



Service: the Future of Information Technology

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Abstract

The Web is the ultimate weapon for delivering service because it takes the human element out of service thereby eliminating variability; and enables customization by allowing IT to create and deliver the precise service that the customer desires. Consequently, we predict that the main outcome of the information age will be radically improved services, just as plentiful food and inexpensive consumer goods were the major consequence of the agricultural and industrial revolutions, respectively. We forecast that the core competency of organizations will be increasingly founded on their ability to deliver services. We also envisage a future in which nearly all customers and durable products will be addressable, wherever they might be.

Introduction

The first half century of information technology (IT) has witnessed ever-expanding visions of its role in our lives. The first vision, the computer is a giant calculator, was so limiting that the world market was seen to be only a handful of machines. Other visions (e.g., the computer is an automated filing clerk or strategic competitive weapon) gradually germinated and greatly expanded the range of IT applications. Now, we believe, the most significant vision of the computer is finally emerging. The short history of the World Wide Web has demonstrated that the computer is the ultimate tool for delivering services (e.g., FedEx's parcel tracking service), and it is the elaboration of this vision that we believe will be the dominant application of IT for the next few decades. In this paper, we justify this claim and consider the implications of this future for IT. We make use of scenarios to illustrate how IT can be used to support a service-oriented society.

A Historical Perspective

The broad sweep of economic change can sometimes provide elucidating glimpses into the future. In our case, we consider the consequences of the agricultural and industrial revolutions on the broad mass of society and then speculate on the impact of the information revolution. The agricultural revolution of the 16th and 17th centuries created a system for the

large-scale production of food. Two centuries later, the industrial revolution enabled the mass production of goods. As a result of these two revolutions, most people in Western societies were provided with food and goods at affordable prices. The agricultural revolution was a necessary precursor of the industrial revolution because factories were impossible when the work force was almost totally devoted to the production of food. With the threat of mass starvation removed, societal needs could move to a higher level and the population became more concerned with acquiring goods that improved the quality of life. Initially, these were simple products such as crockery and cooking utensils, but more recently they have become televisions, CD players, and home computers.

Now, some 50 years into the information revolution, we can extrapolate from the prior revolutions to understand the consequences of this current era of mass change. Once a society satisfies one need, it moves onto another, analogous to Maslow's hierarchy of human needs. Now that the industrial revolution has provided the populace with an abundance of goods, we contend that services will dominate societal needs.* Our argument is bolstered by Quinn (1992), a frequent and respected writer on technology in services, who asserts that the development and use of technology for services may be the key to wealth creation in advanced economies.

Another perspective on social change is gained by considering how wealthy people live in one era and extrapolating that to the following eras. Prior to the agricultural revolution, the rich were among the few who ate well all the time, had plentiful goods (by the standards of that time), and received the personalized attention of servants. In today's society, as a result of the agricultural and industrial revolutions, nearly everyone has access to a plentiful array of food and goods, but only the rich enjoy highly personalized attention. Those who serve the rich cater to their caprices. Hotel managers and restaurateurs remember the favorite rooms, tables, and personal whims of only their most

celebrated clientele. The vast majority of society receives relatively undifferentiated and uncus-tomized service. Our forecast is that the information age will cause a dramatic change in the form, extent, and delivery of services. Information technology will enable the great majority of citizens to receive a level of customized service now enjoyed only by the affluent. The major outcomes of the prior revolutions were food and goods. The remaining unsatisfied demand is for highly personalized services, and this ultimate product of the information revolution will be realized in the next few decades. The effect of each revolution is summarized in Table 1.

We can already see the beginnings of this service revolution in recent Web applications that facilitate direct communication with customers. Many industries (e.g., software and financial services) are already providing a considerable range of services to customers via the Internet. We believe these are early primitive examples of what will happen in the next decade. In the remainder of this paper, we briefly discuss the unique characteristics of services, and the opportunities for their industrialization and mass customization. We show how these characteristics are uniquely adaptable for delivery on the Web. Then we demonstrate how IT will create a society in which services are tailored to the personal desires of customers.

Services: Characteristics and Industrialization

Services possess certain unique characteristics which distinguish them from physical goods (Berry, 1980), and these attributes make services especially amenable to delivery by an electronic medium such as the Internet. First, services are *intangible* – they are experiences or performances, while products are objects that are possessed. Thus, services do not require production or delivery in the broadest physical sense. Second, services are *produced and consumed simultaneously*. In most cases, the producer needs to be present to produce the service, and the customer needs to be there simultaneously in order to consume it (hair-dressers and dentists are good examples of this). This attribute also means of course that the customer comes "inside the service factory," with all the operational complications that this causes. Indeed, customers tend to participate in

* Of course, we are discussing only advanced economies and many societies are still wrestling with providing sufficient food for their people.

both the production and delivery of the services they consume, becoming in a sense, *partial employees* of service organizations (Mills, Chase and Margulies, 1983). Third, because people (employees and customers) produce most services, they are subject to a *variability* or *heterogeneity* not normally encountered in manufactured goods. This means that the customer frequently encounters unpredictable service quality, and one of the fundamental challenges facing service providers is to iron out this inconsistent service delivery. Finally, services tend to be infinitely *perishable*; that is, if the capacity of service providers is not utilized, it is lost forever, unlike products, which can be inventoried. Airlines cannot store seats, or hotel rooms, and an express delivery company cannot bank the unused time of query personnel for later use in peak periods.

In an insightful attempt to overcome the problems of managing service firms, Levitt (1976) argued that rather than attempting to provide more service (in the form of additional personnel and customization), managers should try to make service firms more like factories. Not only will this be more efficient and successful; ultimately it will be what the customer prefers. He contends that many attempts to provide personalized service merely lead to inefficiency at best, and servility at worst. He uses the case of Great Britain as an illustration. The wealthy enjoy wonderful personalized service because they are able to pay servants to perform this; however, the average person receives dreadful service because service providers believe that by performing good service they would be behaving in a servile fashion. The use of IT in many service firms has probably demonstrated Levitt's point that, rather than *throwing more service* at a problem, managers should try to eliminate it by employing technology and systems instead, as illustrated in Table 2.

The Web is a technology that will achieve both seemingly incompatible aims: to take the human element out of service thereby eliminating varia-

Revolution	Major Outcome
Agricultural	Plentiful and inexpensive food
Industrial	Plentiful and inexpensive goods
Information	Many highly personalized services

Table 1. Technological Revolutions and Major Outcomes

bility; and enable customization by allowing IT to create and deliver the precise service that the customer desires. Moreover, the Web will not only overcome to

a large extent the limitations that their characteristics impose on services; it will also enable service firms to exploit certain of these attributes.

A major problem with service intangibility is that it is difficult for customers to see what they are purchasing, and to gain insight into its merits as they would by touching, tasting, and sampling products. The Web will overcome service impalpability by:

- *managing evidence by adding visibility.* More informative than a printed brochure, the Web will enable prospective guests of a resort hotel to see it both in graphic and video format, to talk with staff and even fellow guests to sample their experiences.
- *managing memories.* The Web can engage the customer after use of the service. Guests who have stayed at a resort can become alumni, and revisit it on the Web, reliving their experiences by chatting with staff on-line, and of course with prospective future visitors. In this way customers are not only encouraged to revisit so as to relive memories, but also to act as part-time marketing staff for the resort.

Good services marketers have long understood that simultaneous production and consumption of services can be turned to their advantage. If customers understand their participation in the production process is vital to their receiving good service, they can be gainfully employed to create, produce, and deliver the services that will best satisfy them. Not only will this generally result in significant cost reductions for service providers; it can frequently be used to generate exciting new service concepts and products. There is much evidence of this on the Web. For example:

- FedEx is using its Web site to answer customer queries. Whereas formerly FedEx employed a team of employees to answer telephone calls, customers can now track

Type of Service	Before IT	Since IT
Long distance telephone calls	Operator assisted	Direct Dialing (The customer prefers because it is easier and quicker)
Everyday personal banking (Cash withdrawals and deposits)	Teller assisted	ATM assisted (Most customers prefer because it saves waiting time and has convenient hours)
Gas station (Filling car with gas)	Personal service at the pump, attendant fills car.	Self service; use card to pay for gas. (Most customers prefer because it is quicker)

Table 2. Service and Information Technology

the precise whereabouts of a package at any time simply by using the FedEx Web site. Not only is the process more efficient (quicker, lower cost, no possibility of dealing with a less than courteous employee), but it is also getting the customer to perform the labor that would have normally been carried out by FedEx employees. Indeed, FedEx suggests that some customers enjoy this so much that they track packages merely for the fun of it, and not because there is concern over loss.

- American Airlines now permits customers to access all their frequent flyer details using their Web site. At present the major benefits to the company come in the form of reduced requirements for employee service over the telephone. In the future however, there may be even greater advantages to be gained, as the service provider engages the customer in even more copious coproduction, such as reclaiming miles while booking flights at the same time, pre-reserving preferred seats, arranging meal preferences, and any other activities with which they might gainfully be engaged.
- Most importantly however, Web sites will allow mass customization as customers are involved not only in the production of their own services, but also in the conceptualization and design thereof. We foresee a time when customers will all be able to receive personalized service, by using technology to combine the resources of different firms to give them exactly what they want – be it vacation, insurance, banking, or education and self-development packages.

High quality, personalized service will no longer be the sole precinct of the affluent.

The fact that most services today are still produced by humans causes variability, which is a source of frustration to the majority of customers. It is still quite difficult to paint a smiling face on a surly bank teller, or build *please* and *thank you* into the mind of an insurance claims clerk. The Web will in many ways, permit service firms to follow Levitt's admonition and *take the service out of service* – it will permit the mass production of high levels of service, which is always courteous, competent, responsive, and reliable. It is relatively easy to paint a smiling face on a computer screen and to write software, which is always gracious, as well as knowledgeable.

- Security First National Bank was the first to offer full service banking on the Web. The bank is always open. The electronic tellers always smile and are consistently courteous. There is not a question that the information desk is unable to answer, and if you wish to see the president you can, immediately, without making an appointment. When they say, they'll "get right back to you," they mean it. Literally. This might not be exciting or even interesting banking – the tellers always look the same and don't chew gum, and there are never any real robberies. It is certainly banking as Levitt envisioned it: invariable, immutable, predictable, and it always works.

All service firms are plagued to a greater or lesser extent by the problems that perishability

causes – when the service is available, all customers don't necessarily want it, and when every customer wants the service at the same time, the firm isn't always able to satisfy them. In the past, service firms have attempted to cope with this by such strategies as discounting and promoting in off-peak periods, and by opening for longer hours, or by employing part-time staff in periods of excess demand. We suggest that astute service providers will use the Web to better manage both supply and demand in the future.

- Security First National Bank is able to manage supply because it has replaced most of the activities, which used to be performed by people, by activities that are performed by technology. Employees cannot work 24-hour days; they take coffee and lunch breaks, they take vacations, they get ill, they miss buses. When technology replaces humans, the bank is able to supply a 24 hour-a-day service that is seamless in delivery, in a way that is convenient to customers. When demand really does exceed the ability to supply, the bank does not need to search for, screen, recruit, and train new employees – it simply purchases more bandwidth, more computing power, and more storage space. Instead of purchasing more services, it simply purchases more products.

We believe that in the future, IT will be used to manage customer demand for services more effectively than is possible or dreamed of today. Technology will be used to enable customers to specify exactly what it is they require, and then to price it and charge them individually. Individualized pricing will become feasible, and pricing tactics that are not viable today will be enabled by software systems. These will exact very small but real charges from the individual customer, based on precisely what the customer has purchased. Today the administrative costs of such pricing tactics might not be worth the very small payback. In the future we see service firms amassing wealth by making millions of very small charges for individualized services, and charging individualized prices for these. In a very real sense, the oft-touted notion of *user pays* will become a reality: as users we will only pay for what we use. The demand of the individual customer, not some vague notion of a target group or market segment, will be

managed by manipulating the prices that the individual pays.

Technology

After 50 years of the industrial revolution, one could have safely predicted the broad direction of events for the next 50 years – more goods – as the fundamental innovations had been made. Mass production (e.g., the factories) and distribution systems (e.g., the railways) were in place. Underpinning this was the emergence of the scientific approach to research and development, which would create a flow of innovations. Everything was in place to continue producing a stream of affordable consumer goods for many years.

The basic technology of a service society has been invented and will be increasingly refined over the next decades. Data stores, micro-processors, and networks are the fundamental building blocks of a service society. In addition, we have a market-based economy that is directed at satisfying customers' wants.

Data Stores

A service society requires that suppliers remember vast quantities of data about their customers. The restaurateur caters to the rich by remembering what they like and dislike. Data stores make it possible for service providers to remember the likes and dislikes of every customer. They must remember every purchase and every use if they are to personalize service. A frequent flyer system, for example, may currently remember only the number of miles a customer flew each year. It may not remember the date, destination, and class of travel. It certainly does not remember the meals and drinks the customer ordered. When booking with an airline in the future, you may be offered a choice of five seafood dinners because the airline remembers you always order seafood when given a choice.

The relationship of data stores to service is amply illustrated by ServiceMaster (Quinn, Doorley, and Paquette, 1990). Its database contains 14 years of maintenance history on 17 million pieces of equipment at thousands of locations. As a result, it can determine highly efficient maintenance and procurement plans for its customers. By specializing in a particular

service activity, ServiceMaster is able to create higher value and lower costs.

Microprocessors

Microprocessors will continue to decline rapidly in cost and as a result will be embedded in nearly every product. They will be as ubiquitous as the electric motor, appearing in such devices as hair dryers and electric toothbrushes. Every household and industrial appliance that uses electricity will contain a microprocessor, which will control the performance of the device and collect data about its use. As a result, appliances will be individually programmable based on their usage history and the customer's particular needs. The rotation speed of the bristles of an electric toothbrush, for instance, will be programmed according to the condition of the customer's gums and manner in which the brush is used (e.g., pressure and angle against the teeth).

Networks

Recently, we have experienced the implementation of a National Information Infrastructure (NII) in the form of the Internet. This network of networks means all computers can be linked together and are individually addressable. The next stage is massive networking of a wide variety of devices. We predict that every product that contains a microprocessor will be uniquely addressable and connectable to a network. Most households will contain a local area network managed by the household server, which is connected to the NII via an information service provider (see Figure 1). Consequently, suppliers will have a direct communication link to their customers. Suppliers will thus be able to use the network to deliver software for programming goods and collect data on usage. For example, in anticipation of a particularly hot summer's day, the appropriate supplier will adjust the program for opening and closing the shades of each room. Addressable products and networks make it possible to extend the ServiceMaster model to all products and to add other dimensions of service, many of which are at present unimaginable. Indeed, the most fundamental effect of this technology could be that it will blur the very dividing line between products and services, so those customers will no longer purchase neatly categorized products or services,

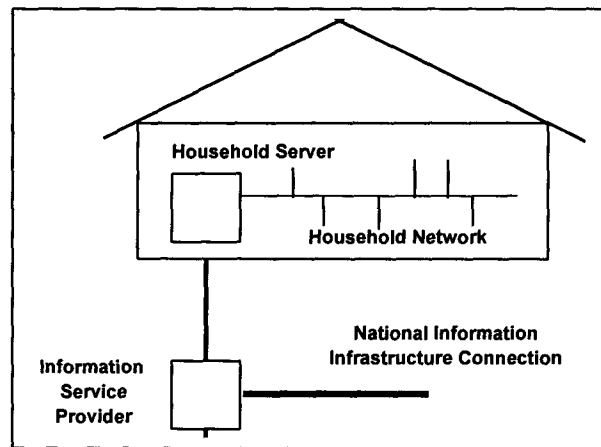


Figure 1. The Networked Household

but solutions to problems, performances, and experiences. Rather than purchase a car (product) and maintenance (service), the customer will purchase a bundle of benefits, which includes mobility and advice as to when equipment should be maintained and refreshed.

The Integration of Data Stores, Microprocessors, and Networks

The three building blocks of the information revolution will be integrated to enable an interactive relationship with individual customers — the marketer's dream (Blattberg and Deighton, 1991). This customer communication system will collect the data necessary to individualize communication and provide customers with highly personalized service. The result will be a form of highly customized attention that was once the reserve of the wealthy. The customer of tomorrow will be as pampered as the rich and famous of today. Andy Warhol's speculation may indeed be realized: We may in the future all enjoy a few minutes of fame.

The Goal of Addressability

The technological model we have outlined is founded on a goal of addressability, the capability of the customer and supplier to locate each other in time and space. Our notion of addressability extends Blattberg and Deighton's (1991) concept, which is essentially based on the idea of maintaining a customer database and direct marketing tools to individualize dialogue with customers. Our concept of addressability is much broader. It entails the customer being able to locate the supplier to gain access to services.

The Electronic Chauffeur

After arriving home from her ten-minute trip to the local telework center, Christine plugged her electric car into the socket in the garage, which was a joint power and network connection. She used the voice command system to inform the electronic chauffeur that tomorrow she would be driving to the airport (about a 90 minute trip) to catch flight 550 to New York and would like a five minute news report, international financial market summary, a 15 minute lesson on French idiomatic expressions, and the remainder of the time should be devoted to light Jazz with an occasional Mozart interlude.

The electronic chauffeur took the following action:

- immediately uploaded data on the car's use since the last network connection from the car's data store to the household server, which was then relayed to the supplier of the car. The data indicated that the front brakes would need service in two weeks time and, after of course checking Christine's diary, a booking was scheduled with her preferred service center;
- downloaded from an information service supplier the requested French lesson and music program into the car's data store;
- accessed the airline's information service to determine the departure time of flight 550, computed the time Christine would need to leave home based on projected traffic conditions, and reserved a parking bay at the airport. It would continue to monitor the departure time and traffic conditions and update the departure time on the kitchen bulletin board when necessary and alert Christine when appropriate;
- downloaded the latest map of the fastest route to the airport and set the speed control system to observe speed restrictions along the way;
- established an intelligent software agent, linked to projected departure time, to download the latest news and financial information into the car entertainment system immediately prior to departure for the airport.

This scenario illustrates how in the information era IT will perform the functions of a personal assistant. Implicit in this scenario is the notion that the auto manufacturer will have to reconceptualize its product as a mobile information and entertainment system. Presently, the auto manufacturer takes little part in entertaining or informing other than providing a radio or CD. Once cars are addressable devices, the auto manufacturer has the opportunity to provide a new range of services that keep the customer entertained and informed while traveling and also maintain the operational efficiency of the car.

Also, because we envision a system of customer communication based on electronic networks, we encompass the addressability of products. Existing data stores are often limited to capturing data about customer purchases, but this is only one phase of the customer service life cycle (Ives and Mason, 1990). Customers can own products for many years, and this lengthy ownership phase provides many opportunities for firms to sell additional service, but only if they know how the customer is using the product. Even primitive systems that capture customer usage data infrequently can be highly successful (see the example of Daiichi described by Stalk and Webber [1993]).

Addressability in a networked society also extends service opportunities beyond the household. When products are addressable and contain microprocessors they can be readily changed to the convenience of the customer. The electronic valet example illustrates some of this potential.

Implications

All revolutions have profound implications for society. Some of these consequences can be anticipated and others are completely unanticipated. We briefly discuss some of the outcomes we can anticipate, but there will be

The Electronic Valet

Upon arriving at the hotel, Ned handed his smart card to the desk clerk who went through the standard authentication check to verify he was the owner of the card. Then the hotel's guest comfort system, known as the electronic valet, took action:

- it downloaded from Ned's home server his room preferences and reserved the room most closely matching his needs
- it reprogrammed all devices in the room to match the settings of the equivalent device in his home (e.g., channel 1 of the TV was set to his favorite cartoon network and quick dial button 2 on the phone was set to his girlfriend's number);
- the shower's temperature and flow were set to the settings of his shower at home;
- it scheduled room service to place an additional pillow in his room and two bottles of Brown Brother's Chardonnay in the fridge.

undoubtedly social and political fallouts that are beyond our ken.

Organizational Strategy

The transition to a service-driven economy will result in a different strategic focus. The industrial era notion of building competence on manufacturing capability will become obsolete. The core competency of organizations will be increasingly founded on the ability to deliver service. This implies that many organizations will need to redefine their fundamental purpose. The home refrigeration manufacturer, for instance, may need to reinvent itself as a home food management system. Selling a fridge is just the beginning of a service relationship; and what should be really sold is a complete food management system: fridge, freezer, and pantry. This system then keeps complete track of all food stored and notifies the customer when an item needs to be restocked or has exceeded its shelf life. The home food management system is the equivalent of a personal housekeeper. Strategic thinking will need to transform from thinking about products to thinking about services and the customer's ultimate goal. As the previous

example illustrates, the customer does not want a fridge; she wants to keep food fresh.

In his definitive analysis, Porter (1980) concludes that there are two generic strategies: differentiation and low-cost leadership. It is possibly too early to identify potential strategies for the information era because the rules of competition are still evolving and very dynamic (e.g., Netscape went from startup to competitive threat to Microsoft in around two years). There is some indication that establishing industry norms provides sustainable competitive advantage (Morris and Ferguson, 1993). Thus, IBM dominated the mainframe era because its operating systems and standards (e.g., SNA, 3270) were widely used. Similarly, Microsoft has a tremendous competitive advantage because it has defined the desktop norm (e.g., Windows and Office). Those service providers that do not define the norm are locked in a fierce, commodity market battle because, ironically, the very technology on which their business is founded, the Internet, permits customers to be highly informed and switch readily (e.g., the long distance phone market in the U.S.). Thus, early signs are that competitive advantage will come from being a defacto standard setter or low-cost service provider.

MIS

Since service will be based on maintaining customer databases and direct electronic communication links, the MIS department will become even more involved in making the corporate strategic plan a reality. Its success will be based on its ability to translate a service delivery strategy into an effective IT infrastructure. MIS managers will need to be extremely end-customer focused. Thus, in the case of the home food management system example, IT will have to develop systems that record not only each time an item is placed in storage, but also its contents (e.g., a half-empty milk container), and other details necessary for managing food.

End-customer systems will be very demanding of MIS skills and resources. There will be literally millions of these installed, and they must be highly fault and customer tolerant. Imagine delivering a system to one hundred million customers, many of whom have never mastered setting the clock on their VCR recorders. MIS

will no longer be creating systems to be used primarily by college educated, white-collar workers. Many customers will be not well educated and not have access to a help desk. Systems must be extremely simple to use, but highly flexible if service is to be very personalized. Despite advances in tools to build and maintain systems (e.g., CASE and object orientation), the long-term trend has been for complex systems to be delivered late, often with reduced functionality (e.g., Windows 95, OS/2). We estimate that end-customer systems will be at least an order of magnitude more difficult to build and maintain than current state-of-the art systems because of their complexity, the size of the market, and the low skills of many customers.

The MIS community will have to work with a wide variety of manufacturers to develop a set of standards for defining the electronic interface to household devices and networks. For example, there will need to be standards for the automotive industry so that third parties can compete to supply entertainment, information, and diagnostics services to the driver.

It is quite possible that many organizations will gut their MIS departments. IT was of necessity a specialist function in the first fifty years, but will become more and more of a general management function (computers will not be mysteries to our children). While specialist technical skills will still be needed (just as marketing research and advertising copy skills are still relevant), a reasonable level of IT skills will be expected of anyone who is a manager. Indeed, the specialist skills are prime candidates for outsourcing (just as advertising and marketing research tend to be outsourced today).

A Cultural Caveat

Nearly all English-speaking countries support and implement a philosophy based on the belief that free markets should govern economic activity. Governments should simply get out of the way and let the market determine how resources are allocated and the direction of the economy. However, Fallows (1994) points out that other major economic powers, such as Germany and Japan, are not so enamored by markets, and there is an alternative to the Anglo-American free-market model.

Fallows observes that Anglo-American economies are more likely to place the needs of the individual above the nation and emphasize consumption over production. Our projections have been influenced by an Anglo-American perspective, given that we both live and work in this setting. Thus, we have emphasized the use of IT to meet consumer and individual needs. German and Japanese societies may well use the same underlying technologies to produce a different IT impact.

Conclusion

We are not the first to see the opportunity to use information technology to improve customer service (see for example Ives and Mason [1990] and Quinn and Papette [1990]), but we do believe we see much further than these scholars. The distance of our vision can be gauged by the key concept that we have introduced – addressable, networked consumer products. Firms need to be able to communicate directly with the products customers use so that they can customize usage to personal needs. When this is feasible, the full potential of IT to provide customer service will be realized.

The IT future we have painted is very realizable and we believe highly likely for two reasons. First, there is every indication that customers are seeking improved service. Second, the technology is currently available. In this paper, we supply the third necessary ingredient – the vision that makes people aware of the opportunity.

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