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# A history of research in service operations: What's the *big idea*?

Richard B. Chase<sup>a</sup>, Uday M. Apte<sup>b,\*</sup>

<sup>a</sup> University of Southern California, Marshall School of Business, IOM Department, Los Angeles, CA 90089-0809, United States

<sup>b</sup> Graduate School of Business and Public Policy, Naval Postgraduate School, 555 Dyer Road, Monterey, CA 93943, United States

## Abstract

The purpose of this paper is to trace the history of research in service operations. After discussing the role of services in national economies and the importance of research in service operations, we discuss major trends in service operations research. For simplicity of exposition, this discussion is organized in terms of *big ideas* that have proved to be influential in setting the research agenda in service operations. In the final section, we identify high-potential research areas where research needs are particularly urgent in the near future.

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## 1. Introduction

There is no question as to the importance of the service sector: it is the largest and the fastest-growing segment of the economies of the U.S. and other developed countries. In the late 18th and throughout the 19th centuries, the Industrial Revolution set the stage for a delineation of economic activity as the workforce shifted towards manufacturing and away from agriculture. Agriculture and mining were seen as *primary* economic activities with the newer manufacturing and industry activities as *secondary*. The residual economic activities – *tertiary* – were labeled “other” activities and included productive (e.g., transport, domestic servants) and non-productive (the clergy, artists, lawyers, monarchy, professors, etc.) economic activities. The USSR and Maoist China – established as

Marxist-Leninist Socialist systems – therefore, attempted to minimize third sector activity. An important aspect of the continuing evolution of the economic systems of these nations continues to be the problems associated with the previous lack of third sector economic activity and attempts to create modern third sector systems. The situation within China's banking and fledgling financial institutions provides evidence of the value of a robust *tertiary* (service) sector for a modern nation.

In *The Wealth of Nations*, Smith (1776) made reference to “non-productive economic activities” so he was probably the first to write about what would eventually become the Service Sector. Two centuries later, in *The Visible Hand*, Chandler (1977) identified the importance of economic activities within the service sector to the overall health of a nation's economy. He made it clear that such service sector activities as communications, banking, finance, and insurance, were prime movers in the development of the U.S. economy in the 19th century. Clark (1940) argued that sectoral differences in productivity leads to a situation whereby,

\* Corresponding author.

E-mail addresses: [richard.chase@marshall.usc.edu](mailto:richard.chase@marshall.usc.edu) (R.B. Chase), [umapte@nps.edu](mailto:umapte@nps.edu) (U.M. Apte).

in the long term, a majority of the labor force is no longer engaged in agricultural or manufacturing, but in services. Clark’s conjecture seems to hold true today for most industrialized nations. For example, in 2006 in the U.S., services accounted for roughly 83% of employment while manufacturing accounted for only about 10% (US Department of Labor, 2006).

Furthermore, Quinn (1992) found that many of the major manufacturing companies (such as General Motors) generate a sizable portion of their revenues from service units (such as GMAC), so as much as 65–75% of employment within these companies is in service occupations. Bryson et al. (2004) concluded, based on several studies, that the demand for services as an input to the production of goods has grown steadily and that the good/services separation has become somewhat of an artificial distinction today. In any event, the sheer size and continuing growth of the service sector and of service occupations within the secondary sector, the lack of significant productivity improvement within services, and a relative paucity of research into the operational issues of services (we have more to say on this issue later), make service operations an important and fertile area of research.

**2. Research in service operations: the big ideas**

Here, we trace the history of research in service operations by discussing the findings of selected research articles and identifying the *big ideas* that have proved to be influential in setting the research agenda in the field. In recounting this history, as appropriate, we also identify practices of selected industry leaders that have served as key motivating factors for research in service operations. We should point out that management science-oriented research with application to service sector industries is beyond the scope of this article. For example, research dealing with topics such as transportation and distribution, shift labor scheduling, etc., will not be addressed here. Similarly, research that focuses exclusively on individual service sectors – such as health care or financial services – and have findings that are not generalizable to other services are also beyond the scope of this article. A chronology of *big ideas* in theory and practice is presented Table 1.

*2.1. Application of scientific management to services: early efforts*

Leffingwell (1917) was one of the early researchers who applied Taylor’s *Principles of Scientific Manage-*

Table 1  
 History of research in service operations: big ideas

Time period	Big ideas: theory and practice
1900–1950s	Application of scientific management to services Walt Disney: industrialized fantasy Holiday Inns: consistency in multi-site services
1960s	McDonald’s: production-line approach to services Service economy and operations in health care
1970s	Industrialization of services Match supply and demand in services The customer contact model Data envelopment analysis
1980s	Classify services to gain marketing and operational insights Gap model of service quality and SERVQUAL Strategic service vision Unconditional service guarantee Psychology of queues Yield management
1990s	Service profit chain Using poka-yoke, or fail-safe, methods to prevent human errors in service systems Globalization of information-intensive services Emergence of experience economy
2000s	Using behavioral science in service operations Managing operations in information-intensive services Information technology in services and e-services Global business process outsourcing Service design

ment (1911) to the activities of service industries such as banks, insurance companies, accounting firms and mail-order firms. The responsibility of a “Scientific Manager” was to study the routines of all employees, work out the simplest and fastest way for them to be done and, finally, establish a standard time for the performance of the chosen routine. For Leffingwell, as for Taylor, the goal of scientific management was to set up routines that, once learned and remembered, could govern every aspect of office life.

Gilbreth, a contemporary of Leffingwell, asserted in the early 20th century that scientific management proponents should consider the perspectives and happiness of workers and argued that the principles of psychology should be applied to solve problems in areas such as office machine companies, hospitals and sports (Koppes, 1999). Her doctoral dissertation, *The Elimination of Waste*, involved application of psychology and scientific management to the work of classroom teachers. Her book, *Psychology of Management* (1914), became one of the most influential textbooks on industrial relations.

Health care was one of the sectors where the principles of scientific management and of its successor, industrial engineering, were applied early on. For example, Barnes' *Motion and Time Study* (1937) describes "Operating-room setup showing tables for instruments and supplies designed to facilitate the work of the surgeon, his assistants and the nurses" (p. 177).

Just as Taylor's theories were based on experiments at Pennsylvania machine shops, Leffingwell's experiments and theories originated from his work with mail-order houses. There was, however, one major difference. The business practices that Leffingwell dealt with had to adapt themselves to the vagaries of customers in a way that Taylor's did not. For example, it was not possible to perfectly predict the number of customer orders, or the length or the content of the letters that accompanied the orders. Leffingwell solved this problem by using what he called the "exceptional principle", the process of separating difficult cases and sending them to an expert for processing (Leffingwell and Robinson, 1943). In the 1940s and 1950s, the *Reader's Digest* used this approach to handle the thousands of pieces of mail which arrived daily at its Pleasantville, New York, headquarters: mail was delivered to the "Mail Opening Room", opened and sorted, then carried to "Mail Reading Rooms" where specialized workers handled renewals, new subscriptions (separately for the *Digest* and *Condensed Books*) and written responses ("standard" or "difficult" cases). For "standard" written responses, the Mail Reader noted letter numbers and/or paragraphs; these were sent to typists who typed the response from a book of standard letter and paragraphs. Mail Readers for "Difficult" responses used a combination of standard letters and paragraphs as well as writing out unique responses; these were sent to another pool of typists.

Attempts at applications of *scientific management* were generally resisted by white-collar workers. Moreover, the challenges of measurement and quantification prevalent in service sector industries made it very difficult for a manager to monitor and control processes. Hence, Taylorism did not have the same record of success in its application to service sector workers as with blue-collar workers.

## 2.2. Walt Disney corporation: industrialized fantasy

Mickey Mouse whistled his way into the hearts of America when Walt Disney released the cartoon "Steamboat Willie" in 1928 (Norris and Bockelmann, 2000, pp. 99–102). By 1935, Mickey Mouse was a

merchandising icon not only in the U.S., but throughout the world and was credited with having pulled many a manufacturer out of bankruptcy by selling millions of branded goods licensed by Disney Corporation. In 1938, the *New York Times* suggested in an editorial that the "industrialized fantasy" represented by Mickey Mouse might prove to be the kind of industry that could pull America out of deep recession.

The creative genius of Walt Disney did not stop at 9 minutes cartoons or full-length movies such as *Snow White and the Seven Dwarfs*. He went on to launch the highly successful Disneyland and its replicas in Florida, Europe and Asia. As a harbinger of the emerging experience economy, Disneyland developed many principles of service operations such as managing the customer's total experience by offering carefully designed themed lands, by providing rigorous training to employees through Disney University, by casting employees to play specific parts and providing them with rigid scripts to follow in interacting with customers, and, last but not least, by leveraging the cartoon characters to "wow" customers.

## 2.3. McDonald's: production-line approach to services

The corner hamburger stand was a common sight in America long before Ray Kroc opened his first McDonald's restaurant in 1955 in Des Plaines, Illinois (Norris and Bockelmann, 2000, pp. 189–190). Howard Johnson's was also selling 27 flavors of ice cream using a standard menu since the late 1940s, pretty much across the country. But, under the visionary leadership of Kroc, McDonald's became the first national fast food chain and later a symbol of American business around the world. When the company met requirements for a listing on the New York Stock Exchange in 1995, the company's president emphasized that the company neither produced nor sold the food, equipment, fixtures or supplies used by the restaurant owners. Its main stock in trade was and is its "know-how" in operating such restaurants. The company's personnel advised the restaurant operator in such matters as purchasing supplies, preparing food, serving customers, undertaking advertising and other details needed for successful operation of the restaurant. Application of *scientific management* to every aspect of restaurant operation was the key factor underlying McDonald's success. The main principles embodied in McDonald's operation include: (1) standardizing and reducing the variety of products; (2) simplification, standardization and automation of processes so that workers with

limited skills and training can reliably produce quality products and deliver high quality service; (3) monitoring and control of process performance. McDonald's arguably exhibits better applications of Industrial Engineering to a greater degree than do many manufacturers.

Much of the high productivity enjoyed by McDonald's is made possible by the training that the company offers through Hamburger University (H.U.). Although the curriculum is centered around business management, H.U. has food preparation labs for trainees to obtain a hands-on understand the basics of "hamburgerology." In some regions, such as southern California, additional basic training of store managers is carried out in specialized facilities called "production stores".

It should be noted here that although McDonald's is rightfully credited with many process innovations in services, the hotel chain *Holiday Inns* was already the leader in its industry by 1952 as a result of its strategy of maintaining consistent quality in each of its hotels nationwide. This focus on consistency came about as a result of its founder, Kemmons Wilson of Memphis, Tennessee, deciding to start a chain of predictably quality hotels after suffering through hit-or-miss lodging experiences on a cross-country trip with his family after the World War II.

#### 2.4. Service economy and operations in health care

Research work in the services in the 1960s was largely in the areas of economics and health care. For example, economists such as Fuchs (1965, 1968) wrote about the service economy, Feldtstein (1967) studied the efficiency of health care services, Baumol and Bowen (1965) analyzed the economics of performing arts, and Bell (1973) forecast the emergence of "post-industrial society" involving a continuing shifting from a goods-producing to a service economy. In the same general timeframe, Smalley and Freeman (1966) continued with the application of Industrial Engineering in health care to prescribe layouts and operational details for hospital intensive care units, laundries and kitchens while production/operations management researchers, including Abernathy and Hershey (1972) and Sprague (1973), worked on location and capacity problems in health care services.

#### 2.5. Industrialization of services

Levitt (1970, 1972) argued that if companies would stop thinking of service as servitude and personal ministrations, they would be able to effect drastic

improvements in their quality and efficiency. Taking inspiration from companies such as McDonald's and Transamerica, he described how companies could apply the production-line approach to services. He further suggested that companies substitute "technology and systems for people and serendipity", and apply three types of technologies – hard, soft, and hybrid – to industrialize services.

Shostack (1977, 1984) was one of the early researchers who identified characteristics, such as intangibility, simultaneity of production and consumption, and co-production that distinguish services from manufacturing. Drawing from her years of experience with service organizations, she suggested that rational management techniques be applied to the development of new services. She described how the use of a blueprint can help a service developer not only understand the service creation process so as to identify problems before they happen, but also to see the potential for other market opportunities and to test the quality of services being offered.

#### 2.6. Match supply and demand in service industries

Sasser (1976) argued that what makes service industries distinct from manufacturing ones is their immediacy: the hamburgers have to be hot, the motel rooms available for occupancy exactly when and where the sleepy travelers want them, and the airline seats empty when the customers want to fly. However, balancing the supply and demand sides of a service operation is not easy, and whether a manager is successful in this task or not can make all the difference. In discussing the way service managers can match supply and demand, Sasser suggested two basic strategies – "chase demand" and "level capacity" – available to most service companies. He also discussed several strategies through which service managers can alter demand and influence capacity.

#### 2.7. The customer contact model

Chase (1978) introduced the customer contact model of services, one of the most widely cited theoretical constructs in service operations research literature. The customer contact model holds that the potential efficiency of a service system is a function of the degree of customer contact entailed in the creation of the service. Specifically, the less direct contact the customer has with the service system, the greater is the potential of the system to operate at peak efficiency. Conversely, where direct customer contact is high, the

smaller is the potential to achieve high levels of efficiency. This conceptualization was drawn from the work of organizational theorist Thompson (1967) who proposed in his book that “Under norms of rationality, organizations seek to seal off their core technologies from environmental influences.” (p. 19). A number of papers have addressed the specific dimensions of contact for purposes of design. Kellogg and Chase (1995) found, from a study of nursing activities, that contact could be operationally defined as consisting of contact time, information richness, and intimacy. Froehle and Roth (2004) blended the customer contact model and the service profit chain construct to develop multi-item scales for evaluating customers’ perceptions of their experiences when engaged in contact with various types of technology-mediated services.

The distinction between high- and low-contact systems provides a basis for classifying service production systems that can enable the manager to develop a more effective service operation. Based upon this conceptualization, Chase (1983) identified a number of propositions about high contact systems and proposed some simple heuristics for service system design and operation. A related concept that has gained prominence in recent years is the practice of decoupling services into front-office and back-office operations, with the former responsible for the high-contact elements of work and the latter taking care of the low-contact elements. An advantage of decoupling services is that the back-office work can be often removed from the physical locations that deals with the customers and moved to less expensive locations including foreign countries (Metters et al., 2006).

## 2.8. Data envelopment analysis

Service firms often have a large number of geographically dispersed service facilities. This factor, along with the difficulties in measuring and quantifying output, makes assessment of the relative performance of individual units very difficult. Charnes et al. (1978) developed an effective approach for measuring “decision-making efficiency” in public programs. This approach, called “data envelopment analysis (DEA)”, involves the application of linear programming techniques to the analysis of the inputs and outputs of the decision-making process. Specifically, the model defines efficiency in terms of a ratio of the sum of the weighted outputs to the sum of the weighted inputs. Application of DEA can lead to both better planning and control of decision-making activity. Banker et al. (1984) extended the model so that the DEA approach

could be used in situations where the operations were conducted in regions of increasing, constant or decreasing returns to scale (in multiple input and multiple output situations).

By way of example, Banker and Morey (1986) applied DEA to a 60-unit fast food restaurant chain and found 33 units to be maximally efficient in their use of resources. In their analysis, three outputs (i.e., food sales for breakfast, lunch, and dinner) and six inputs (i.e., materials and supplies, labor, age of store, advertising expenditures, urban versus rural location, and existence of a drive-in window) were used. Worthy of note is that the inputs included both uncontrollable and discretionary variables (e.g., the demographic variable of urban/rural locations, and whether or not the unit had a drive in window). Later, Frei and Harker (1999) used a variation of DEA in a retail bank setting to determine how much inefficiency in a business process is due to process-design choice and how much is due to process execution.

## 2.9. Classifying services to gain marketing and operational insight

Given the diversity of services, it is difficult to define general principles about managing operations and marketing practices in service organizations. However, classifying services along suitable dimensions does make it feasible to generate managerially useful guidelines. Lovelock (1983) argued for a focus on specific categories of service and proposed five schemes for classifying services in ways that transcend narrow industry boundaries. These schemes revolve around the nature of service act and the recipient of service, the relationship with customer and the nature of service delivery, the degrees of service customization and judgment exercised by service personnel, the nature of demand and supply, and the method of service delivery.

Following a similar line of reasoning, Schmenner (1986) suggested the use of a service matrix defined by the degree of customer interaction and customization on one axis and the degree of labor intensity on the other. Giving rise to four classes of services – service factory, service shop, mass service and professional service – this matrix can be used to help understand the managerial challenges faced in each class and design appropriate strategic operational changes.

## 2.10. Gap model of service quality

The attainment of quality in products and services became a pivotal concern of the 1980s. While quality in

tangible goods had been described and measured by marketers, quality in services remained largely undefined and un-researched. Parasuraman et al. (1985) attempted to rectify this situation by reporting the insights obtained in an exploratory investigation of quality in four service businesses and by developing a model of service quality. As per the “Gap Model” of service quality, customers assess service quality based on the gap between expected service and perceived service delivery. The researchers, therefore, proposed that this gap be measured and managed to manage service quality. Accordingly, they developed SERVQUAL, a survey instrument that has been used extensively in measuring service quality in marketing as well as operational contexts (Zeithaml et al., 1990).

The SERVQUAL questionnaire consists of 22 items of which four to six questions pertain specifically to one of each of five major service quality dimensions—reliability, responsiveness, assurance, empathy, and tangibles. The scoring uses a seven-point Likert scale of “strongly agree” to “strongly disagree”. For example, expectation question 1 says (with reference to the tangibles of company XYZ) “They should have up to date equipment,” while perception question 1 states XYZ “has up-to-date equipment.” Thus, if one gave an expectation score of 7 (“strongly agree”) but a perception score of 5 (“agree”), there would be a gap of 2 (i.e., Expectation of 7–Perception of 5). The total gap score for the tangibles category of four questions would be the sum of this score plus the gap score for the remaining three tangibles questions. The company’s overall gap score would be the sum of scores for all five categories. The beauty of the gap model is that it systematically relates each service quality dimension in a way that makes intuitive sense to managers, and is actionable.

### 2.11. The strategic service vision framework

Heskett (1987) proposed a “strategic service vision” framework that consisted of identification of the target market segment, development of the service concept to meet the needs of the target segment, formulation of an operating strategy to support the service concept, and design of a service delivery system to support the operating strategy. He reviewed the experiences of leading companies – most notably Southwest Airlines – to illustrate some of most successful strategies. These include: (1) close coordination of the marketing and operations relationship; (2) a strategy built around elements of a strategic service vision; (3) an ability to redirect the strategic service inward to focus on vital

employee groups; (4) an appraisal of the effects of scale on both efficiency and effectiveness; (5) the substitution of information for other assets; (6) the exploitation of information to generate new business.

### 2.12. The unconditional service guarantee

It is well accepted that, by definition, service performances cannot be guaranteed since they are generally delivered by human beings who are known to be less predictable than machines. Hart (1988) argued that while this may be true, it does not mean that customer satisfaction cannot be guaranteed. Drawing inspiration from Domino’s Pizza, Federal Express, and the owner of a pest extermination company—“Bugs” Burger (who wrote out a service guarantee on a napkin in a potential customer’s restaurant in order to land his business), Hart developed the criteria for a good service guarantee. That is, the guarantee is: (1) unconditional; (2) easy to understand and communicate; (3) meaningful; (4) easy (and painless) to invoke; (5) easy and quick to collect on. He claimed that a service guarantee is a powerful tool because it: (1) forces the entire company to focus on the customer’s definition of good service; (2) sets clear performance standards for employees; (3) generates reliable dates when performance is poor; (4) forces the company to examine its entire service delivery system for possible failure points; (5) builds customer loyalty, sales and market share.

### 2.13. Psychology of queues

Queues involve waiting, to be sure, but one’s attitudes toward queues may be influenced more strongly by other factors. In light of this fact, when designing waiting lines, one should consider the psychology of queues in addition to the estimated average waiting time. Maister (1985) suggested two “laws of services”. The first compares the customers’ expectations with their perceptions of the delivered service to conjecture that if the perceived service is better than expectations, they depart as happy customers. The second law states that first impressions can influence all of the rest of the service experience.

Larson (1987) states that customers may become infuriated if they experience social injustice defined as the violation of first-in–first-out principle. The queuing environment and feedback regarding the likely magnitude of any delay can also influence customer attitudes and, ultimately, in many instances, a firm’s market share. Even if the customer focuses on the wait itself,

the “outcome” of the queuing experience may vary non-linearly with the delay, thus reducing the importance of average time in queue, the traditional measure of queuing performance.

#### 2.14. Yield management

The application of booking limits on the number of seats available at different prices on the same flight allows airlines to increase revenues. Effective seat inventory control by an airline depends on forecasts of future bookings, the revenue values associated with each fare type, and an ability to make systematic tradeoffs between booking requests so as to maximize total flight revenues. Belobaba (1989) described the implementation of a computerized system for making these tradeoffs and setting booking limits on future flights. The expected marginal seat revenue (EMSR) decision model developed for this application takes account of the uncertainty associated with estimates of future demand as well as the nested structure of booking limits in airline reservations systems.

Since deregulation, most airlines have been using yield management to allocate their fixed capacity of seats in the most profitable manner possible. Since the “inventory” of seats is perishable, the airlines must have a method to quickly and accurately allocate potential demand to capacity. Kimes (1989) explained that yield management has potential application to any firm constrained by capacity, such as lodging, rental car, delivery service, rail, and cruise industries. A good yield management system helps a firm determine how much of each type of inventory to allocate to different types of demand. After discussing the managerial implications of yield management, she suggested that the operations management researchers could assist small- and medium-sized capacity-constrained firms by developing simple, yet accurate, yield management techniques.

#### 2.15. The service profit chain

The service profit chain (Heskett et al., 1997) links profitability and revenue growth of a service enterprise with the satisfaction and loyalty of its employees. The framework suggests that profitability and revenue growth are influenced by customer loyalty, which in turn is determined by perceived value of the service. Since a key to generating service value for the customer is having satisfied, loyal and productive employees on board, the framework recommends that the service business must pay particular attention to such human

resource issues as employee selection and training, providing suitable information, and designing reward and recognition systems for the employees. The exemplar company used in this discussion was Southwest Airlines. In this issue of the *Journal of Operations Management*, Brown and Hyer (2007, this issue) describe a successful 19th century service profit chain in existence well before the concept was explicitly developed by researchers at the Harvard Business School.

Mistakes are inevitable but dissatisfied customers are not. Hart et al. (1990) made a case that a good recovery from service failures can turn dissatisfied customers into loyal ones. They suggested the following actions for the “profitable art of service recovery”: (1) anticipate the needs for recovery; (2) act fast; (3) train employees; (4) empower the front-line employees; (5) close the loop by keeping customers informed about improvements.

#### 2.16. Using poka-yoke, or fail-safe, methods to prevent human errors

One of the most useful concepts from the total quality management (TQM) movement in manufacturing is the application of poka-yoke, or fail-safe, methods to prevent human errors in the production process and thereby to improve the quality of the end product. Chase and Stewart (1994) suggested that these methods apply equally well to services and provided a framework for systematically applying poka-yoke to service encounters. They argued that actions of the system, the server and the customer can be “fail-safed”, and provided numerous examples to stimulate service managers to think in fail-safe terms. A few of these included locks on airline lavatory doors, indented trays for surgical instruments in hospitals to assure that no instrument is left in the patient at the end of an operation, and mirrors next to phones in call centers to assure a “Voice with a Smile”.

#### 2.17. Globalization of information-intensive services

“Globalization of information-intensive services” by Apte and Mason (1995) was probably the first service operations article to seriously address the phenomenon of globalization of information-intensive services. Specifically, they concluded that information-intensive services are being globally disaggregated as corporations respond to the pressures of increasing global competition and take advantage of opportunities

made available by the progress of information technology and the emerging global work force. In order to globally disaggregate services, corporations must decide whether or not to carry out a service activity within the organization, and where to locate it, within or outside the geographic boundary of the home-base country. After reviewing a wide range of illustrative examples of service disaggregation, they analyzed the opportunities and challenges of globally disaggregating information-intensive services, and developed a theoretical framework that identifies criteria and guidelines for successfully selecting service activities to be globally disaggregated. Specifically, they hypothesized that service occupations that are characterized by high information intensity and low customer contact and physical presence needs are more amenable to global outsourcing. This hypothesis appears to have been validated by the recent and growing trend towards business process outsourcing (BPO) and off-shoring of back-office services.

### 2.18. *Emerging experience economy*

Pine and Gilmore (1998) argued that services are undergoing a transformation from the traditional concept of service transaction to one of an experience (Fitzsimmons and Fitzsimmons, 2005). They suggest that as services and products become more like commodities, experience emerges as the next step in the progression of economic value. They describe the changing competitive environment as an “experience economy,” and recommend that companies use service as a “stage” to attract the customer as a “guest” in creating a “memorable” experience for the customer. The classic examples that illustrate the emerging experience economy include the Disney theme parks and Starbucks coffee shops. It is believed that creating “service experience” offers an excellent opportunity for service innovation. Current work by Voss et al. (2006), develops the strategic requirements needed to make such innovative experiences come about.

### 2.19. *Summary and evaluation of the big ideas*

Which of the big ideas still stand and which are ready for retirement? To address these questions, we group the big ideas into three general categories: transference of industrial management concepts to service industries, frameworks for service design and management, and tools and techniques of service operations to improve productivity in services.

#### 2.19.1. *Transference of industrial management concepts to service industries*

Scientific management, Disney’s industrialized fantasy, McDonald’s production-line approach, and operations in health care all to a greater or lesser degree focus on transferring the factory production concept of rationalization to service design and delivery.

McDonald’s and Disneyland have retained their positions, though in somewhat different ways, as the leading exponents of this rationalization, and have made their way into the language of general management and culture. “McDonald’s” is shorthand for cookie cutter approaches to everything from housing to medical care, while “Disneyfying” conveys the notion of high volume fun on an industrial scale. Rationalization and productivity improvement in health care operations are timeless questions and will always be a challenge for the service operations field for obvious reasons.

As previously mentioned, the early applications of scientific management were not as successful in services as in manufacturing. Today, however, a number of service industries, from the customer contact factories of the call centers to the managed care organizations in the healthcare services, are well positioned to apply the principles of scientific management (Head, 2003). The main difference now, of course, is the power of modern information technology. With the availability of networked computers and the associated workflow software, managers in the service sector have available the power of computerized measurement, monitoring, and control. The factor that limits the extent of service rationalization is the variation inherent in the human interactions, a hallmark of the service processes.

#### 2.19.2. *Frameworks for service design and management*

The customer contact model, classification systems, the strategic service vision, and the service profit chain were all developed before the advent of the Internet. This creates complications for the customer contact approach in particular since it was predicated on the physical presence or absence of the customer. It still is useful for thinking about many service situations but extensions of it to the virtual world have not seen widespread recognition or application.

The service vision is always important, but it has been eclipsed by other prescriptive strategy approaches such as the “blue ocean strategy” (Kim and Mauborgne, 2005). The service profit chain is still quite useful, but more empirical work needs to be done verify the model in service settings where technology



mediates interactions with customers. For example, supermarket cashiers may be dissatisfied, but speedy checkout scanners allow high productivity and as a result high customer satisfaction. With respect to service recovery, there is a lack of research as to which recovery action is best for a given class of failures. That is, one would expect that a failure of a clerk in binding a report at a copy center would call for a different response and restitution than when the report is bound properly but the copy center clerk is rude.

### 2.19.3. *Tools and techniques of service operations to improve productivity in services*

These tools and techniques can be further divided into analytical methods for capacity planning and empirical tools for service quality. Among the former, yield management (YM), now often termed “revenue management”, has come a long way since its origins in the newsvendor problems. Kimes and Chase (1998) see additional strategic uses of YM, and show how service duration and price can be used as strategic levers in non-traditional YM industries such as restaurants and golf courses. The prospects for DEA are less exciting, since, as a linear programming approach, it may involve making huge assumptions about costs and forecasts, and it is generally hard for managers to understand.

Regarding tools for service quality, the gap model reflected in the SERVQUAL model has “legs” and will continue to be the most widely used of the service quality measuring systems. Service guarantees – conditional or not – continue to pop up, though they are often used more for marketing purposes rather than as a driver to improve operations. In general, it is probably better to have a guarantee than not to have one, providing you can deliver on it. Poka-yoke concepts will retain their usefulness for simpler tasks, but their value may diminish as the services become more complex. On the other hand, the value of the poka-yoke concepts may actually increase with the increasing use of computers in this Internet age. For example, consider the pop-ups, which ensure that you really want to erase everything you’ve done for the past hour when you accidentally hit the wrong key.

## 3. High-potential areas for research in service operations

As we look to the future of research in service operations, we believe that a considerable amount of work is still needed to fully explore a number of the *big ideas* identified in the previous section. Moreover, we think that research needs are particularly urgent in the

near future in several high-potential research areas including: (1) using behavioral science to improve the customer experience; (2) managing operations in information-intensive services; (3) information technology in services and e-services; (4) global business process outsourcing; (5) service design. We provide brief comments on the first two topics and refer readers to Fitzsimmons and Fitzsimmons (2000), Karmarkar (2004), Roth and Menor (2003), and Rust and Kannan (2002) for a head start on the other topics.

### 3.1. *Using behavioral science to improve customer experience*

Chase and Dasu (2001) have suggested that the empirical work of Nobel Prize winning psychologist Daniel Kahneman on how people process information and remember events can be applied to service encounter design. For example, the often replicated findings that people tend to overweight the peak and ending events in a sequence of events in their recollection of an experience can be used to guide service designers in selecting how they want a service to unfold. Cook et al. (2002) discuss this line of research along with other current research questions relating to the human side of the design, development, and deployment of new service technologies. We argue that for service encounter research to be of maximum value, we must approach the psychological side of services with at least the same depth and rigor that we have traditionally approached the manufacturing of goods.

### 3.2. *Managing operations in information-intensive services*

Apte and Nath (2006) estimated the size and structure of the U.S. information economy in 1992 and 1997 and assessed the growth experienced by different industries and sectors since Porat’s pioneering research on the U.S. information economy in 1967. Their study indicates that the share of the information economy in total GNP grew from about 46% in 1967 to about 56% in 1992 and to 63% in 1997. The study further indicates that, during this time period, the share of service sector information activities in total GNP increased substantially, while the shares of non-service sectors declined correspondingly. The industries displaying the highest growth rates include business, medical and educational services. In this issue of the *Journal of Operations Management*, Karmarkar and Apte (2007, this issue) discuss the

implications of the growth of the information economy for research and teaching in Operations Management. In our view, the growing prominence of information-intensive services (IIS) offers exciting research opportunities into the issues surrounding the management of operations in IIS.

A critical subset of IIS is Internet encounters. There is little in the way of empirical research specifying how service interactions should be handled over the Internet. Guidelines for face-to-face services are only partially applicable to email where an interaction can be paused by either side and treated as a letter exchange. A recent extension of SERVQUAL to Internet ordering, E-S Qual (Parasuraman et al., 2005), shows promise here but provides little in the way of guidelines for determining how to design diagnostic and problem solving types of interactions. Chase (2002) proposed “Ten Commandments of E-Service,” which included such admonitions as “Thou shalt design thy website as a pleasant path, not a maze.” The problem with this, of course, is that it begs the question as to what constitutes ‘a pleasant path’ through an Internet encounter. Answering this question, in turn, calls for classification schemes, which differentiate among paths according to the nature of the service business at hand and providing operationally useful rules for design.

#### 4. Concluding remarks

Notwithstanding the well-accepted and long-standing view regarding the dominance of services in the economy and the importance of research in services, the penetration of service operations studies in OM journals has remained surprisingly low until recently. In their analysis of the types of OM research articles published from 1992 to 1997, Pannirselvam et al. (1999) found that less than 3% of the articles have dealt with topics related to services. And, while one may argue about the specific definitions used in this research in their labelling of the article as being related to services or not, it is hard to refute the conclusion that research and teaching in operations management has been biased towards the manufacturing. Roth and Menor (2003) provide a list of factors inherent in services (intangibility, simultaneity of production and consumption, and co-production) that have inhibited research in service operations.

However, there have been several recent developments that promise to create conditions promoting the publications of research in service operations. Major OM journals are now uniformly behind publishing new

service work. A quick review of the JOM for the past 4 years shows an average of one paper every other issue, in addition to a special issue on service design research (2002). Similarly, POM and MSOM have also been actively seeking service papers and empirical research, which address service issues.

There have been at least three other noteworthy developments that are creating an environment more conducive for research in service operations. First, the formation of the *College of Service Operations* (CSO) within the Production and Operations Management Society. CSO has been established to develop and nurture a community of scholars and practitioners who are interested in the research and teaching of service operations management. Activities of CSO that have been particularly useful include organizing biannual research conferences and guest editing special issues of POM focusing on service operations. Second, the initiation of *Service Enterprise Engineering* program at the National Science Foundation (NSF). Recognizing the importance of services in the economy, NSF has initiated a specific program of funding for research in service operations.

Finally, the undertaking of *Service Science, Management and Engineering* (SSME) initiative at IBM. At IBM, the services accounted for roughly 55% of the total revenues in 2005, while hardware and software products accounted for the rest. In comparison, however, services contributed only about one-third of the company’s total profit (Wladawsky-Berger, 2006). There are several reasons behind this discrepancy. Hardware and software products can leverage technology assets and apply engineering principles to improve quality, increase capacity, and achieve higher productivity and profit margins. Services, on the other hand, have been generally more labor-intensive, less amenable to economies of scale, exhibit higher quality variations, and are generally less productive and profitable. IBM has, therefore, started the SSME initiative to better understand the nature of services, with a particular focus on productivity improvement in services. As a part of this initiative IBM is now working with universities, research labs and government bodies focusing on research, education, and skills development in services.

In summary, the future for OM service research looks bright if for no other reason than our prime customers – our students and the employers of our students – expect to see Operations Management concepts applied to service settings rather than the factory. The challenge now is to create new *big ideas* that can be used in this effort.

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