Schema*. Morgan Kaufmann, 2003.
- [22] Garvey, Patrick and Bill French, "Generating user interfaces from composite schemas," *IDEAlliance XML 2003 Conference*.
- [23] Florins, Murielle and Jean Vanderdonckt. "Graceful degradation of user interfaces as a design method for multiplatform systems," *International Conference on Intelligent User Interfaces*, 2004.
- [24] Moed, Andrea. "Generative Logging: Product Information Histories as Drivers of Service Ecologies," *University of California Berkeley School of Information Report 2007-006*, February 2007.