CHAPTER SEVENTEEN

Design of Services

EXHIBIT 17-1
A Zipcar vehicle.

In June 2000, Zipcar launched a new vehicle-sharing service in Cambridge, Massachusetts. The service provides customers with vehicles that are rented on an hourly basis (Exhibit 17.1). Zipcar helped to redefine the way many people think about automobile ownership and transportation by giving them the freedom to use a vehicle whenever they want and making the process of renting a vehicle as simple, convenient, and reliable as possible. From the very start, Zipcar's aim was to provide "wheels when you want them." By 2012, Zipcar had become the world's largest vehicle-sharing service, providing over 10,000 vehicles to more than 750,000 members in 50 cities in the United States and Europe. While the vehicles used by Zipcar are the tangible products of automobile manufacturers, what Zipcar offers to its customers is a *service*. Zipcar's success as a service business may be attributed to at least these factors:

- ***Easy reservations:*** Zipcar members could browse and reserve available vehicles online or by phone at any time, immediately or up to one year in advance. Rentals could be as short as one hour or as long as four days.
- ***Convenient parking:*** Vehicles were parked in designated spaces throughout the metropolitan areas where Zipcar operated: on-street locations, neighborhood parking lots, and parking garages. Members returned the vehicle to the same location after using it.
- ***Automated check-in and return:*** Members received a card containing an RFID (radio frequency identification) chip that unlocked the vehicle only during the time of their reservation. Each vehicle recorded the mileage driven and communicated wirelessly to a central computer for automated billing.
- ***Attractive brand associations:*** Members perceived Zipcar to be associated with low environmental impact, financial intelligence, and innovation.
- ***A culture of continuous improvement:*** Zipcar strived to learn from its customers to provide additional features and to improve operations.

While most producers of physical goods have a defined product development process, many service-based businesses are only recently implementing formal methods for the development of their offerings. The focus of this chapter is the development of new services. It describes product-service systems and some of the differences between physical products and services. It then introduces a method of representing services as process flow diagrams. This method makes explicit the design of the service and can help to identify opportunities for innovation and improvement. We use the Zipcar example throughout to illustrate the successful design and development of a new service.

Product-Service Systems

Physical products are tangible goods produced by manufacturing operations and used by customers; their benefits derive from the material properties and geometry of components and assemblies. For instance, Toyota is primarily a manufacturer, producing automobiles, which are owned and used by its customers. Services are largely intangible, even if often associated with physical goods. For instance, automobile insurance is an intangible financial service provided to owners of automobiles to reduce the magnitude of the loss the insured suffers in an accident. Most services have some associated physical products and most physical products have some associated services. For example, automobile rental

Category	Physical Product Elements	Service Elements
Mobile communications	Handsets, transmission towers	Network connectivity
Enterprise computing	Computing hardware, switches, servers	Information processing, storage, back-up
Desktop printers	Printer hardware	Cartridge recycling
Auto rental	Vehicles	Reservation, insurance, maintenance, billing
Restaurants	Food	Reservations, food preparation, wait service, ambiance
Airlines	Aircraft	Ticketing, in-flight entertainment, piloting, baggage handling, loyalty programs
Healthcare	Drugs, medical devices	Diagnosis, procedures, advice

EXHIBIT 17-2 Examples of product-service systems.

companies provide short-term use of a vehicle without requiring the user to own the vehicle, yet the actual physical vehicle is critical to the service; and while Toyota is primarily in the business of making vehicles, it also provides vehicle financing and roadside assistance, and its dealers provide maintenance and repair services. We call this bundle of the physical and intangible the *product-service system*. Other examples of product-service systems are in Exhibit 17-2.

For the purposes of this chapter, we will refer to *physical products* simply as *products* and to intangible products as *services*, with the recognition that the more general use of the economic term *product* refers to both physical products and services.

In What Ways Are Services and Products Different?

In most ways, services and products are similar enough that they can be developed using the familiar product development process described throughout this book. Like products, services address customer needs, are based on concepts, exhibit an architecture, require testing, and are provided by organizations adhering to economic principles; however, certain characteristics of services are more prominent than for products:

- ***Customer involvement:*** The customer is generally an integral part of the service delivery process, providing information inputs, making choices, interacting with the service provider, and consuming the service during its delivery. Because the customer interaction is somewhat unpredictable, services are often designed to adapt dynamically to the customer. Given that many services are interactive, they also may comprise many *touch points*—each one representing an opportunity to succeed or fail, and a potential focus of innovation.
- ***Timing:*** A service usually includes a prominent time dimension. Customers are generally concerned with waiting for service, the timing of key touch points, and the overall elapsed time in the service experience.
- ***Matching capacity and demand:*** Many service products are consumed quite close to the time at which they are produced. For instance, restaurant meals are usually consumed within minutes of production. Air travel is consumed simultaneously with

its production. Because of this close coupling of production and consumption, inventory is of limited use in buffering variability; therefore, either capacity and demand must be closely matched, or excess capacity must be provided. Otherwise, waiting times will grow or customers will be lost.

- ***Modular architecture:*** Service processes are usually collections of activities arranged in sequential and parallel process flows. Many processes are essentially modular—process steps map closely to features and functions of the service. With this type of modular architecture, services are easily modified, refined, and extended.
- ***Repeated use cycles:*** Although some services may be experienced just once or infrequently (e.g., laser vision correction surgery), more typically a customer uses a service repeatedly (e.g., automobile rental, hotels, gyms). As a result, customer acquisition and relationship management are critical elements of the service.
- ***Customization:*** Because of the customer involvement in services and the modular process flow of most services, the experience can often be readily customized to the needs of individual customers with more limited investment than is typically required to customize products.

The Service Design Process

Most chapters in this book and their associated methods apply as well to services as to products. Specifically, for both products and services, these tools and methods are important: opportunity identification, identifying customer needs, generating concepts, selecting concepts, establishing specifications, concept testing, economics, project management, and product planning.

An exception is Chapter 13, Design for Manufacturing, which mostly describes methods for dealing with physical component production and assembly. Chapter 16, Patents and Intellectual Property, is possibly more relevant to products than services, although some of the most famous patents are associated with services (e.g., Amazon's one-click patent). The specific guidelines in Chapter 12, Design for Environment, are more relevant to products than to services, although the principles still apply very well.

On the whole, the design and development processes for services and products are more alike than different. Still, some differences in tools and techniques are worth highlighting. Here we discuss the idea of a *service concept*. Then, we introduce a tool for representing the system-level design of the service, the *service process flow diagram*. We illustrate each of these with the Zipcar example.

The Service Concept

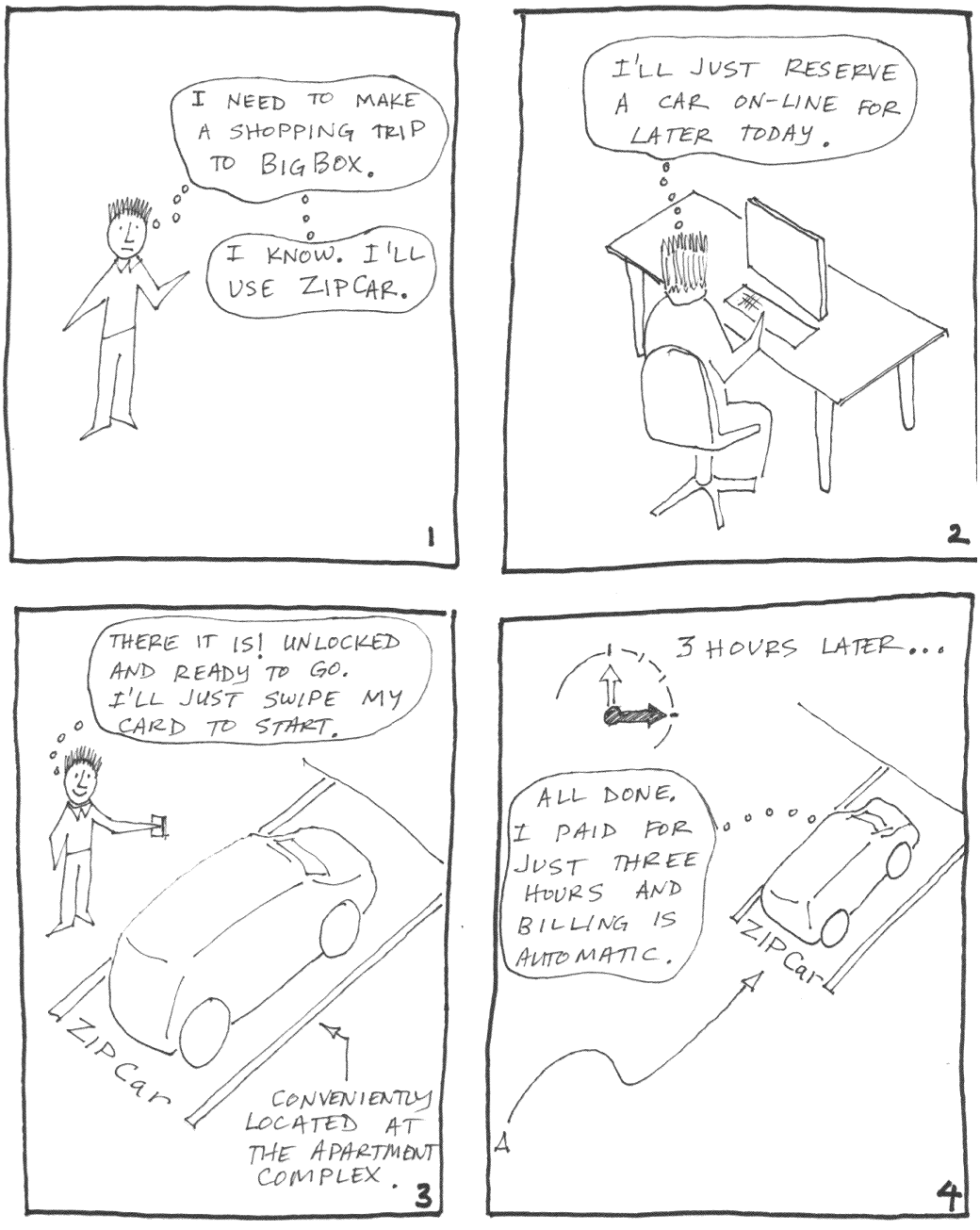
Recall from Chapter 7, Concept Generation, that the concept is the approach and working principles the product will embody to deliver the basic function of the product and satisfy the customer needs. With physical goods, the product concept is best represented with a sketch of the geometry and configuration of physical elements; however, services include intangibles and information processing activities, and so a sketch of physical components will be a limited and incomplete description of a service. For services, the concept is more typically a textual description of the big idea—a narrative of how the service works. The big idea of a service concept can usually be conveyed in a few words, often with a description of the sequence of events and key features.

For instance, the concept for Zipcar is

> Zipcar provides automobile rental for periods of 30 minutes to 4 hours. Zipcar vehicles are parked in specially marked spaces in convenient locations, such as adjacent to apartment and office buildings. Users join the Zipcar service and receive a membership card. They reserve vehicles online, use their card to access the vehicle, and then drive away. They simply return the vehicle to the same spot within the reserved rental period. Billing to the customer's account is automatic.

A service concept can be further elaborated with a *storyboard.* A storyboard is a sequence of graphical illustrations that show the key steps in a service experience. For instance, a storyboard for the Zipcar concept is shown in Exhibit 17-3.

EXHIBIT 17-3
Zipcar storyboard.



The same techniques described in Chapter 7, Concept Generation, can be used to generate service concepts as well as product concepts. For instance, the problem can be decomposed by sequence of user actions, by considering the key functions of the service, or by key customer needs. For example, Exhibit 17-4 shows a decomposition of the car rental service by sequence of user action. A new service concept can be constructed by selecting a solution concept (or perhaps more than one concept) from each of the columns and integrating them into an overall service offering.

Concept Development at Zipcar

The Zipcar team developed several solution concepts. Each solution presented different technical, logistical, and financial challenges and would also provide a different customer experience.

Zipcar was a startup company, so the team knew that their resource constraints would not allow them to immediately deploy all of their innovative ideas, such as an RFID-based lock system or a wireless mileage tracking system, at once. The team realized that providing the highly sophisticated service for the original concept would require several more months of development, testing, and implementation of features and operational procedures. Initially, they decided to launch the minimally viable vehicle-sharing service as quickly as possible. Because services can generally be easily modified, beginning with the minimally viable service is an effective strategy to get started, begin learning, and improve incrementally.

They asked themselves: Which steps of the cycle can we deliver with the least cost and the least time? Which features should we implement first and which in future iterations of the service? For example, the team defined a concept in which each vehicle would be equipped with a communication system to wirelessly transfer data between the vehicle and a server to transmit mileage data for billing. In the first offering of the service, however, this communication system was not ready to be implemented. Instead, the mileage data was logged in the vehicle by the member, and employees would collect the driving records from each vehicle for billing on a monthly basis.

Join	Reserve	Obtain Vehicle	Use Vehicle	Return Vehicle	Pay
Register	No reservation–first-come, first-served	Delivered to your location	Optional driver provided	Any location	Automatic billing
Pre-Register	Mobile app	Distributed locations		Same as pick-up	Check-out sequence on mobile device
Use service as "guest" with no registration	Website	Central hub in each region		Different location	Check-out sequence on on-board system in vehicle
Join using existing credentials (e.g., Facebook)	Call center	Partnership with gas stations or convenience stores			Kiosk at drop-off location
Employer registers in bulk	Commit to return time				
	Open-ended reservation				

EXHIBIT 17-4 Decomposition of car rental service by sequence of user actions. Alternative approaches to each action are listed in the columns.

The Service Process Flow Diagram

Recall some attributes that make services distinctive from products: the role of time, customer interactivity, modularity of process, and close matching of capacity and demand These distinctive attributes can be dealt with explicitly by representing a service with a process flow diagram.

Exhibit 17-5 shows a process flow diagram for the Zipcar service. Process steps are shown as labeled boxes. Precedent relations between steps are shown as regular weight lines and arrows. Material flows are shown with heavy lines and arrows. Information flows are shown with dashed lines and arrows. The human figures in the diagram represent the customer touch points.

The service process flow diagram is created by listing the process steps and then by arranging them graphically to show precedence, material flows, and information flows Typically, this is an iterative process done at a whiteboard or with pencil and paper and then captured more formally with an illustration tool such as PowerPoint.

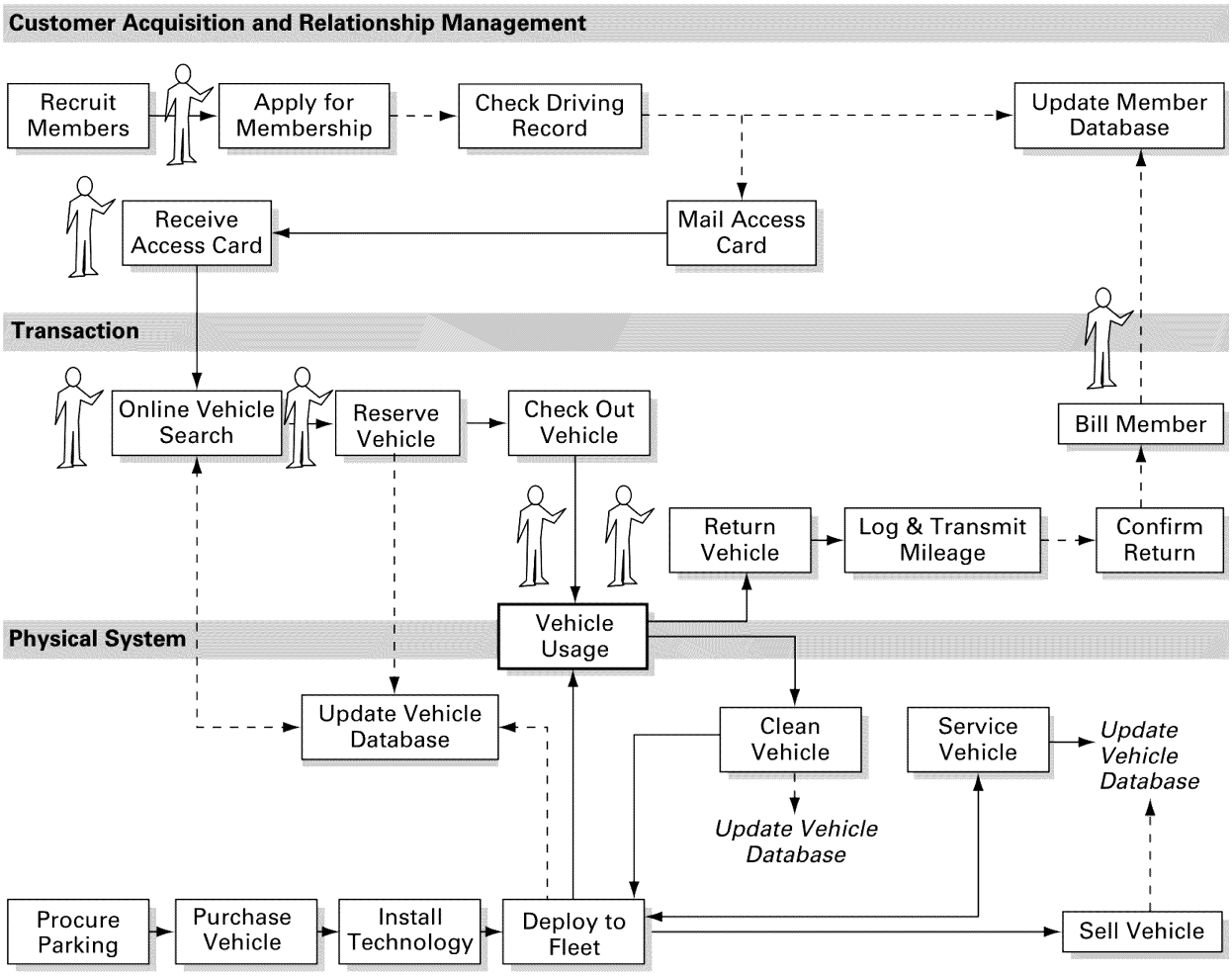


EXHIBIT 17-5 Service process flow diagram for the Zipcar service.

Many processes are quite complex, in the sense that they involve many process steps and interactions. To organize the diagram, the designer may benefit from separating the process steps into categories. Three categories used in Exhibit 17-5 and useful generally are:

1. Customer acquisition and relationship management (e.g., creating awareness and enrolling members).
2. Transaction processing (e.g., reserving, checking out, and returning a rental).
3. Physical process flow (e.g., the procurement and provisioning of vehicles).

The usefulness of the service process flow diagram derives from the ways services are distinctive from products. Because of the intrinsic modularity of services, the process flow diagram is essentially a diagram of the *functional elements* of the service, as in the function diagram in Chapter 7, Concept Generation. Given how modular services are, the process flow diagram nearly completely describes the actual embodiment of the service.

Subsequent Refinement

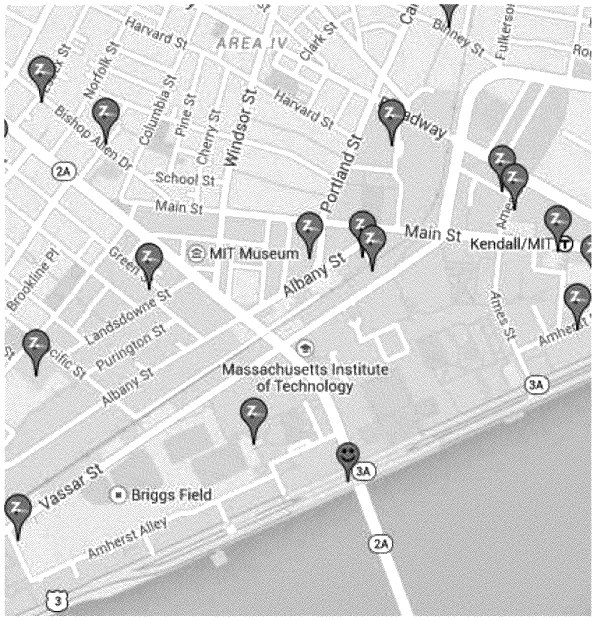
Zipcar started with a minimal version of each process flow and subsequently added functions and enhancements over time. For example, in the membership process flow, Zipcar started business development with specific institutions (universities, hospitals, large businesses), a small marketing campaign based on word-of-mouth promotion, and some public relations activities. When they expanded the business to other cities, they enhanced the marketing functions to include more print and online advertising campaigns. The membership process also became more streamlined over time, as Zipcar learned that customers didn't need an in-person orientation. The team also implemented a faster procedure to check the applicant's driving records, allowing Zipcar to send the access cards within two days.

A major influence in designing the service architecture was the company's goal to expand their business beyond Cambridge to other cities in the United States and Europe; therefore, the team decided which activities of the process flows needed to be deployed locally and which could be built as a shared infrastructure. Necessary local infrastructure would be established in each market, consisting of the vehicle fleet, parking spaces, equipment and staff for vehicle maintenance, local management, and sales representatives. Local staff arrange for parking spaces and recruit new members by establishing contracts with local businesses, universities, hospitals, and government institutions. Every element of the local infrastructure must be appropriate and specific to the local environment. The shared infrastructure consists of elements that would be set up in Zipcar's headquarters in Cambridge, such as the hardware, software, and support for the online reservation system and mobile application (see Exhibit 17-6).

Downstream Development Activities in Services

As in any development process, refining, testing, and implementing a new service requires significant resources and coordination among many individuals. Although most service-development tasks are quite similar to those for products, here we draw some further distinctions related to the downstream development activities.

EXHIBIT 17-6
The Zipcar vehicle locator and mobile phone application.



Prototyping a Service

As a service is typically a process, creating a prototype of a service requires creating ar approximation of the intended process. For a Web-based service, this prototype may be a Web site. For a service involving physical process steps (e.g., a restaurant or retailer), a prototype may be a pilot facility, perhaps even set up in a temporary location.

As with physical products, service prototypes are often labeled *alpha* and *beta*. Indeed Google's Gmail service was "in beta" for several years, suggesting to users that changes experiments, and refinements would be common.

The standard approaches to design of experiments (see Chapter 15, Robus Design) apply also to service experimentation. In many cases (particularly fo established operations implementing new or modified services), service experiment may be conducted with real customers in the actual service setting. In other cases, a pilot test environment can be built to approximate the real setting. On one hand, the closer that service experiments and test can represent the intended service operation the better. On the other hand, testing the service with real customers can be risky particularly for an established business, for if anything goes wrong, customers car be lost.

Zipcar conducted a pilot study with one vehicle and 22 participants for two month before launch. The pilot study allowed the team to evaluate customers' responses t each step of the service, such as applying for membership, using the reservation system and accessing the vehicle. Based on the results of the pilot, the team gained importan

insights. For example, some participants lost the access card or loaned their card to friends. Also, many customers forgot to leave the keys inside the vehicle when returning it. The Zipcar team developed a solution to tether the keys to the steering wheel rather than hiding them in the glove box as initially envisioned.

Growing Services

In many instances, services are launched only locally, although a Web-based service can sometimes be easily deployed in a large geographic region. Location often plays a key role because of the geographic distribution of potential customers. Restaurants, hotels, and auto rental companies all serve customers in particular geographic regions. As a result, the ramping-up and growth of a service usually requires geographic expansion. The pattern of geographic expansion allows a service to be established in one location (e.g., the home location of the development team) and then expanded region by region.

During its ramp-up, the Zipcar team finalized all operational elements and made the service publicly available. Zipcar was officially launched in Cambridge in June 2000. By the end of September, the company had deployed 15 vehicles across the city and nearly 400 members had joined.

In September 2001, Zipcar expanded the service to Washington, D.C. The team chose Washington because the market size is similar to Cambridge, and a high fraction of residents used public transportation to commute to work and did not own a car. The second launch allowed Zipcar to try a modified pricing model in which no security deposit was required. By comparing accident frequency in the two cities, they determined that Zipcar drivers are equally careful in both cities. As a result, Zipcar dropped the requirement for the security deposit.

The Washington experience allowed Zipcar to further improve and scale their service operations before deploying the service in larger cities, such as New York City, where Zipcar launched in February 2002. Over the next few years, Zipcar expanded to many other cities in the United States and Europe. Eventually, Zipcar became the world's largest vehicle-sharing organization.

Expanding the service to different cities also challenged the team to make sure that its operations ran properly. Events that were infrequent when operating on a smaller scale, such as collisions, speeding tickets, and lost access cards, became more frequent as Zipcar expanded further. The team was required to implement new operational processes to handle the increasing volume of these events.

Continuous Improvement

Because customers and service employees are simultaneously involved in a service operation, obtaining helpful feedback from customers is relatively easy. According to its founders, a major factor in Zipcar's success has been the ongoing enhancement of the service with new features and improved operational procedures. Zipcar created a close relationship between its employees and members to build better understanding of customer needs and to foster innovation. For the first two years of operations, every employee was required to take customer calls and to answer online customer inquires. By offering Zipcar employees a discount, they were encouraged to use the service themselves to get first-hand experience and to identify potential improvements.

Changes are inevitable, and some may be unpopular with users. For instance, the team adjusted the service pricing after six months of operations. They found that the daily charge was too low and that they needed to increase it by 25%. They sent a personal message to every member explaining that they needed to increase prices to stay in business. Members appreciated the personal message and Zipcar lost only a few members due to the higher prices.

Over time, the Zipcar team tested and incorporated several new technologies into the service. The reservation system, for example, initially provided a list of the few available vehicles. In the next iteration, the system displayed an appropriate selection of the increasing number of vehicles, filtered by price and/or location. In a later iteration, the system displayed the member's previous reservations, facilitating a faster transaction for most customers. For smartphones, the team developed an application allowing members to reserve and access vehicles using their phone. The application also helps members to locate the right vehicle by providing real-time directions using GPS on the phone (and even to sound the horn when nearby).

Avis, one of the largest vehicle rental and leasing companies, acquired Zipcar in 2013. Avis intended to use its existing infrastructure, scale, and experience in managing a worldwide vehicle rental system to increase the growth and profitability of Zipcar. In particular, Avis wanted to provide Zipcar with additional vehicles to satisfy the high customer demand for vehicles on weekends. The acquisition by Avis provided the Zipcar team with several new technical and logistical challenges, but more importantly, it provided the team with many new opportunities to innovate and take their service to a new level of sophistication.

Summary

- Services are largely intangible, while physical products are tangible goods produced by manufacturing operations.
- Most services have some associated physical products and most physical products have some associated services. Together they form product-service systems.
- Distinctions between products and services include a high degree of customer involvement, a prominent time dimension, a requirement for close matching of capacity and demand, modular architecture usually in the form of a process, repeated purchase and use cycles by customers, and at least some customization or adaptation to the needs of individuals.
- The service concept is typically a textual description of the big idea—a narrative of how the service works. The service concept is sometimes illustrated with a storyboard.
- The design of a service is often represented with a process flow diagram. The service process flow diagram is created by listing the process steps and then by arranging them graphically to show precedence, material flows, and information flows.
- While some distinctions between services and products are useful, most aspects of the development process are essentially similar.

References and Bibliography

Many current resources are available on the Internet via
www.ulrich-eppinger.net

Thomke describes the challenges of applying the discipline of formal R&D processes to services. He explains the process that Bank of America used to create new services for retail banking.

Thomke, S., "R&D Comes to Services: Bank of America's Pathbreaking Experiments," *Harvard Business Review*, vol. 81, no. 4, 2003.

Cusumano discusses the importance of services to product-based firms and the emergence of product-service systems.

Cusumano, M. A., *Staying Power: Six Enduring Principles for Managing Strategy & Innovation in an Uncertain World*, Oxford, Oxford University Press, 2010.

Many new services are based on innovative business models. Osterwalder and Pigneur present a comprehensive compilation of proven and modern business models.

Osterwalder, A., Pigneur, Y., *Business Model Generation*. Campus Verlag, 2011.

Girotra and Netessine provide a process for developing new business models.

Girotra, K., and Netessine, S., *The Risk-Driven Business Model: Four Questions That Will Define Your Company*. Harvard Business Press, 2014.

Heskett et al. discuss how leading companies achieve profit and growth through the customer-oriented design of services.

Heskett, J. L., Sasser, W. E., Schlesinger, L. A., *The Service Profit Chain*, Simon & Schuster Inc., 1997.

Bitner et al. describe the service blueprinting method, which is closely related to the service process flow diagram.

Bitner, M. J., Ostrom, A. L., Morgan, F. N., "Service Blueprinting: A Practical Technique for Service Innovation," *California Management Review*, Spring 2008, vol. 50, no. 3, 2008, pp. 66–94.

Sampson's text covers many design and managerial aspects of service design. He presents the process chain networks (PCN) analysis method for documenting, analyzing, and innovating provider-customer interactions using detailed flow charts.

Sampson, S. E., *Essentials of Service Design: Developing High-Value Service Businesses with PCN Analysis*, second edition, 2012.

Exercises

1. Define the service process flow for a service of interest to you. Some suggestions are purchasing a new automobile, going to a coffee shop, booking a vacation, buying a new computer, purchasing music, dining in a restaurant, going to the movies, staying at a hotel, applying to graduate school, or shopping for clothing.

2. Identify opportunities for innovation or areas of recent innovation in the service process described in Exercise 1.
3. List five products that benefitted from the introduction of necessary or complementary services in terms of market success and customer satisfaction.

Thought Questions

1. What are the differences and similarities between the product development process and the process of designing services? Illustrate your answer with representative development process diagrams.
2. Draw the Zipcar process flow diagram in a way that explicitly delineates process flows for customer actions, visible employee actions, back-office employee activities, and IT-based systems. What is the relationship between the company's service process flow and the customer's service experience?
3. For a product-service system such as a mobile phone or an automobile, consider the relative pricing of the product and the service. How would you optimize pricing to maximize profits? What are some of the challenges that make this very difficult to do in practice?