Antecedents of New Service Development Effectiveness

An Exploratory Examination of Strategic Operations Choices

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This article examines the strategic process of new service development (NSD). The authors empirically explore the strategic influence of team-based organizational structure, NSD process design, and information technology (IT) choices on the speed and effectiveness of NSD efforts. Several literature-based relationships are tested with a recursive path model using a multi-industry sample of U.S. service organizations. Most results for the service sector are similar to those found in manufacturing: (a) NSD cross-functional team structures directly influence the effectiveness of the firm's NSD efforts, (b) more formalized NSD processes indirectly influence the firm's ability to develop new services by increasing the speed of NSD, and (c) IT choices directly affect both the speed of the NSD process and the general effectiveness of the firm's NSD activities. Contrary to expectations, no direct relationship between the use of cross-functional team structures and the speed of NSD was found.

Service businesses are vital to the economies of industrialized countries, as they represent the sector with the highest growth in gross domestic product. Yet, many services face hypercompetitive environments (D'Aveni 1994) and, as a result, are in a constant state of flux. Sustaining competitiveness in dynamically changing markets is difficult. Rapid technological advancement, coupled with globalization, is rapidly making service offerings obsolete and changing both the product content and distribution channels. These factors, in turn, create a constant churning of customer requirements and increasing qualifications for service viability.

Given these service industry dynamics, how new services are developed and launched is becoming increasingly important to the competitiveness and growth of service organizations (Fitzsimmons and Fitzsimmons 1999). Unfortunately, the impact of strategic operations choices on the firm's capacity for swift and effective new service development (NSD) is not well understood. Service opera-

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tions management would indeed benefit from an enriched understanding of the NSD process, as it may be distinctive from manufacturing-based new product development (Fitzsimmons and Fitzsimmons 1998; Johne and Storey 1998; Menor 2000). Previous research on goods-oriented new product development provides useful guidance for determining which strategic choice variables are likely to affect NSD (Meyer and DeTore 1999; Nie and Kellogg 1999; Sundbo 1998). The primary goal of this exploratory study is to assess, at the most general level, the following question: What is the impact of theory-based, strategic operations choices on the speed and effectiveness of a firm's NSD efforts?

Although grounded in service operations strategy, marketing and strategy research also support the selection of these operations choices. Through a synthesis of earlier studies, Miller (1986) hypothesized a strategic configuration he refers to as the "innovative differentiator." Strategically innovative firms resembling this configuration rely on open and informal communication systems, intense collaboration, and organic organizational structures to rapidly adapt to new environments (i.e., markets) and introduce novel products and services. When considering the speed and effectiveness of these development processes, more contemporary research has similarly suggested that two strategic choices have significant impact on product development outcomes, namely, (a) the design of the NSD process (Edvardsson, Haglund, and Mattsson 1995; Scheuing and Johnson 1989; Terrill 1992; Voss et al. 1992) and (b) the firm's organizational structure (Olson, Walker, and Ruekert 1995; Terrill 1992), such as the use of cross-functional development teams or dedicated innovation functions (Sundbo 1998). More recently, Meyer and DeTore's (1999) case-based research developed a framework for NSD anchored on three critical elements, namely, multidisciplinary teams, highly specified processes, and computer systems technology.

These organizational and process elements are especially important to consider when evaluating the impact of information technology (IT) on NSD, as IT decisions must simultaneously take into account both organizational structure (Orlikowski, Walsham, and Jones 1996) and business process design (Davenport 1993) if maximum benefit is to be obtained. Menor, Roth, and Mason (1998) empirically showed that agile service archetypes (i.e., those able to introduce new service products more rapidly than others) have significantly better control over their IT infrastructures than do their nonagile counterparts.

This study concurrently examines the effects of three literature-based strategic operations choices on NSD speed and effectiveness outcomes: (a) the use of cross-functional, team-based organizational structures for NSD; (b) the degree of NSD process formalization; and (c) the sophistication of IT infrastructures employed within the firm. We explore these managerial choices at the strategic, as opposed to tactical, level to maximize generalizability and breadth of inference for resource deployment and expected outcomes. In addition, examining core NSD issues at a broad-scale, strategic level across multiple service industries helps us establish an empirically based future research agenda for new service development.

The next section of this article provides greater detail on the conceptual background and motivation related to these research objectives and offers several formal hypotheses. A recursive path model is then developed to formally test these exploratory hypotheses in the third section. The fourth section presents the empirical results, and the final section presents our conclusions, related opportunities for further research, and managerial implications.

MOTIVATION: STRATEGIC ROLE OF NSD

The importance of NSD to business spans industries, cultures, and geographic differences. Many executives remember when Japan virtually wiped out many high-technology industries and cast doubt on Porter's (1985) competitive model. Similarly today, the Internet is charting new territory in services and distribution. E-services like Amazon.com are fundamentally changing the rules of business. Prominent business leaders have publicly stated that improving their companies' capabilities for developing new products and services is a primary concern for the foreseeable future (*Best Practices for Global Competitiveness* 1998; Scott 1999). Business scholars have hypothesized and repeatedly demonstrated the importance of developing these capabilities at the strategic level. Such innovativeness forms a core characteristic of strategic archetypes in many different conceptual typologies and empirically verified taxonomies (e.g., Miles and Snow's 1978 and Hambrick's 1983 "prospector configuration" and Menor, Roth, and Mason's 1998 "agile strategic service group").

In IBM's 1995 annual report, the company reported that its rapidly developing services operations were the fastest growing portion of the company's business and accounted for nearly a third of annual revenues. America Online is continually morphing itself by adding new services to its Web-based offerings. Burger King is exploring augmentation of its current services with IT-based features; in its Manhattan branch, each customer who purchases a value meal gets 20 minutes of Internet access on in-store computers. McDonald's has transformed its highly standardized offerings, from "have it *our* way" to "made for you." These are but a few of the many examples of how rapidly changing service industries are looking to NSD to obtain a competitive advantage over their competitors.

Despite its criticality, the strategic operational aspects of the NSD process are still poorly understood (Gadrey, Gallouj, and Weinstein 1995; Johnson et al. 1999; Meyer and DeTore 1999) and are not yet fully integrated into the service strategy research literature as in the manufacturing literature (Menor 2000). Consequently, when compared to tangible products, services are generally underdesigned and inefficiently developed. Behara and Chase (1993) observed this condition, noting that "if we designed cars the way we seem to design services, they'd probably come with one axle and five wheels" (p. 87). A similar assertion concerning design is reported by Roth, Chase, and Voss (1997). A trial-and-error type of approach has traditionally dominated service development efforts (Shostack 1984), resulting in irreproducible methods, unpredictable success levels, and unsatisfactory development results.

NSD has never been more vital to success in service operations. If this capability is to make a significant contribution to corporate performance, strategic factors contributing to NSD speed and effectiveness must be more rigorously understood and better implemented. Thus, based on these considerations, as well as the theoretical foundations discussed earlier, this study empirically examines the influence of three fundamental service design elements (Meyer and DeTore 1999) on NSD effectiveness. These strategic operations choices include (a) the relative sophistication of the firm's IT infrastructure, (b) the degree to which the service incorporates NSD cross-functional teams in the firm's organizational structure, and (c) the level of formalization of the firm's NSD process. Each is discussed below.

Information Technology as NSD Enabler

Information is strategically important to service design along several dimensions. Fitzsimmons and Fitzsimmons (1998) outline four such critical roles, two of which are productivity enhancement and the development of database assets. Information-based productivity enhancement in NSD requires capable information-handling processes, whereas the use of an NSD-oriented information base (e.g., customer relationship management and data warehouses) helps generate ideas for new services or service enhancements. This information base can be tacit, as in employees' previous experiences, or explicit, such as a software-based storehouse of patent ideas, previous discoveries, and market intelligence (Ljungberg 1982). Marketing data about customers or competitors is often cited as an important, if not principal, source for successful new services (Sundbo 1997; Voss et al. 1992), and such market acuity frequently plays a role in the swift imitation of new services (Meyer and DeTore 1999; Roth and Jackson 1995). Menor, Roth, and Mason (1998) also found that market acuity was associated with high levels of service agility, thereby providing an empirical linkage between IT use and the ability to act and react swiftly.

Besides providing directly relevant information on a topic, interestingly, databases are often a source of tangentially related ideas as well. Martin (1982) found that on large-scale database searches, roughly 20% of the results are immediately applicable, and another 60% are only slightly related to the topic at hand. Martin also discovered that by surveying this other marginally relevant 60%, researchers and scientists often uncover extensions and new uses not previously considered. Thus, the exploratory portion of the development process is even more successful than might have been anticipated. Information-rich environments have also been associated with highly innovative organizations (Hill 1982). One key method of attaining such richness is by tapping into a variety of knowledge sources. Because employees are often seen as key information resources, their value increases with the velocity of their circulation (Leonard-Barton 1992; Prahalad and Hamel 1990). IT can enable virtual circulation by improving communication flows and allowing easier access to individuals otherwise separated by distance or language. In addition, because more sophisticated IT systems are often associated with richer forms of communication, more complete transfers of knowledge may take place between individuals (Kellogg and Chase 1995).

The role of IT is especially critical to services, as it has quickly become one of the most important infrastructural elements of service firms. Huete and Roth (1988) showed that, in information-intensive banking services, IT was frequently a vital part of the production and delivery process. As an information transfer and communication facilitator, IT can improve interaction within and between firms, can enable organizational transformation (Guile and Quinn 1988; Zuboff 1996), and can help streamline and reengineer vital business processes (Davenport 1993; Grint, Case, and Willcocks 1996; Wang 1997). Although success in the development of new services has been tangentially linked to the use of IT in some prior research (Guile and Quinn 1988; Heskett, Sasser, and Hart 1990; Huete and Roth 1988; Quinn and Paquette 1990), the evidence has been primarily anecdotal, limited in its generalizability (due to a focus on a specific industry or operationalization), or narrow in its definition.

There is a distinct trend in services toward including more informational content with the labor and goods that comprise the total service package (Huete and Roth 1988; Porter and Millar 1985; Quinn and Paquette 1990). Advanced information technologies, such as groupware, intranets, and electronic commerce, help organizations direct, organize, and revitalize these flows of organizational knowledge, thereby creating better processes and better service products. It should come as no surprise, then, that Roth and Jackson (1995) empirically found service innovation to be an integral component of a technology leadership scale. Similarly, sophisticated IT systems have also been shown to accelerate decision-making processes (Opper and Fersko-Weiss 1992).

Thus, there appears to be some preliminary evidence for IT's ability to support NSD in three ways: (a) IT enhances communication, reduces information lags, and generally speeds up the product development cycle; (b) IT fosters the conceptualization and creation of new ideas by improving the availability of new content; and (c) IT provides measures for timely organizational feedback, which improves the overall effectiveness of the innovation. Therefore, two related hypotheses are offered as follows:

Hypothesis 1a: The sophistication of the information technology infrastructure (IT) positively influences the speed of the NSD process (SPEED).

Hypothesis 1b: Above and beyond the contribution to NSD speed, the sophistication of the information technology infrastructure (IT) positively influences the overall effectiveness of the NSD process (EFFEC).

The Role of Teams in NSD

How the people in a firm are functionally and hierarchically related to each other, as represented by the organizational structure, has received a great deal of attention from both practitioners and academics. In particular, the new product development literature suggests that cross-functional teams "increase the likelihood of new product development success" (Schilling and Hill 1998, p. 74). Page (1993) found that more than three fourths of the responding companies use multidisciplinary teams to develop new products. Similarly, Cooper and Kleinschmidt (1995) found that solid performers generally used cross-functional teams. In the context of NSD, there is also evidence regarding the importance of cross-functional teams (Meyer and DeTore 1999; Sundbo 1998). The findings of Olson, Walker, and Ruekert (1995) showed that team importance increases with the level of novelty represented by the new product, as more formalized communication networks inhibit the free-form communication needed to integrate atypical concepts.

Davenport (1993) and Terrill (1992) offer support, albeit anecdotal, to the proposition that teamwork and integration are critical to process innovation efforts. Specifically, they found that effective process innovation teams span traditional organizational boundaries and consist of members who contribute unique abilities and knowledge. Gallouj and Weinstein (1997) reflected this belief in their position that flexible, cross-functional teams are successful in development activities because of the new combinations of knowledge and competencies they offer to the organization. Pisano (1997) found that integrated, cross-functional organizations completed development projects sooner and with fewer effort hours than did firms that were separated functionally. Through a careful inspection and survey of earlier innovation research, Brown and Eisenhardt (1995) outlined three different models that are used to describe new product development. One central element that these authors included in their integrated model of new product development is planning and team organization. They posit that these characteristics are related to speedy innovation processes. Therefore, we expect that in services, the use of cross-functional teams will influence NSD outcomes, so our next hypothesis is

Hypothesis 2a: The employment of NSD teams (TEAM) positively influences the speed of the NSD process (SPEED).

Research by Ancona and Caldwell (1992) showed that diverse teams not only brought more experience to the new product development effort but that their greater degree of external communication further enhanced the generation and quality of new ideas. Quinn, Baruch, and Paquette (1988) described multidisciplinary, cross-organizational structures as important for effective implementation of decision making. The communication web model of new product development, as presented by Brown and Eisenhardt (1995), corroborates the view that creativity is often a result of communication between parties with different knowledge sets. Collectively, these studies suggest that team structures can directly affect the overall success of NSD independent of new product development speed. Therefore, we hypothesize

Hypothesis 2b: Above and beyond the contribution to NSD speed, the employment of NSD teams (TEAM) positively influences the overall effectiveness of the NSD process (EFFEC).

Design of the NSD Process

The service development process has been analytically dissected and modeled by numerous researchers, including Shostack (1984, 1985, 1987), Bowers (1985), Scheuing and Johnson (1989), Edvardsson and Olsson (1996), Menor (2000), Sundbo (1997), and others. The competitive importance of the NSD process has been widely hypothesized. For example, in their case-based study of an insurance firm's NSD processes, Meyer and DeTore (1999) reported that "the founders believed that the more it could do to systematize the development and delivery of these service components, the greater would be its ability to deploy them in service teams rapidly and in volume" (p. 70). These authors clearly implied that systematic processes would influence the speed of NSD. However, empirical tests of the systematic relationship between process characteristics and NSD outcomes are not as prevalent in the service literature as in the manufacturing literature.

In their comprehensive model of new product development, Kessler and Chakrabarti (1996) include development process design as an important factor in determining successful new product development outcomes. Their model holds that more formalized process controls and conscious, rather than ad hoc, process designs enable more robust development cycles for manufacturers. Cooper and Kleinschmidt (1995) found that a high-quality new product development process was characteristic of better performers in manufacturing because there "was a focus on quality of execution" (p. 384).

Focused on banking services, Roth and van der Velde (1992) empirically observed in a sample of world-class banks that market leaders "continue to develop products and service innovations that have differentiable value . . . and drive competitors out of their markets" (p. 28). The research of Olson, Walker, and Ruekert (1995) supports this view for the development of products and services that are more familiar to the firm. Tax and Stuart (1997) discuss the importance of a well-defined NSD process, especially one that considers the entire service system. Because formalization of the NSD process involves more systematic approaches to innovation, it can be replicated more easily and reduce cycle time. Formalization usually incorporates common rules, product platforms, integrated subsystems, and other key building blocks that enable the service provider to anticipate and respond to market dynamics. This leverage leads to our next hypothesis.

Hypothesis 3: Process formalization (PROC) positively influences the speed of the NSD process (SPEED).

Speed as an Antecedent of Effectiveness

Miller and Friesen (1984) identified a class of firms (labeled *innovators*) that were successful through the "frequent generation of product innovations" in order to dominate niche markets (p. 119). This definition suggests that the rapid development of new products and services is an integral component of innovation-based competition. Successful firms constantly reexamine their development processes in search of better methods, shorter cycles, and time-based performance measurements.

Indeed, one relationship central to Brown and Eisenhardt's (1995) new product development model posits that the speed of innovation directly contributes to the overall success of a firm's development efforts. In the 1991 General Electric Annual Report, John Welch, then chairman and chief executive officer, commented on the need for swiftness in his company's development of new services and products: "Speed tends to propel ideas and drive processes right through functional barriers, sweeping bureaucrats and their impediments aside in the rush to get to the marketplace." Development speed is a desirable outcome that results from purposeful development process design. Rapid development processes allow more new services to be developed when resources are constrained, all other things being equal (Edgett 1994). Therefore, our final hypothesis is stated as follows:

Hypothesis 4: The speed of the NSD process (SPEED) positively influences the overall effectiveness of the NSD process (EFFEC).

EMPIRICAL MODEL

Path Model

Taken together in a cohesive structure, the above hypotheses form the model shown in Figure 1. This model illustrates the close interrelationships that tie NSD to the core concepts of IT, team structures, and process formalization. As hypothesized, speed is also seen as an endogenous antecedent of NSD effectiveness. Each relationship is shown as a directional arrow in the model and is labeled with its corresponding hypothesis.

Database

The data to test the hypotheses in this study were obtained from the U.S. subset of firms participating in the International Service Study (ISS) (Roth, Chase, and Voss 1997; Voss et al. 1997). Started in 1996, the ISS is a collaborative research initiative of U.S. and European academic

FIGURE 1
Hypothesized Path Model of the Influences of Strategic Choices on New Service Development (NSD) Outcomes

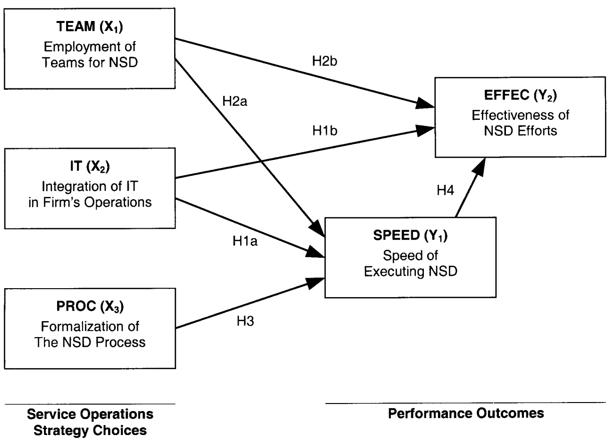
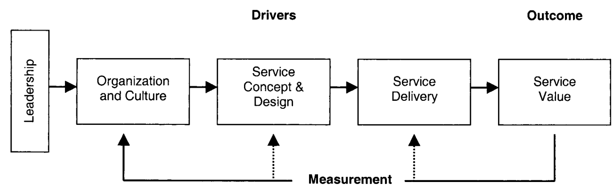


FIGURE 2
International Service Study Research Model



institutions to determine state-of-the-art service management practices and to investigate a wide set of factors hypothesized to influence performance.

Development of the original ISS research framework, shown in Figure 2, drew on a range of sources. The first was the "service profit chain" (Heskett et al. 1994), which postulated a chain of interaction from management of the workforce, through productivity, service quality, customer satisfaction, customer retention, to profitability. To expand the model, the research drew on a wide range of published research. This included service quality, where the items were derived from SERVQUAL research (Parasuraman, Zeithaml, and Berry 1988; Roth and van der Velde 1992), service mapping (Shostack 1984), moments of truth (Albrecht and Zemke 1985), innovation, design (De Bretani 1989; Edgett 1994; Edvardsson, Haglund, and Mattsson 1995; Quinn and Paquette 1990; Storey and Easingwood 1993; Voss et al. 1992), performance measurement (Chiesa, Coughlan, and Voss 1996; Olson, Walker, and Ruekert 1995; Roth and Jackson 1995; Roth and van der Velde 1991, 1992), total quality management (National Institute of Standards and Technology [NIST] 1996), quality leadership (NIST 1996), service recovery (Hart 1988), and empowerment (Bowen and Lawler 1992).

To increase the validity of the overall model, it was tested against three established practitioner models: the Malcolm Baldrige National Quality Award (NIST 1996), the European Quality Award (European Foundation for Quality Management 1996), and from the United Kingdom, the Citizens' Charter (1996). All three were widely used and accepted by commercial and noncommercial service organizations at the time of the study. The Baldrige model has been shown to have content, construct, and predictive validity; it is also broader than other models in these areas (Pannirselvam, Siferd, and Ruch 1998).

Overall, 80 questions were developed for the ISS survey. The structure of the questionnaire and a list of the individual question topics are available in Roth, Chase, and Voss (1997). Each was assessed on a 5-point scale, and each had a question descriptor. The scales also had descriptors of the states of practice or performance, ranging from 1 to 5, where 1 indicated *low (poor) levels of best practices (performance)* and 5 indicated *state-of-the-art (outstanding) levels of practices (performance).* Descriptors 2, 3, and 4 represented intermediate points. Note that some items were reverse coded. All questions were field tested, reviewed by subject experts, and where appropriate, revised before final use, based on tentative reliability and validity. The operationalization of the five variables included in this article is described in more detail below.

A trial-and-error type of approach has traditionally dominated service development efforts (Shostack 1984). The factors leading to successful service design or innovation have been studied by a number of authors (De Bretani 1989; Edgett 1994; Edvardsson, Haglund, and Mattsson 1995; Martin and Horne 1993; Menor 2000; Storey and Easingwood 1993). Effective design will require appropriate organization and coordination and a process for design and improvement (Chiesa, Coughlan, and Voss 1996). Organizational integration, through cross-functional teams, for example, is thought to be important (Cooper and Kleinschmidt 1995; Olson, Walker, and Ruekert 1995). The ISS study developed two questions that served as reasonable proxy variables to examine these areas:

NSD team implementation (TEAM). The question descriptor was "organizational structure for new service and product development." The descriptor for a score of 1 was "ad hoc design and development of new services," and for a score of 5, "cross-functional staff teams typically develop new services and products (with or without internal/external support)."

NSD process formalization (PROC). The question descriptor was "new service design and development process." The descriptor for a score of 1 was "no identifiable process for new service development; ad hoc basis," and for a score of 5, "formal and reproducible processes for developing new and enhancing existing services."

The objective of the design process is rapid and effective introduction of new and modified services and products. Measures of success of service innovation and development have been developed on a number of dimensions (Chiesa, Coughlan, and Voss 1996; Roth and van der Velde 1992; Storey and Easingwood 1993). Voss et al. (1992) proposed a series of measures of the service innovation and design process: cost, effectiveness, and speed. To measure service effectiveness, two ISS variables served as proxies for the theoretically important outcomes in the model:

NSD speed (SPEED). The question descriptor was "speed of development, relative to competition." The descriptor for a score of 1 was "often lag competition," and for a score of 5, "consistently beat competition to the market."

NSD effectiveness (EFFEC). The question descriptor was "number of innovations and development of new ideas and services." The descriptor for a score of 1 was "no recent innovations in service concept and process," and for a score of 5, "many innovations; recognized as a leading innovator in industry/segment."

Central to the effective use and redesign of processes, such as new product and service development, is the use of IT. In many cases, the coupling of IT and process redesign has enabled organizations to completely change the basis of industry competition (Davenport 1993). To assess the firm's degree of IT sophistication, the following variable served as a proxy:

Information technology (IT). The question descriptor was "current use of information technology (IT)." The descriptor for a score of 1 was "IT used just for standard applications (e.g., accounts, invoicing, payroll)," and for a score of 5, "IT and other technologies used to support redesign of business processes in order to change the basis of industry competition."

TABLE 1
Distribution of U.S. Respondents by Service Industry

Principal Industry Affiliation	*Number of Respondents*	*Percentage of Respondents*
Health care	40	22
Financial services	32	18
Professional services	24	13
Utilities	19	10
Hotels	15	8
Retail	13	7
Transportation	11	6
Industrial services	9	5
Dining/food services	6	3
Local government	6	3
Information systems	5	3
Media	2	1
Total	182	100

SOURCE: Roth, Chase, and Voss (1997).
NOTE: Due to rounding, percentages do not total 100.

TABLE 2
Distribution of U.S. Respondents by Size

Number of Employees	*Number of Respondents*	*Percentage of Respondents*
Fewer than 50	22	12
50 to 200	30	16
201 to 500	28	15
More than 500	99	54
Not applicable	3	2
Total	182	100

SOURCE: Roth, Chase, and Voss (1997).
NOTE: Due to rounding, percentages do not total 100.

Sample firms were selected from a range of sources, including trade directories and government sources. The ISS sample was chosen carefully to ensure representation from a diverse group of service firms (Roth, Chase, and Voss 1997). The ISS did not, however, employ probability sampling methods of the entire service firm population, nor did the researchers desire to have measurement aimed at a single service sector. The sampling frame for the U.S. subset used in this research was based primarily on the Conference Board's Total Quality Management Center (TQMC) service firm member list as of January 1996. The population at that time of 48 TQMC service members was contacted, of which 71% participated in our study. All members were contacted personally for participation, and appropriate internal company contacts were located. Note that for the most part, these providers are service exemplars in that they are among the most well known and highly respected firms in the United States.

To augment this exemplar group of service providers, we applied quota sampling to obtain a minimum of 15 "typical or average" firms in targeted sectors: health care, financial services, professional services, public sector, utilities, and hotels (see Table 1). We also stratified the sample to cover a range of organization sizes (see Table 2); however, very small services, such as sole proprietorships, were excluded. Thus, the final sample, although not generalizable to all U.S. services, is entirely appropriate in explanatory studies that examine unique or complex phenomena (Pinsonneault and Kraemer 1993). The resultant sample, composed of both well-known service exemplars and lesser known organizations across the United States, is biased toward higher performing firms. About 64.6% are service exemplars, and 14.9% are laggards with poor practice and performance; the remaining 20.5% could be considered competitive (Roth, Chase, and Voss 1997). These groups were validated against Baldrige Assessment Scores, where possible.

The process for data collection was designed to avoid the problems of single-respondent interviews (Huber and Power 1985). One to two weeks in advance of the interview, the questionnaire was sent to a designated research coordinator in the organization. This person was asked to gather a "diagonal slice" team, covering different departments of the organization and different levels, from customer-contact employees to management. Each company team member was then asked to respond to the questions individually; they were then asked to meet as a team to debate each of the questions and come to a consensus as to the correct response. If there was still disagreement, they were to gather further information in order to clarify and overcome disagreement and, failing that, to bring the alternate views to the next stage. The final stage was a 3- to 4-hour meeting between the organization and the research interviewer. The interviewer reviewed each question with the organization and, where appropriate, sought further information. The final score on all items was determined by the interviewer based on the output of the team, moderated by the further information gathered at the interview. Total anonymity was guaranteed, and tailored research summaries were promised to motivate the respondents to answer objectively.

The management interviews, using this structured protocol, provided rich data and additional case insight into each company's operations, values, attitudes, and performance. As some of the items represent rather complex topics (e.g., IT sophistication), it was necessary for the researchers to explore the qualitative aspects of the corporate environments before an appropriate quantitative score could be assigned. This combination of qualitative case observations and quantitative data has proven to be very useful to researchers (Creswell 1994; Miles 1979). In addition, the interviewers were highly trained, exposed to a large number of firms, and cross-evaluated for consistency of assessment scoring.

TABLE 3
Summary Statistics for Observed Variables (*n* = 175)

			Pearson Correlations				
Item	*Mean*	SD	*TEAM*	*PROC*	*IT*	*EFFEC*	*SPEED*
TEAM	3.08	1.35	1.00				
PROC	3.09	1.14	0.63	1.00			
IT	3.55	1.02	0.26	0.25	1.00		
EFFEC	3.30	1.11	0.38	0.35	0.34	1.00	
SPEED	3.10	1.16	0.20	0.28	0.30	0.54	1.00

SOURCE: Roth, Chase, and Voss (1997).
NOTE: All items were assessed using 5-point Likert-type scales; none were reverse coded. TEAM = new service development (NSD) teams; PROC = process formalization; IT = integration of information technology; EFFEC = effectiveness of the NSD process; SPEED = speed of the NSD process.

Of the 182 U.S. service firms involved in the study, 7 were removed from the data set due to significant missing data. The remaining 175 firms were then used in the recursive path analysis (Bollen 1989). Summary statistics for the analyzed variables are shown in Table 3.

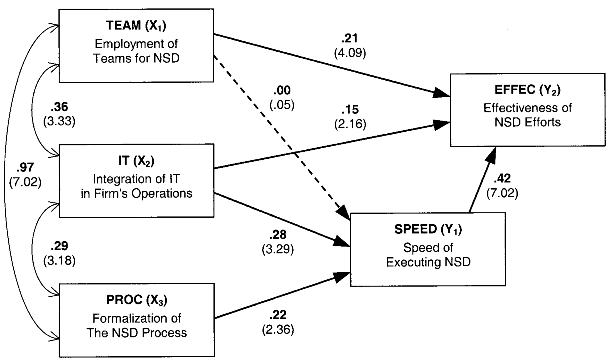
ANALYSIS AND RESULTS

The hypothesized path model in Figure 1 was formally tested using the AMOS software package (Arbuckle 1997). The observed $\chi^2 = .60$ ($p < .44$) implies that the model is appropriately representative of the sample data. In addition, global fit indices (NFI = .997, CFI = 1.000, IFI = 1.002, and RMSEA < .001), local parameter estimates, and observed residuals support that the model is robust (see Figure 2) (Bentler 1990; Bollen 1989; Dillon and Goldstein 1989).

The resulting regression coefficients for each relationship are shown in Figure 3. The estimated covariances between the independent variables (X_i) are shown, as are the parameter estimates between independent variables and dependent variables (Y_j) and the parameter estimate of the relationship linking the two dependent variables. All coefficient estimates are significant at the .05 level, except for the direct relationship between TEAM and SPEED.

The magnitudes of the standardized regression weights provide guidance regarding the relative influence of the strategic choice variables on the NSD outcome measures. A summary of these findings is shown in Table 4, and Ta-

FIGURE 3
Resulting Path Model of the Influences of Strategic Choices on New Service Development (NSD) Outcomes



NOTE: Paths are labeled with standardized regression coefficients (*t* statistics in parentheses).

ble 5 provides a summary of the direct, indirect, and total effects for each relationship.

Impact of Information Technology

The role of IT, in terms of its effect on the firm's capacity for rapidly developing new services, is represented by Hypothesis 1a, which was supported. Our results are consistent with Quinn and Paquette's (1990) findings that technology can facilitate innovation and development processes, especially when systems are easy to use, synergistic, and supportive. They demonstrate the enabling role of IT to facilitate rapid communication and feedback, reduce error and redundancy, and streamline the service design process. As more services examine their NSD systems, our empirical findings indicate that IT can be an integral component in creating a capability for swift NSD.

Access to more timely and accurate information is one such benefit of IT in the NSD process. A regional manager of a major fast-food restaurant chain involved in the study illustrated this by saying, "Our company-owned restaurants are wired in for sales—sales numbers come into the corporate offices all the time. This gives us a real handle on where a new process is working and where it is not." Such technologies provide tangible support for critical activities, like process verification, in a firm's NSD efforts. This is similar to the managed care case study results of Meyer and DeTore (1999).

Support for Hypothesis 1b, which posited a reinforcing relationship between IT and overall NSD effectiveness, implies additional benefits from IT. "Informating" technologies (Zuboff 1988) appear capable of extending the communication web much like the diversity of the cross-functional team and result in a similarly beneficial effect. New ideas, whether evolving from lunchtime conversations or extended data-mining sessions, are often fodder for the conceptualization process and therefore possess real, potential benefit to the organization. One entertainment industry executive from our study claimed that having access to valid and reliable data made it easier to develop more customized products for each market segment. A telecommunications executive told us that his firm's advanced IT systems supported the frontline workers with scripts and product information regarding each new service. The company had undergone a significant reengineering effort, and IT was used as a key enabler for enhancing employee productivity.

TABLE 4
Summary of Results

Hypothesis	*Hypothesized Direct Relationships*	*Result*	*Confidence Level*	*Coefficient Estimate*
1a	IT → SPEED	Supported	$p < .01$	.28
1b	IT → EFFEC	Supported	$p < .05$	.15
2a	TEAM → SPEED	Rejected	$p > .25$	.00
2b	TEAM → EFFEC	Supported	$p < .01$	.21
3	PROC → SPEED	Supported	$p < .05$	.22
4	SPEED → EFFEC	Supported	$p < .01$	.42

NOTE: TEAM = new service development (NSD) teams; PROC = process formalization; IT = integration of information technology; EFFEC = effectiveness of the NSD process; SPEED = speed of the NSD process.

TABLE 5
Summary of Effects

Effect of	*On*	*Direct Effect*	*Indirect Effect*	*Total Effect*
TEAM	SPEED	.00	—	.00
IT	SPEED	.28	—	.28
PROC	SPEED	.22	—	.22
TEAM	EFFEC	.21	.00	.21
IT	EFFEC	.15	.12	.27
PROC	EFFEC	—	.09	.09
SPEED	EFFEC	.42	—	.42

NOTE: Values are standardized regression coefficients (β). TEAM = new service development (NSD) teams; PROC = process formalization; IT = integration of information technology; EFFEC = effectiveness of the NSD process; SPEED = speed of the NSD process.

Impact of Organizational Structure

The use of cross-functional staff to develop new services did not directly contribute to the speed of the NSD process; therefore, Hypothesis 2a was rejected. This finding is counter to that of Miller and Friesen (1984) and has significant implications for service management. The "best practice" of Pdiverse, cross-functional teams does not seem to consistently help accelerate the service development process more than non-team-based approaches, such as ad hoc deployment or dedicated new product staff.

Our findings provide general support to the conclusions of Olson, Walker, and Ruekert (1995), who posited that teams are not the best structure for all NSD tasks, especially when speed is a concern. It is plausible, then, that obtaining cross-functional inputs, especially at the front end of the NSD process where considerable uncertainty exists and complex information is required, may actually impede development speed. Although important, attaining concurrence of opinion and aligning invested functions within the firm can introduce significant delays into the development process. When developing a new service that is unfamiliar to the firm, the initial opinions and positions can be greatly varied, making this information-gathering and consensus-building process much more complicated and time consuming.

Although the indirect relationship between team deployment and NSD process effectiveness, as mediated by NSD speed, was not found, we did find a strong direct relationship between TEAM and EFFEC. Thus, Hypothesis 2b was supported. This indicates that the use of development teams for NSD has a direct effect on NSD outcomes by promoting activities and additional considerations not systematically related to execution speed. One banker from the study reported that pulling together multidisciplinary teams was a bit more time consuming in that it took more time for the team to become a working group and develop a shared vision of the new service requirements; however, the ultimate consumer satisfaction with the new service was generally better than if only a single function's perspectives were used. Often, the multidisciplinary teams include a customer representative as well. Another participant indicated that multidisciplinary teams spent more time in up-front planning, which resulted in "significantly better returns." Attributing to the mixed results regarding speed, one hotel executive indicated that "pulling together people in cross-functional teams that have worked together and know each other increases development speed."

Our findings generally corroborate the empirical results of Cooper and Kleinschmidt (1995), who found that the use of high-quality, cross-functional teams was a driver of new product development performance. However, upon closer examination, the results of Hypotheses 2a and 2b support the conclusions of Ancona and Caldwell (1992) and Brown and Eisenhardt (1995) that cross-functional teams benefit the NSD process more through their diversity and richness of ideas than through any consistent advantages in efficiency or speed. It should be noted, however, that the size of the team, in addition to its composition, has been noted by Cohen and Bailey (1997) to affect speed and efficiency; however, we did not include size data in our research. Nevertheless, we believe that our findings raise important questions about the organizational dynamics and the potential trade-offs that service providers make between bringing new services to market quickly to capture market share and the ultimate effectiveness (or quality) of the innovation.

Impact of Process Formalization on NSD Speed

As expected, more formalized service development processes contribute directly to the speed of a firm's NSD efforts, as evidenced by support for Hypothesis 3. Process formalization routinizes certain support activities, systematizes knowledge, and offers sequences of steps that enhance learning about how to innovate (Behara and Chase 1993; Johnson et al. 1999). McDonald's, for example, has very formalized processes for its NSD. Its speedy rollout of the "made for you" campaign was highly systematized.

When developing new services that are somewhat familiar to the firm (i.e., that are not dramatically different from other offerings), a formalized process would seem intuitively appealing for its ability to reduce miscommunication, eliminate non-value-added activities, and improve project flow. It has been suggested that for new services that lie outside the firm's current experience, flexible and purposefully amorphous processes may be more effective (Olson, Walker, and Ruekert 1995). This is an important differentiation, as managers often struggle with determining the appropriate level of control over complex processes.

Impact of Speed on NSD Effectiveness

Supporting Hypothesis 4, the results indicate a strong positive relationship between the speed of the NSD process (SPEED) and the general effectiveness of the firm's NSD efforts (EFFEC). Interestingly, although new product introduction speed, as advocated by practitioners, does directly influence the service firm's overall advantage in turning ideas into competitive new service products, the magnitude of the path coefficient indicates that the effectiveness of a firm's NSD efforts is influenced by other factors as well. Khurana and Rosenthal (1998) suggest that a clear product strategy, project definition, and clear organizational roles affect outcomes in product-based firms. By analogy, these product factors may also be important in services. In services, Roth and van der Velde (1992) found a relationship between market leadership and the speed and number of new service innovations. However, in manufacturing, Ittner and Larcker (1997) state that "simply accelerating product development does not guarantee competitive advantage" (p. 22). The exploratory results offered here indicate that although speed does aid a firm's NSD initiatives, it should not be the organization's sole development goal or primary metric.

CONCLUSION

From these results, it appears that the strategic operations choices service firms make regarding IT, the use of teams for NSD, and NSD process design significantly influence their ability to develop new services quickly and effectively. The findings here show general support for the emerging NSD literature and lead to some pragmatic prescriptions for managers about how to best allocate scarce resources for NSD. In addition, the study has crystallized some rather interesting relationships as well as refuted some previously developed ideas.

IT choices appear to play a significant role in improving both the speed of the NSD process and the effectiveness of the firm's NSD efforts. Thus, investments in process-enabling information technologies can yield multiple benefits, increasing the generation of new ideas, accelerating the development of new services based on those ideas, and generally supporting the firm's goal of rapidly bringing new offerings to market. To realize these benefits, however, organizations must do more than just issuing a purchase order. In this study and others, training, employee attitudes, and the perception of managerial encouragement have all been shown to moderate the effectiveness and adoption of new IT tools (Agarwal and Prasad 1997; Leonard-Barton and Deschamps 1988; Roth, Chase, and Voss 1997). So, NSD process improvement efforts, based on the implementation and introduction of new IT tools, appears to be justified as long as proper organizational preparations have been made.

The employment of teams for NSD directly contributes to the overall effectiveness of developing new services, but contrary to earlier research, no definite connection was found between a multidisciplinary team structure and service development speed, ceteris paribus. Our conclusions regarding this finding align with the theoretical models developed by Ancona and Caldwell (1992) and Brown and Eisenhardt (1995). That is, teams appear to benefit the firm's NSD efforts through the improved creativity and breadth of ideas that are associated with diversity, given that proper motivation is also provided from management. In contrast, however, there appears to be no systematic empirical connection between the use of cross-functional development teams and any significant benefit in terms of process execution speed. This is a noteworthy difference between services and manufacturing and should be considered when planning an NSD strategy. This is clearly an area for future research.

Formalization of the NSD process directly contributes to the execution speed of the company's service design subprocesses. This finding suggests that those service firms with formal and reproducible processes for developing new and enhanced services are more likely to outperform competitors by taking advantage of "first mover" benefits or by quickly imitating leading-edge competitors.

Limitations

This study, like any other, has methodological and conceptual limitations. Although it resulted in some interesting findings, the path analysis used in this exploratory examination assumed that the observed variables were measured without error. This assumption is consistent with traditional regression and path analytic techniques; however, it is a restriction that should be considered when evaluating the statistical generalizability of our results (Bollen 1989). Another methodological issue is sampling. The sample of firms used here was not drawn randomly but, rather, represents a set of generally superior-performing Conference Board member companies located in the United States. Therefore, the extension of our results to poorly performing firms or to companies outside the United States should be done with caution.

Conceptually, there are two limitations of this study that should be considered. First, using a sample composed of firms in a wide array of industries presents both opportunities and limitations. Although the ISS sample is one of the most diverse that we have seen in services research, this diversity may have caused the strength of some of the relationships discovered in our model to be somewhat attenuated. Firms in an industry with a stronger relationship between two variables may have been partly offset by firms in an industry with a weaker relationship. A more focused version of this study that concentrates on only a single industry may find slightly different path coefficients than what were found with our current sample. However, in general, due to the variety of industries and firm types represented and the statistical significance of our results, we would not expect any service industry to consistently exhibit dramatic and systematic deviations from the theoretically derived relationships we empirically verified.

Second, because the constructs involved were assessed at the most general, comprehensive level, our findings must be discussed at a similar level. That is, attempts at deriving detailed linkages between specific characteristics or subcomponents of these constructs are limited to our existing theoretical understanding and to anecdotal evidence from our survey. Achieving greater specificity about the relationships between any pair of constructs included here will require additional research targeted at breaking these top-level constructs down into their various facets or dimensions and then assessing those relationships at a much finer scale.

Future Research

We have investigated a limited set of the dimensions important to the topic, and our findings provide some insights into the directions that a future NSD research agenda may include. First, the underlying model of new product development that was the basis for this study was derived at least in part from the manufacturing and product literature. An implicit question in this research revolves around how well this model transfers to services (Johnson et al. 1999; Meyer and DeTore 1999). Are the requirements for effective NSD similar to those for new products, or does the intangible nature of service, the ease of modification of concepts, and the difficulty of testing off-line due to the simultaneity require a different model (Sundbo 1998)? Although we have not been able to address these questions directly, the strength of the empirical relationships between IT, process formalization, team implementation, and NSD effectiveness would indicate that some of the doubts about transfer of practices may be unfounded. They may be generic success factors for both service and product development, as asserted in prior research by Meyer and DeTore (1999). To the extent that our findings hold, services have much to learn from their manufacturing counterparts regarding new product development. Clearly, there is a considerable agenda for future research in this area. For example, are the three variables studied here more effective in some types of services than in others? It is possible that financial services would lend themselves to considerable formalization, teamwork, and use of IT, whereas some smaller professional services may not.

Second, an important stream of future research will be the study of the process itself. Given that process formalization is important, what is the nature of the process in services? Is it similar or different to that in manufacturing and product design? What is the nature of the integrating systems, policies, or modular approaches used in the process development? Our study has not provided evidence on these more tactical questions, where a direct transfer of techniques from product development may be less appropriate. Indeed, it would be worthwhile to determine whether the relationships derived in this research are affected by such fundamental service contingencies as the extent of customer contact during the service encounter (Johne and Storey 1998) and the form of the service encounter (Huete and Roth 1988). Customer contact can be dichotomized into high contact and low contact (Chase 1981; Chase and Tansik 1983), and the form of the encounter can be classified as assistance based, routine, or environmental (Coyne 1989). It would seem that these structural and process characteristics would call for differential skills and practices in managing NSD and, in turn, modifications to an organization's NSD strategy (Heskett, Sasser, and Hart 1990). The foregoing hypotheses could be readily recast to reflect these issues.

Although there are some similarities in the strategic determinants of product and service innovations, extreme caution needs to be exercised about using direct analogies between them. Heskett, Sasser, and Hart (1990, p. 137) report that consumers adopt innovations in services more slowly than they adopt innovations in goods and that they maintain greater loyalty to services they use than to products they use. Atuahene-Gima (1996) concluded that successfully developing new services is shaped by the quality of customer relationships, which is different than that found for new products. We have demonstrated the importance of IT in the process of NSD; just as important is the role of IT in the services being developed. Future research should focus on such questions as how NSD takes place in IT-rich services.

Third, because the relationships linking process improvements, service quality, and firm performance are complex (Kordupleski, Rust, and Zahorik 1993; Storey and Easingwood 1993, 1998), the impact of these choices on the quality of new service innovations appears to be a significant opportunity for additional study. Whereas speed of introduction and the effectiveness of NSD may generate competitive advantage in the short run, it has been empirically shown that quality is a necessary attribute for long-term development (Roth and Jackson 1995; Voss et al. 1992). Do service innovations have higher profits and systematic advantages over the long run? Under what types of environmental conditions?

Fourth, there may be some decisions in the areas of organizational and process design that are more critical to innovation than others. Although this study established the importance of these broad decisions categorically, further study on all elements of service operations strategy is needed as an aid to managers and as an aid in implementation (Heskett et al. 1994; Roth and van der Velde 1991, 1992).

Fifth, Miller and Friesen (1984) and Menor (2000) proposed that strategic intent dictates in part the level of innovative activities in which companies engage. As strategic intent was not treated here as a separate variable, future studies may wish to examine possible effects that strategic configuration membership might have on service innovation. For example, it would be interesting to establish the relationship between a service firm's strategic intent and the choices made with respect to NSD.

Finally, longitudinal research is needed to assess how changes in each of these areas of managerial choice affect the ability of service firms to innovate. This study shows how each of these areas relate at one moment in time, but as firms are rarely static, greater insight into the dynamics of these relationships would benefit both practitioners and researchers concentrating on this topic. Indeed, as services are becoming increasingly important to the global economy, further empirical research on the NSD process and its related issues will be needed.

Managerial Implications

In light of these findings, several interesting and relevant inferences immediately applicable to everyday management concerns may be drawn.

- The use of diverse, cross-functional NSD team structures has a stronger influence on the overall effectiveness of the development process than on its speed. This has implications both for strategic operations choices in designing NSD systems and for the assessment metrics used. The relative importance of speed versus effectiveness should direct management in its choice of managerial emphasis and the metrics used. If new service effectiveness is crucial, then metrics should not be confined to time-based aspects, such as speed, but should also measure aspects of overall NSD effectiveness such as new service adoption rate and customer satisfaction with new services. Incorporating a wider spectrum of metrics will help to ensure that the benefits of the team structure are appropriately assessed.
- When developing and implementing NSD processes, managers may wish to err on the side of more structured, formal approaches rather than ad hoc initiatives, as the contribution of process formalization to process speed was found to be significant. When working on projects further removed from the firm's current experience and knowledge base, though, some relaxation in the protocol may be appropriate (per Olson, Walker, and Ruekert 1995).
- Managers should take advantage of contemporary information technologies to help improve the speed, quantity, quality, and richness of NSD staff communication. Although assigning a monetary value to the utility of IT systems is as difficult as ever, the results from this research indicate that it can make a significant improvement in both the speed and effectiveness of a firm's NSD efforts.

REFERENCES

Agarwal, R. and J. Prasad (1997), "The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies," *Decision Sciences*, 28, 557-82.

Albrecht, K. and R. Zemke (1985), *Service America! Doing Business in the New Economy*. Homewood, IL: Dow Jones-Irwin.

Ancona, D. G. and D. F. Caldwell (1992), "Demography and Design: Predictors of New Product Team Performance," *Organization Science*, 3, 321-41.

Arbuckle, J. L. (1997), *AMOS User's Guide, Version 3.6*. Chicago: Small Waters Corporation.

Atuahene-Gima, K. (1996), "Differential Potency of Factors Affecting Innovation Performance in Manufacturing and Service Firms in Australia," *Journal of Product Innovation Management*, 13, 35-52.

Behara, R. S. and R. B. Chase (1993), "Service Quality Deployment: Quality Service by Design," in *Perspectives in Operations Management*, R. K. Sarin, ed. Boston: Kluwer.

Bentler, P. M. (1990), "Comparative Fit Indexes in Structural Models," *Psychological Bulletin*, 107, 238-46.

Best Practices for Global Competitiveness (1998), Teleconference presentation, ASQC, New York and London, January 21.

Bollen, K. A. (1989), *Structural Equations with Latent Variables*. New York: John Wiley.

Bowen, D. E. and E. E. Lawler III (1992), "The Empowerment of Service Workers: What, Why, How, and When," *Sloan Management Review*, 33 (3), 31-39.

Bowers, M. R. (1985), "New Product Development in Service Industries," doctoral dissertation, Texas A&M University.

Brown, S. L. and K. M. Eisenhardt (1995), "Product Development: Past Research, Present Findings, and Future Directions," *Academy of Management Review*, 20, 343-78.

Chase, R. B. (1981), "The Customer Contact Approach to Services: Theoretical Bases, and Practical Extensions," *Operations Research*, 30, 698-706.

——— and D. A. Tansik (1983), "The Customer Contact Model for Organizational Design," *Management Science*, 30, 1037-50.

Chiesa, V. R., P. Coughlan, and C. A. Voss (1996), "Developing an Innovation Management Audit," *Journal of Product Innovation Management*, 13 (2), 105-36.

Citizens' Charter (1996), Cabinet Office, London.

Cohen, S. G. and D. E. Bailey (1997), "What Makes Teams Work: Group Effectiveness Research from the Shop Floor to the Executive Suite," *Journal of Management*, 23, 239-90.

Cooper, R. G. and E. J. Kleinschmidt (1995), "Benchmarking the Firm's Critical Success Factors in New Product Development," *Journal of Product Innovation Management*, 12, 374-91.

Coyne, K. (1989), "Beyond Service Fads—Meaningful Strategies for the Real World," *Sloan Management Review*, 30 (4), 69-76.

Creswell, J. W. (1994), *Research Design: Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage.

D'Aveni, R. A. (1994), *Hypercompetition: Managing the Dynamics of Strategic Maneuvering*. New York: Free Press.

Davenport, T. H. (1993), *Process Innovation: Reengineering Work through Information Technology*. Boston: Harvard Business School Press.

De Bretani, U. K. (1989), "Success and Failure in New Industrial Services," *Journal of Product Innovation Management*, 6, 239-58.

Dillon, W. and M. Goldstein (1989), *Multivariate Analysis*. New York: John Wiley.

Edgett, S. (1994), "The Traits of Successful New Service Development," *Journal of Services Marketing*, 8, 40-49.

Edvardsson, B., L. Haglund, and J. Mattsson (1995), "Analysis, Planning, Improvisation and Control in the Development of New Services," *International Journal of Service Industry Management*, 6, 24-35.

——— and J. Olsson (1996), "Key Concepts for New Service Development," *Service Industries Journal*, 16, 140-64.

European Foundation for Quality Management (1996), "The European Model for Business Excellence," European Foundation for Quality Management, Brussels, Belgium.

Fitzsimmons, J. A. and M. J. Fitzsimmons (1998), *Service Management: Operations, Strategy, and Information Technology*, 2nd ed. Boston: Irwin/McGraw-Hill.

——— and ——— (1999), *New Service Development*. Thousand Oaks, CA: Sage.

Gadrey, J., F. Gallouj, and O. Weinstein (1995), "New Modes of Innovation: How Services Benefit Industry," *International Journal of Service Industry Management*, 6, 4-16.

Gallouj, F. and O. Weinstein (1997), "Innovation in Services," *Research Policy*, 26, 537-56.

General Electric (1991), "Annual Report." Fairfield, CT.

Grint, K., P. Case, and L. Willcocks (1996), "Business Process Reengineering Reappraised: The Politics and Technology of Forgetting," in *Information Technology and Changes in Organizational Work*, W. J. Orlikowski, ed. London: Chapman & Hall.

Guile, B. R. and J. B. Quinn (1988), *Technology in Services: Policies for Growth, Trade, and Employment*. Washington, DC: National Academy Press.

Hambrick, D. C. (1983), "Some Tests of the Effectiveness and Functional Attributes of Miles & Snow's Strategic Types," *Academy of Management Journal*, 26, 5-26.

Hart, C.W.L. (1988), "The Power of Unconditional Service Guarantees," *Harvard Business Review*, 66 (4), 54-62.

Heskett, J. L., T. O. Jones, G. W. Loveman, W. E. Sasser Jr., and L. A. Schlesinger (1994), "Putting the Service Profit Chain to Work," *Harvard Business Review*, 72 (2), 164-74.

———, W. E. Sasser, and C. W. Hart (1990), *Service Breakthroughs: Changing the Rules of the Game*. New York: MacMillan.

Huber, G. P. and D. J. Power (1985), "Retrospective Reports of Strategic-Level Managers: Guidelines for Increasing Their Accuracy," *Strategic Management Journal*, 6, 171-80.

Huete, L. and A. V. Roth (1988), "The Industrialization and Span of Retail Banks' Delivery Systems," *International Journal of Operations and Production Management*, 8, 46-66.

Hill, M. W. (1982), "Information for Innovation: A View from the UK" in *Information and Innovation*, B. T. Stern, ed. Amsterdam: North Holland.

IBM (1995), "Annual Report to Shareholders." Armonk, NY.

Ittner, C. D. and D. F. Larcker (1997), "Product Development Cycle Time and Organizational Performance," *Journal of Marketing Research*, 34 (1), 13-23.

Johne, A. and C. Storey (1998), "New Service Development: A Review of the Literature and Annotated Bibliography," *European Journal of Marketing*, 32 (3/4), 184-251.

Johnson, S. P., L. J. Menor, A. V. Roth, and R. B. Chase (1999), "A Critical Evaluation of the New Service Development Process: Integrating Service Innovation and Service Design," in *New Service Development*, J. A. Fitzsimmons and M. J. Fitzsimmons, eds. Thousand Oaks, CA: Sage, 1-32.

Kellogg, D. L. and R. B. Chase (1995), "Constructing an Empirically Derived Measure for Customer Contact," *Management Science*, 41, 1734-49.

Kessler, E. H. and A. K. Chakrabarti (1996), "Innovation Speed: A Conceptual Model of Context, Antecedents, and Outcomes," *Academy of Management Review*, 21, 1143-91.

Khurana, A. and S. R. Rosenthal (1998), "Towards Holistic 'Front Ends' in New Product Development," *Journal of Product Innovation Management*, 15, 57-74.

Kordupleski, R. E., R. T. Rust, and A. J. Zahorik (1993), "Why Improving Quality Doesn't Improve Quality (or Whatever Happened to Marketing?)," *California Management Review*, 35 (3), 82-90.

Leonard-Barton, D. (1992), "Core Competencies and Core Rigidities," *Strategic Management Journal*, 13, 111-25.

——— and I. Deschamps (1988), "Managerial Influence in the Implementation of New Technology," *Management Science*, 34, 1252-65.

Ljungberg, S. (1982), "How Can a Well-Organized I&D Service Help to Improve the Innovation Process in a Company?" in *Information and Innovation*, B. T. Stern, ed. Amsterdam: North Holland.

Martin, C. R. and D. A. Horne (1993), "Services Innovation: Successful versus Unsuccessful Firms," *International Journal of Service Industry Management*, 4, 49-65.

Martin, P. (1982), "The Innovative Process and the Online Information Channel," in *Information and Innovation*, B. T. Stern, ed. Amsterdam: North Holland.

Menor, L. J. (2000), "New Service Development Competence and Performance." Ph.D. Dissertation, University of North Carolina at Chapel Hill.

———, A. V. Roth, and C. H. Mason (1998), "Agility in Retail Service Management: A Numerical Taxonomy," in *Proceedings of the 1998 Decision Science Institute Annual Meeting*, Las Vegas.

Meyer, M. H. and A. DeTore (1999), "Product Development for Services," *Academy of Management Executive*, 13 (3), 64-76.

Miles, M. B. (1979), "Qualitative Data as an Attractive Nuisance: The Problem of Analysis," *Administrative Science Quarterly*, 24, 590-601.

Miles, R. E. and C. C. Snow (1978), *Organizational Strategy, Structure, and Process*. Boston: McGraw-Hill.

Miller, D. (1986), "Configurations of Strategy and Structure: Towards a Synthesis," *Strategic Management Journal*, 7, 233-49.

——— and P. H. Friesen (1984), *Organizations: A Quantum View*. Upper Saddle River, NJ: Prentice-Hall.

Nie, W. and D. L. Kellogg (1999), "How Professors of Operations Management View Service Operations?" *Production and Operations Management*, 8 (3), 339-55.

National Institute of Standards and Technology (1996), "Malcolm Baldrige National Quality Award," National Institute of Standards and Technology, Gaithersburg, MD.

Olson, E. M., O. C. Walker, and R. W. Ruekert (1995), "Organizing for Effective New Product Development: The Moderating Role of Product Innovativeness," *Journal of Marketing*, 59, 48-62.

Opper, S. and H. Fersko-Weiss (1992), *Technology for Teams*. New York: Van Nostrand Reinhold.

Orlikowski, W. J., G. Walsham, and M. Jones (1996), "Information Technology and Changes in Organizational Work: Images and Reflections," in *Information Technology and Changes in Organizational Work*, W. J. Orlikowski, G. Walsham, M. R. Jones, and J. I. DeGross, eds. London: Chapman & Hall.

Page, A. (1993), "Assessing New Product Development Practices and Performance: Establishing Crucial Norms," *Journal of Product Innovation Management*, 10, 273-90.

Pannirselvam G. P., S. P. Siferd, and W. A. Ruch (1998), "Validation of the Arizona Governor's Quality Award Criteria: a Test of the Baldrige Criteria," *Journal of Operations Management*, 16, 529-50.

Parasuraman, A., V. A. Zeithaml, and L. A. Berry (1988), "SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality," *Journal of Retailing*, 64 (1), 12-40.

Pinsonneault, A. and K. L.. Kraemer (1993), "Survey Research Methodology in Management Information Systems: An Assessment," *Journal of Management Information Systems*, 10, 75-105.

Pisano, G. P. (1997), *The Development Factory*. Boston: Harvard Business School Press.

Porter, M. E. (1985), *Competitive Advantage*. New York: Free Press.

——— and V. E. Millar (1985), "How Information Gives You Competitive Advantage," *Harvard Business Review*, 63 (4), 149-60.

Prahalad, C. K. and G. Hamel (1990), "The Core Competence of the Corporation," *Harvard Business Review*, 68 (3), 79-91.

Quinn, J. B., J. J. Baruch, and P. C. Paquette (1988), "Exploiting the Manufacturing-Services Interface," *Sloan Management Review*, 29 (4), 45-56.

——— and P. C. Paquette (1990), "Technology in Services: Creating Organizational Revolutions," *Sloan Management Review*, 32, 67-87.

Roth, A. V., R. B. Chase, and C. A. Voss (1997), *Service in the U.S.: Progress Towards Global Service Leadership*. Severn Trent, London, and University of North Carolina Research Monograph.

——— and W. E. Jackson III (1995), "Strategic Determinants of Service Quality and Performance: Evidence from the Banking Industry," *Management Science*, 41, 1720-33.

——— and M. van der Velde (1991), "Operations as Marketing: A Competitive Service Strategy," *Journal of Operations Management*, 10 (3): 303-28.

——— and ——— (1992), *World Class Banking: Benchmarking the Strategies of Retail Banking Leaders*. Chicago: Bank Administration Institute.

Scheuing, E. E. and E. M. Johnson (1989), "A Proposed Model for New Service Development," *Journal of Services Marketing*, 3, 25-34.

Schilling, M. A. and C.W.L. Hill (1998), "Managing the New Product Development Process: Strategic Imperatives," *Academy of Management Executive*, 12 (3), 67-81.

Scott, G. M. (1999), "Top Priority Management Concerns about New Product Development," *Academy of Management Executive*, 13 (3), 77-84.

Shostack, G. L. (1984), "Designing Services That Deliver," *Harvard Business Review*, 62, 133-39.

——— (1985), "Planning the Service Encounter," in *The Service Encounter*, J. Czepiel, M. Solomon, and C. Surprenant, eds. Lexington, MA: Lexington Books.

——— (1987), "Service Positioning through Structural Change," *Journal of Marketing*, 51, 34-43.

Storey, C. and C. Easingwood (1993), "The Impact of the New Product Development Project on the Success of Financial Services," *Services Industries Journal*, 13, 40-54.

——— and ——— (1998), "The Augmented Service Offering: A Conceptualization and Study of Its Impact on New Service Success," *Journal of Product Innovation Management*, 15 (4), 335-51.

Sundbo, J. (1997), "Management of Innovation in Services," *Service Industries Journal*, 17, 432-55.

——— (1998), *The Organisation of Innovation in Services*. Frederiksberg, Denmark: Roskilde University Press.

Tax, S. S. and I. Stuart (1997), "Designing and Implementing New Services: The Challenges of Integrating Service Systems," *Journal of Retailing*, 73, 105-35.

Terrill, C. A. (1992), "The Ten Commandments of New Service Development," *Management Review*, 81, 24-27.

Voss, C. A., K. Blackmon, R. B. Chase, B. Rose, and A. V. Roth (1997), "Service Competitiveness—An Anglo-U.S. Study," *Business Strategy Review*, 8, 7-22.

———, R. Johnston, R. Silvestro, L. Fitzgerald, and T. J. Brignall (1992), "Measurement of Innovation and Design Performance in Services," *Design Management Journal*, 3 (1), 40-46.

Wang, S. (1997), "Impact of Information Technology on Organizations," *Human Systems Management*, 16, 83-90.

Zuboff, S. (1988), *In the Age of the Smart Machine*. New York: Basic Books.

——— (1996), "The Emperor's New Information Economy," in *Information Technology and Changes in Organizational Work*, W. J. Orlikowski, G. Walsham, M. R. Jones, and J. I. DeGross, eds. London: Chapman & Hall.

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