New service development: areas for exploitation and exploration

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Abstract

The management of new service development (NSD) has become an important competitive concern in many service industries. However, NSD remains among the least studied and understood topics in the service management literature. As a result, our current understanding of the critical resources and activities to develop new services is inadequate given NSD's importance as a service competitiveness driver. Until recently, the generally accepted principle behind NSD was that "new services happen" rather than occurring through formal development processes. Recent efforts to address this debate have been inconclusive. Thus, additional research is needed to validate or discredit the belief that new services happen as a result of intuition, flair, and luck. Relying upon the general distinctions between research exploitation and exploration, this paper describes areas in NSD research that deserve further leveraging and refinement (i.e. exploitation) and identifies areas requiring discovery or new study (i.e. exploration). We discuss the critical substantive and research design issues facing NSD scholars such as defining new services, choice in focusing on the NSD process or performance (or both), and specification of unit of analysis. We also examine what can be exploited from the study of new product development to further understanding of NSD. Finally, we explore one important area for future NSD research exploration: the impact of the Internet on the design and development of services. We offer research opportunities and research challenges in the study of NSD throughout the paper. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

The importance of the service sector is emphasized by virtually any economic measure chosen. By all accounts, services dominate most developed economies given that significantly more than half of these countries' gross domestic product is in the service sector, and projected economic and job growth through the 21st century is expected to be dominated by services (Pilat, 2000). Concurrent to this growth, the globalization of services and rapid technological progress, afforded by information and communication technology, are increasing the pressures for service firms to compete on new offerings (Menor, 2000). The benefits that accrue from providing new services include: (1) enhancing the profitability of existing offerings, (2) attracting new customers to the firm, (3) improving the loyalty of existing customers, and (4) opening markets of opportunity (Storey and Easingwood, 1999). As reported in a recent study, service firms report that 24.1% of revenues came from new

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services introduced in the last 5 years and that 21.7% of company profits are derived from these new services (Griffin, 1997b).

The management of new service development (NSD) has become an important competitive concern in many service industries (Johnson et al., 2000; Fitzsimmons and Fitzsimmons, 2000; Johne and Storey, 1998; Meredith and Roth, 1998; Gallouj and Weinstein, 1997). However, NSD remains among the least studied and understood topics in the service management literature despite the plethora of rigorous research and models on product development, especially in recent years. As a result, our current understanding of the critical resources and activities to develop new services is inadequate given NSD's importance as a service competitiveness driver. Until recently, the generally accepted principle behind NSD was that "new services happen" rather than occurring through formal development processes. Recent efforts to address this debate have been inconclusive, thus additional research is needed to validate or discredit the belief that new services happen as a result of intuition, flair, and luck (Langeard et al., 1986). Cooper and de Brentani's (1991, p. 77) observation that investigation into why new services succeed or fail is still in its infancy, "approximately where similar research into manufactured products stood in the early 1970s" continues to ring true today—especially in operations management (OM). Compared to physical products, services are generally underdesigned and inefficiently developed (Froehle et al., 2000). Behara and Chase (1993, p. 87) quip that "if we designed cars the way we seem to design services, they would probably come with one axle and five wheels".

Service design and development issues are increasingly being recognized as important to managers. A recent *Business Week* cover story titled "Why Service Stinks" (Brady, 2000) posited that companies know how valuable customers are and as a result are more inclined to lavish considerable service only to those most valued customers. Less valuable customers, on the other hand, are served more frugally. The anecdotal evidence offered by Brady suggests that service organizations intentionally treat customers unequally. Such practice, from the OM viewpoint, is justified. Consider the early literature in service design that focused on demand management. This research advocates the necessity for matching service offerings

with modes or channels of delivery, segmenting customers according to their set of needs or desires for service offerings, then channeling the customer to the delivery mode appropriate to service his/her service needs (Northcraft and Chase, 1985). Why might the services received vary between customers? Because they have been designed that way.

The objective of this paper is to provide a basis for identifying what is understood, hence, exploitable, about NSD and what issues still need to be explored. While we conclude that there are many opportunities to further—and a few challenges that hinder—understanding of NSD, a fair amount of conceptual and empirical investigations exist on this sub-area of service management (see Tatikonda and Zeithaml, 2001; Johnson et al., 2000; Johne and Storey, 1998). One contribution of this paper is to provide a structured review of the extant research with extensive citations to cross-functional literatures. We hope that this catalog helps researchers locate papers in new areas.

We rely upon March's (1991) notions of *exploitation* and *exploration* to highlight the distinction between potential research areas available for leveraging existing knowledge and creating new knowledge, respectively. Emanating from the study of organizational learning, exploitation research activities involve the utilization and refinement of existing knowledge; exploration research activities revolve around the search and discovery of new knowledge. We posit that each of these aspects of exploitation and exploration are essential to an ongoing and future research agenda in NSD. Further, maintaining a balance of exploitation and exploration research efforts is critical to enriching and expanding understanding in NSD. For example, additional utilization and refinement of NSD process models (see Section 2.1) and application of NPD-related tools and knowledge (see Section 3.3) are useful areas for NSD research exploitation. On the other hand, the discovery of guidelines for design-of-implementation in services (see Section 3.4) or the search for understanding of issues complicating the design and development of services on the Internet (see Section 4.2) constitute valuable avenues for future NSD research exploration.

The extant conceptual and empirical work in NSD, a transfunctional research topic (Karmarkar, 1996), emanates primarily from service marketing and to a much lesser extent from OM. However, much of that work—

especially the empirical—lacks theory. Our underlying focus in this paper on the empirical aspect of NSD research stems from the recognition that the availability of information related to the development process—an increasingly studied topic in OM (Scudder and Hill, 1998)—is a research dilemma requiring collection of data in the field (cf. Clark et al., 1987). Hence, the greatest opportunities for research exploitation and exploration in order to advance understanding in NSD will require empirical effort.

Research opportunities (RO) and research challenges (RC) for the study of NSD are offered throughout the paper. ROs represent potential avenues for scholarly work that exploits existing knowledge or explores new knowledge in a particular area. RCs, on the other hand, represent obstacles—substantive and methodological—that potentially limit understanding and theory and impacts the quality of research exploitation and exploration efforts.

The remainder of the paper is divided into three major sections. First, we provide a discussion of the substantive issues facing scholars interested in NSD. Namely, scholars must address definitions of what constitutes a new service and NSD, then decide whether to focus on the development process, development performance, or both. We focus some discussion on the OM research addressing these NSD foci. Second, we discuss how our NSD understanding can be increased through exploiting what has been learned from research in the more established field of new product development (NPD). Third, we discuss one critical area for NSD research exploration: how NSD is complicated by the emergence of the Internet. While research exists on how technology has impacted service delivery, little effort has been taken to discuss how technology could potentially impact the design and development of services. We then summarize the ROs in NSD and offer potential future research questions. Finally, we offer brief conclusions about research efforts on the overall, on-going NSD research program.

2. Substantive issues in new service development research

A number of the basic constructs and paradigms commonly deployed in service management research

and teaching are design-related (e.g. Wemmerlöv, 1990; Schmenner, 1986). Some of these service design constructs range from the familiar like customer contact (Kellogg and Chase, 1995; Chase and Tansik, 1983), service blueprinting (Shostack, 1987, 1984), and service quality (Harvey, 1998; Behara and Chase, 1993) to less frequently mentioned—though important—constructs such as service recovery (Miller et al., 2000; Hart et al., 1990) and service climate (Schneider and Bowen, 1995, 1985). Among the more familiar service design paradigms are the production-line approach to service (Levitt, 1972), the service-driven service company (Schlesinger and Heskett, 1991), and the service profit chain (Heskett et al., 1997). Even the service analogues of the product and process matrix offered by Kellogg and Nie (1995) and Collier and Meyer (1998), along with many of the prevailing service classification schemes (see Cook et al. (1999) for a review), have normative implications for service design.

A natural extension of this service design literature is the area of NSD. Johnson et al. (2000) differentiate service design from NSD in that the former specifies the detailed content and configuration of a service concept (Fitzsimmons and Fitzsimmons, 2001) and operations strategy (Roth and Jackson, 1995), while the latter refers to an overall process of developing new service offerings. Naturally, design issues are critical to NSD. What follows in this section of the paper is a discussion of some of the substantive issues shaping our current understanding in NSD. Given the nascent state of OM research in NSD, many of these issues discussed provide opportunities for research exploitation of service marketing-oriented efforts.

2.1. New services and new service development

Any discussion of NSD must begin with a definition of what is meant by a "new service". Several definitions or classification of new services have been offered. Lovelock (1984), based on an adaptation of Heany (1983), defined new services in terms of the product or service outcomes (or offerings). New service offerings according to these authors (and summarized by Johnson et al., 2000) range the gamut from radical to incremental (see Table 1).

Tax and Stuart (1997) provide an alternative way of defining new services based on the extent of change to

Table 1
Classification of new services[a]

New service category	Description
Radical innovations	
Major innovation	New services for markets as yet undefined; innovations usually driven by information and computer-based technologies
Start-up business	New services in a market that is already served by existing services
New services for the market presently served	New service offerings to existing customers of an organization (although the services may be available from other companies)
Incremental innovations	
Service line extensions	Augmentations of the existing service line such as adding new menu items, new routes, and new courses
Service improvements	Changes in features of services that currently are being offered
Style changes	Modest forms of visible changes that have an impact on customer perceptions, emotions, and attitudes, with style changes that do not change the service fundamentally, only its appearance

[a] Adapted from Johnson et al. (2000).

the existing service system or based on the operational process and participants. Each of these are elements of the service concept, which represents the operational blueprint that communicates to customers and employees what they should expect to receive and to give (Fitzsimmons and Fitzsimmons, 2001). Underlying this definition is the belief that services are essentially a series of interactions between participants, processes and physical elements (Johnston, 1999; Shostack, 1987). Any changes to the service concept that requires different competencies from the existing operation can be considered a new service. Menor (2000), recognizing the need to consider both the newness of the service offering (what service is offered?) and service concept (how the service is offered?), defines a new service as an offering not previously available to a firm's customers resulting from the addition of a service offering or changes in the service concept that allow for the service offering to be made available.

A review of the extant empirical research in NSD (see Johne and Storey (1998) for a review of the services marketing focused NSD research) reveals few efforts that clarify just what types of new services are being investigated. Rather, new services are treated and studied in aggregate which is problematic given the different degrees of newness suggested in Table 1 and the difficulty in defining a service (e.g. as an input, delivery process, or output). Given the heterogeneous nature of most service offerings and concepts, such aggregation may create a bias that limits the predictive and external validity of NSD research findings. While

there is agreement in the literature that different types of new services exist, there still is little agreement on what these different types are. This constitutes a RC that potentially compromises the precision of the design of NSD research and generalizability of results.

RC_1: Specifying *a priori* the type(s) of new service to be studied in order to design a study around that new service and frame the implications of research findings.

NSD researchers would benefit from following a basic service design principle of "focus or falter" (Davidow and Uttal, 1989) where, applied to this NSD research issue, what represents a new service should be clearly specified prior to any investigation else the results lose potency.

Every RC, however, represents a potential RO. The distinctions of what constitutes a new service are meaningful, both to strategic planners determining the appropriate mix of services in the portfolio they offer, and in terms of understanding how the customer—or the marketplace—perceives the new service. This can be thought of as "external newness." Also important, particularly to researchers from the OM tradition, is the "internal newness" of the new service. That is, the degree of change from prior extant systems that is required to achieve the service delivery process for the proposed new service. The external and internal newness (Tatikonda and Zeithaml, 2001) are both relevant descriptors of a new service, but each has different implications for the development process.

External newness captures the novelty of the service as the customer perceives it and is helpful, for example, when considering marketing positioning or planning market promotion. In contrast, internal newness captures what exactly must be developed and put in place vis-à-vis the service concept for the new service to be operational.

The notion of "highly new" (e.g. radical or breakthrough) versus "not so new" (e.g. incremental, derivative) is helpful in qualitatively defining differences among proposed new service offerings. But these qualitative categorical descriptors do not describe in a detailed manner the actual, internal development challenges, uncertainties, and resource requirements associated with the proposed new service. This issue of newness is especially critical for Internet-based services (as discussed in Section 4).

In physical goods, internal newness is largely influenced by the necessary degree of change in the product and (manufacturing) process technologies relative to prior technological experience of the firm. The relevant dimensions of internal newness for services have not been fully clarified yet and merit further study. Some scholars (e.g. Tatikonda and Zeithaml, 2001; Tax and Stuart, 1997) have suggested evaluating the degree of internal newness or change along dimensions including the degree of change in service delivery personnel training and development, information flows and information technology infrastructure, non-IT physical infrastructure of the service, and facilitating goods. Hence, one immediate RO for improving NSD exploitation involves the following.

RO_1 : Developing more precise classifications of what constitutes a new service and, as a result, uncover how each of these types of new services differ.

The constructs "service development" and "service innovation" have been used interchangeably in past research (Sunbo, 1997; Barras, 1986). For contextual clarity, this interchangeability deserves some comment. The label service development emanates from the service management and marketing tradition that focuses on the idea of service quality while the label service innovation emanates from the economics and business strategy tradition that focuses on entrepreneurship and technological development. Additionally, these two perspectives can be distin-

guished in that service development focuses on the understanding of service development practice while service innovation typically focuses on developing abstract theories (e.g. Gallouj and Weinstein, 1997; Barras, 1986). The extant literature reports service development as describing the tactical management of development activities and service innovation as describing the strategic implications of offering new services. Hence, a second RO for NSD researchers to exploit involves the following.

RO_2 : Clarifying the tactical or strategic nature of the research contribution given the different research traditions in service development and service innovation.

Subsequent research may benefit from the use of a common descriptor for service development and service innovation given the increasing need to match tactics with strategies; "NSD" best captures the intent of both.

The emerging OM treatment of NSD spans tactical process related issues (Tatikonda and Zeithaml, 2001; Johnson et al., 2000; Deszca et al., 1999; Bitran and Pedrosa, 1998) and service design (Verma et al., 2001, 1999; Pullman et al., 2001) to strategic performance issues (Froehle et al., 2000, Menor, 2000). Interestingly, the research related to NSD processes is mostly conceptual while that focused on NSD performance (and its antecedents) is more descriptive in substance. Subsequent discussion in this section of the paper reviews a sample of these NSD process and performance focused research.

2.2. New service development processes

Martin and Horne (1993, p. 62) note that "the process (of NSD) is not well defined and does not adhere to conventional empirical mechanisms. Yet, new services come onto the market everyday. 'How?' remains the critical question." (This is especially salient for e-services.) Cooper and Edgett (1999), as do others (e.g. Bitran and Pedrosa, 1998), reinforce the importance of this "how" by observing that there is no topic in new product and service management that has received more attention than establishing the right process for development. Griffin (1997b, p. 453) explicitly remarks that "more research on the NPD needs for service firms should be done, and practices specific

to meeting those needs should be developed, starting with better delineation of best practice processes and organizational structures for service development."

While acknowledging the importance of the unique characteristics that distinguish service operations from their manufacturing counterparts such as customer participation, intangibility, heterogeneity, etc. (Fitzsimmons and Fitzsimmons, 2001), most studies focused on NSD acknowledge—though mostly leave unstudied—the implications of these unique characteristics to NSD (for some discussion see Section 3.2 of this paper). Rather, scholars have predominantly focused their efforts to advocate processes based upon those used in NPD, notably the process model offered by Booz et al. (1982) (BAH). The six stages of the BAH are sequenced: NPD strategy, idea generation, screening and evaluation, business analysis, development, testing, commercialization (see Johnson et al. (2000) for a more thorough discussion of this literature). In the services marketing literature, Johne and Storey (1998) identify six key areas of research on the NSD process: the corporate environment, the process itself, the people involved, analysis of opportunities, development and implementation. The early empirical work in that area starting with Bowers (1985) focused on identifying common stages in the NSD process (Johnson et al., 2000, Johne and Storey, 1998).

From the OM perspective, several studies in the NSD process literature followed the same pursuit conceptually. Voss et al. (1992), while noting the importance of NSD for companies whose newly implemented ideas are quickly imitated, describe the process of service development as following the traditional stages of concept development, prototype development, prototype testing and launch. Service improvements, however, can be facilitated at any stage in the NSD process by feeding back through earlier stages. Bitran and Pedrosa (1998) also depict development through a sequence of stages: strategic assessment, concept development, system design, component design and implementation. Unique to their depiction is that the process of service development involves the creation of component designs (referring to changes in people, service offerings and infrastructure) and architectural knowledge (indicating how design components are linked together without changing the core service). More recently, Deszca et al. (1999), in a study

of breakthrough products (or radical innovations) offered a sequenced, staged development framework intended for both NPD and NSD application. They clearly identify product/service development to encompass only opportunity development and product/service creation. Activities involving development strategy formation, opportunity identification in the front-end and introduction, and life cycle management in the back-end fall beyond the scope of NPD or NSD. Important to their framework, however, is the recognition that organization, skills, competencies, tools and measurement are enablers in the development effort.

Viewed in aggregate, these studies each exploit the stages of the basic NPD process while providing new extensions that enrich understanding of the facilitating conditions, activities and outcomes of the NSD process. Johnson et al. (2000) integrate many of these facilitating conditions, activities and outcomes in their NSD process cycle (see Fig. 1).

The NSD process cycle represents a progression of planning, analysis and execution activities. The cyclic nature is meant to suggest the highly iterative and non-linear processes typically employed in most NSD efforts. Indeed, Griffin (1997b) notes that services tended to use less formal NSD processes than those found in NPD. Empirical support from two separate studies corroborates that assertion of lack of formality (see Menor, 2000; Roth et al., 1997). Additionally, the NSD process cycle recognizes that the fundamental NSD stages revolve around the design and configuration of the service concept elements and that resources such as development teams and tools play an enabling function in the development process. This conceptual framework deserves detailed scrutiny especially given the dramatic changes to the service concept for technology-mediated services (see Johnson et al. (2000) and Section 4 of this paper). Hence, a third RO for NSD research exploitation involves the following.

RO3 : Understanding the NSD process stages/ activities and characteristics of successful NSD execution (e.g. degree of process formalization, use of teams, etc.).

Recent empirical investigation in NSD performance suggests, however, that the NSD process is one of several critical elements that facilitates successful development. Discussion of this research, largely motivated
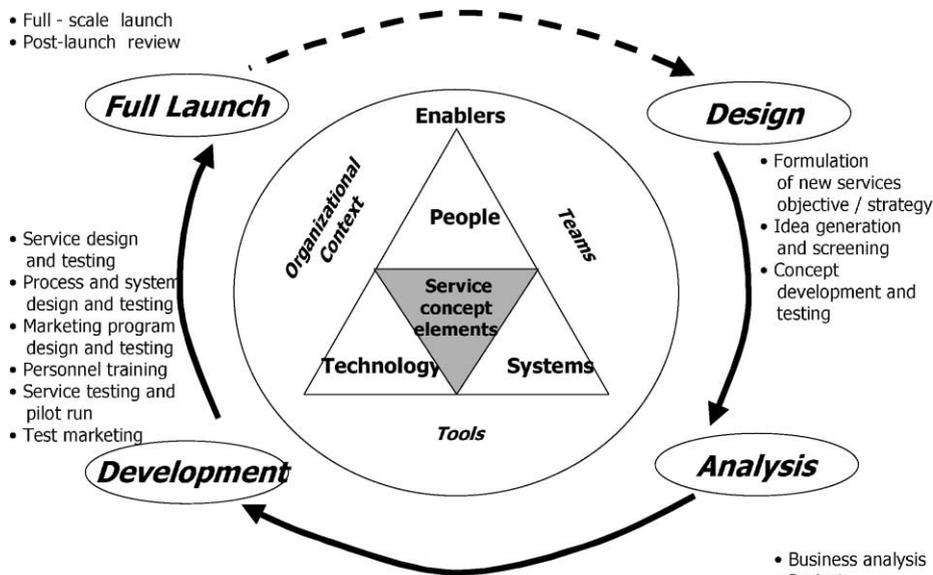
Fig. 1. The NSD process cycle, adapted from Johnson et al. (2000).

by efforts to understand the antecedents of development performance, follows in the next session.

2.3. New service development performance and antecedents

Highly successful new products and services (henceforth, "offerings") produce multiple benefits. Managers typically evaluate the new product/service development efforts that result in such offerings based on financial criteria (e.g. revenue, profit, or profit margin) or other related quantifiable measures as sales volume and market share (Griffin and Page, 1996). Nonetheless, the demand for exploring the wider performance benefits associated with producing new offerings is growing. Voss et al. (1992) articulated a useful distinction between process measures of NSD performance and outcome measures of NSD performance akin to efficiency and effectiveness measures for NSD. Table 2 summarizes a sample of these metrics.

An increasingly important performance measure across many development efforts is timeliness (Hendricks and Singhal, 1997; Kessler and Chakrabarti, 1996). Indeed, Schilling and Hill (1998) identify (i) the minimization of time-to-market and

(ii) the maximization of fit between customer requirements and product characteristics as being critical objectives for NPD processes. Cohen et al. (2000, 1996) add a third objective to that mix, namely total development cost. Time, cost and quality (e.g. the features and characteristics of the service offering) are typically viewed as the central objectives for and operational outcomes of a development effort (Tatikonda and Montoya-Weiss, 2001). These three objectives are just as important, if not more so, for the management of NSD given the shortening periods of advantage common to many new services, the difficulties in aligning service concepts with customer requirements, and that the development processes for services tend to be less formalized. These three development realities make the allocation of service firm resources towards innovative efforts a challenge.

NSD performance is a multidimensional construct that reflects both operational effectiveness and market-place competitiveness (cf. Cooper and Kleinschmidt, 1995; Tatikonda and Montoya-Weiss, 2001), and can be measured on a project or overall development process level (Johne and Storey, 1998; Voss et al., 1992). Critical to research addressing NSD performance is the realization that what gets measured and how it is measured are interrelated decisions for service devel-

Table 2
Measures of NSD outcome and process performance[a]

NSD outcomes	NSD process
Financial measures	Criterion cost
Achieving higher overall profitability	Average development cost per service product
Substantially lowering costs for the firm	Development cost of individual service product
Performing below expected costs	Percentage of turnover spent on developing
Achieving important cost efficiencies for the firm	new services, products and processes
Competitiveness measures	Effectiveness
Exceeding market share objectives	How many new services developed annually
Exceeding sales/customer use level objectives	Percentage new services that are successful
Exceeding sales/customer growth objectives	
Achieving high relative market share	
Having a strong positive impact on company image/reputation	
Giving the company important competitive advantage	
Enhanced sales/customer use of other products or services	
Quality measures	Speed
Resulting in service "outcome" superior to competitors	Concept to service launch time
Resulting in service "experience" superior to competitors	Concept to prototype time
Having unique benefits perceived as superior to competitors	Prototype to launch time
Great reliability	Time to adopt new concept from outside the firm
More user friendly	

[a] Adapted from Voss et al. (1992).

opers. As suggested by Table 2, the choice of focusing on either the NSD process or outcome (or both) of the NSD effort implies that different efficiency and effectiveness measures be used. Hence, a fourth RO for exploitation in the study of NSD involves the following.

RO_4: Addressing the widespread (or selective) importance and applicability of effectiveness and competitiveness performance metrics to measure and assess NSD efforts.

While some of the NSD performance research has focused on identifying appropriate development performance measures (see Storey and Easingwood, 1999), the majority of this research has focused on the antecedents of performance. Underlying the empirical work addressing the antecedents of development performance is the belief that a common set of factors—development process, market/environment, organizational and strategic—impact NPD performance (Schilling and Hill, 1998; Brown and Eisenhardt, 1995; Montoya-Weiss and Calantone, 1994) and NSD performance (de Brentani, 1995; Cooper et al., 1994; Cooper and de Brentani, 1991). In NSD, these factors have commonly encompassed the offering and market fit, quality of execution of launch

activities, service expertise and offering advantage (de Brentani and Cooper, 1992).

While a majority of this research is service marketing driven, there is a nascent amount of empirical work in OM focusing on the strategic choices impacting NSD. Froehle et al. (2000), utilizing cross-sectional data at the level of the business unit development portfolio, empirically examine the strategic influence of team-based organizational structure, NSD process design and IT on the speed and effectiveness of NSD efforts. They found evidence for team structure directly influencing the effectiveness of NSD, NSD process formalization having an indirect influence on NSD speed, and IT impacting both the speed and effectiveness of NSD effort. The authors note that these findings are similar to those found in manufacturing. Menor (2000), in a study of radical service innovation, developed a measure of development competence (or internal expertise) which was defined as the ability to deploy resources and routines, usually in combination, to effect a desired NSD end. Utilizing retail-banking data, Menor found that NSD competence was reflected (listed in order of importance) by the retail bank's level of market acuity, NSD strategy, use of IT and NSD process formalization. The

relatively lower importance of NSD process formalization to this measure of development competence runs contrary to the conventional prescription that a systematic and formalized process is most critical to development success. Given that NSD competence was positively related to both effectiveness and competitiveness measures of NSD performance, this research highlights the importance of managing the synergistic effects of multiple NSD resources and routines.

These resources and routines, which have been studied in the past in piecemeal fashion, are similar to those studied in NPD. Given the shortage of OM research in this area, a fifth RO for NSD research exploitation involves the following.

RO₅: Investigating in greater detail the operational antecedents of NSD performance.

3. New product development research: What new service development research can potentially exploit and explore

As suggested earlier, there may be commonalties between the antecedents contributing to NSD and NPD performance. The extant NSD research, for example, employs performance measures commonly used in NPD (e.g. speed of executing NSD, percentage of profits provided by new offerings less than 3 years old). Given the wide array of performance measures utilized in the study of NSD, many of which that have not yet received systematic study, it would be overly premature to suggest that what works for NPD applies to NSD. However, such an assertion would have important implications for the study of NSD. Hence, a second RC facing NSD researchers involves the following.

RC₂: Integrating understanding of relevant facets of NPD (process and performance) that are most applicable to furthering the study and understanding of NSD.

This challenge is particularly difficult given the diverse literature reporting NPD research (see Krishnan and Ulrich, 2001; Wind and Mahajan, 1997; Brown and Eisenhardt, 1995).

Focusing on NPD, Van de Ven (1986) notes four problems related to the management of development and innovation efforts. First, there is the problem of managing human attention to focus on new ideas, needs and opportunities instead of perpetuating or harvesting existing practices. Second, there is the problem of managing development ideas such that they are implemented and institutionalized. Issues of the social and cultural dynamics of development become important as a commitment to innovation becomes critical. Third, there is the structural problem of managing individual transactions in light of the requirement for the management of multiple functions, resources and disciplines. Fourth, there is the problem of managing institutional leadership wherein existing organizational arrangements are transformed to create an infrastructure that is conducive to development and innovation efforts. While efforts to address these problems span multiple disciplines, Meyer and DeTore (1999) propose the need to exploit findings from NPD specifically to better understand the management of NSD. Section 3.1, in an effort to begin addressing RC₂, offers some insight on what NPD research issues can be exploited to further effective NSD management.

Opportunities exist for OM researchers, particularly empiricists, to "exploit" findings from the traditional physical products (NPD) literature. The opportunity for exploitation not only relies on the extant empirical findings themselves, but also the learning curve and progression of the overall research program in NPD; this includes "aha's" and the realization of some research pitfalls and challenges. In this section, we aim to take lessons learned from the NPD arena and apply them to potential future research on NSD. The extant NPD research does not have all the answers to the questions of product or service development, but there is a foundation that can be drawn on (see integrative reviews by Krishnan and Ulrich, 2001; Schilling and Hill, 1998; Wind and Mahajan, 1997; Brown and Eisenhardt, 1995). We believe that NSD researchers can avoid "reinventing the wheel" to some degree as some of the design and development problems and decisions in NPD are common to services (cf. Krishnan and Ulrich, 2001).

NPD has long been part of the operations manager's tool-kit of activities and processes to manage. The tremendous emphasis on rapid time-to-market (see Section 4.2), engendered due to highly dynamic competition in some markets, in combination with corporate emphasis on productivity of the resources applied to research and development led to great practical con-

cern about these issues in the mid-1980s. Researchers taking a uniquely operational perspective on the product development process made early contributions to the literature in the late 1980s with case studies of "concurrent engineering" and the planning/execution of product development projects (Clark et al., 1987). By the start of the 1990s, several in-depth—mostly clinical—studies of product development projects had been published: Clark and Fujimoto's (1991) detailed study of product development in the international automobile industry, Rosenthal's (1992) cross-case analysis of a range of high-tech product development efforts, and Wheelwright and Clark's (1992) book which addressed both strategic and tactical factors in managing a diverse range of product development activities for various types of for physical products. These studies were primarily comparative analyses of richly documented or clinically observed case studies, or were small-sample statistical analyses of a cross-section of product development projects.

Since the early 1990s, the field of NPD research, as conducted by OM researchers, has grown considerably. Relying on the foundations provided by the work cited above, recently published studies utilize large-sample analyses, employ multiple performance metrics, adopt cross-functional perspectives, and focus more depth on specific tools, steps and stages within the overall development process.

3.1. Unit of observation

Innovation is clearly a complex phenomenon, and a challenge faced by NPD researchers has been the clear delineation of the boundaries of what is studied in a given empirical investigation. The lack of understanding of the unit of analysis, or the ignorance of the unit of analysis, can lead to inappropriate hypothesizing and findings that are either difficult to interpret or are misattributed. The unit of observation issue is a key factor in organizing an empirical research study and interpreting its findings (see Tatikonda, 1999; Bayus, 1994, 1998).

It is possible to study a development portfolio (a particular unit of observation). In such a situation, any conclusions drawn about individual projects (a different unit of observation) must be understood in the context of the portfolio data. Similarly, study of individual projects does not always clearly lend itself

to generating conclusions about development portfolios. Each unit of observation—listed below by level in the firm—occurs in its own distinctive organizational and environmental context, can be described as a substantively different process or element, is potentially subject to different types of uncertainties, and may require empirical investigation in different ways with different relevant constructs, measures and informants.

NPD research has addressed product development at different organizational levels including the following.

- The strategic business unit.
- The overall product development portfolio.
- A given product line.
- A specific product platform or product family.
- An individual product development project.
- Particular types of new product projects.
- Focused steps, stages or tools used in an individual project.

Any empirical study of NSD must be assessed in light of the intended unit of analysis. Thus, a third RC facing the NSD researcher involves the following.

> **RC_3** : Choosing the appropriate unit of analysis that facilitates the research design, analysis and answering of the specific NSD research question(s)
> investigated.

3.2. Is the service development process different?

A key issue to address is whether the NSD process is indeed different from the NPD process, i.e. RC_2. While the "jury is still out" on this question, many services researchers believe that services have key intrinsic differences relative to physical products, and so NSD as a process is highly likely to be different at least in some aspects if high NSD effectiveness is desired (see Section 2.2). The degree to which NSD is different from NPD indicates: (1) the degree to which prior NPD research can be exploited, and (2) what elements are truly quite different and so need to be explored in future NSD research.

Clearly one key difference between NPD and NSD is the output of the development process. This is "what is made" as a result of the organizational process of NPD or NSD. The output of an NPD process (sometimes referred to as "physical goods NPD") is a physical entity. The physical entity is a system of parts

that must work together in a physical product whole. For example, the output of the product development process for a desktop computer is the product system that is the desktop computer. However, the output of a NSD effort is, in most instances, a service delivery process (Fitzsimmons and Fitzsimmons, 2001; Johnson et al., 2000). This too is a system of parts (including personnel, materials and information flows, facilitating goods, and supporting information technology and physical facilities) which must work together to comprise a functioning service delivery process. Hence, the spirit of what is the outcome of the development process is quite different in NSD versus NPD.

In addition, services researchers have identified distinctive characteristics of services that have been used to contrast services with goods. These characteristics include intangibility, co-production, simultaneity, heterogeneity, perishability (see Fitzsimmons and Fitzsimmons (2001) for elaboration of these dimensions). What must be considered is how these distinctions might influence the need for a development process that is different for services than for goods. We address three unique aspects here.

The intangibility characteristic places an onus on service developers to "tangibilize" the service concept/offering so that it is not abstract; that it is understood in a consistent, shared fashion by all parties in development; and that all parties in development can work towards the same goal, rather than different perceptions of the goal of the given service development effort. In physical product development this is dealt with though the use of prototypes (which may be 3D physical mock-ups, electronic drawings, or hard-copy schematics). In NSD the idea of a "blueprint" or other specific means to describe the service concept may need to be especially emphasized (Shostack, 1987). A sixth RO for NSD research exploitation involves the following.

RO$_6$: Developing techniques for more effective and efficient "tangibilizing" of service concepts.

The issue of co-production (and simultaneity) gets at the essence of most services: the potential interaction of the customer with service providers during the delivery of a service. The NPD literature extols the importance of "customer involvement" and understanding customer desires (the voice of the customer) (Griffin and Hauser, 1993; Hauser and Clausing,

1988). Lessons about the nature of customer involvement and tools to facilitate it during the development process can be drawn from the NPD literature. The issue of customer involvement in the development process is perhaps even further emphasized in NSD given the interactive role of the customer in an actual service provision instance. Future NSD research could focus on how customer involvement in the NSD process should be different from the type of customer involvement in a typical NPD process.

Services are classically unique in that the "front-office" (where service delivery comes in contact with the customer) is distinguished from the "back-office" (where service delivery is insulated from the customer). The front-office and back-office must be newly developed or modified from extant capabilities for any given NSD. But the objectives for each can be quite different (Metters and Vargas, 2000). There is emphasis on traditional operational efficiency and volume output for the back-office, while in the front-office there is emphasis on satisfactory customer experiences and general system robustness. Although the front and back-offices have different objectives, they still must function together as an integrated whole to provide the composite service. This is an issue not raised in the NPD literature, and leads to a unique challenge faced in NSD (although it is somewhat analogous to concurrent engineering which addresses coordination and integration of functionally different product and process engineers). Future NSD research could focus on how to most effectively manage the organizational coordination of developers of the front and back-offices so to achieve the best new service. Given these observations, a seventh RO for NSD research exploitation involves the following.

RO$_7$: Determining the specific operational impact that these differentiating characteristics of services (e.g. intangibility, simultaneity, etc.) have on the NSD process.

3.3. The "fuzzy front end" versus the "execution-oriented back-end"

Developing a physical product has often been described as managing a development project. A number of studies have focused exclusively on the project-level unit of analysis (Tatikonda and Rosenthal, 2000;

Hauptman and Hirji, 1996; Meyer and Utterback, 1995; Iansiti, 1995; Clark, 1989). Further, NPD researchers have defined two macro stages in the project-level development: the "fuzzy front end" and the "execution-oriented back-end" (Khurana and Rosenthal, 1997; Griffin, 1997a; Moenaert et al., 1995). Applied to NSD, the front end is the first portion of the development effort, and consists of the activities involved in determining what service concept should be developed. This includes activities such as strategic positioning, idea generation, and concept development/refinement. The back-end is the remaining portion of the development effort, and consists of activities involved in actually implementing the chosen service concept. This is where internal newness becomes important, as the personnel, information and communication technologies, physical facilities, facilitating goods and other actual elements of the service delivery process must be adapted from prior capabilities, newly developed and implemented, acquired, or outsourced.

The two "ends" have qualitatively different objectives and management characteristics, and so can be studied as unique management processes in and of themselves. Further, as is the case in NPD, the front end (which is classically Marketing-centric) can become isolated from the back-end (which is classically Operations-centric), leading to "over-the-wall" transfer of information and other dysfunctional organizational behavior. For example, the segmentation of front end and back-end has occurred with e-services as discussed in Section 4.3. The front and back-ends need to be understood as potentially different processes, but also must be simultaneously coordinated and integrated. The lack of such linkage could lead to inappropriate specification of the service concept; that is, service concepts which are not inherently executable or are resource inefficient.

Development processes for both goods and services have front and back-ends. The NPD literature on marketing/design interaction and concurrent engineering may be applied to the NSD context. For example, Behara and Chase (1993) applied quality function deployment to services. Other tools such as design-for-manufacture (DFM) and the organizational processes around them could likewise find application in services. Hence, an eighth RO for NSD researchers involves the following.

RO_8 : Investigating how NPD tools such as concurrent engineering and QFD are applicable, or are modified to be applicable, to NSD.

Given the lack of previous NSD research on the use of such tools, RO_8 is more exploration than exploitation.

Further, the NPD literature has developed descriptions of the architecture, modularity, and inherent variety of different products (Baldwin and Clark, 2000; Sanderson and Uzumeri, 1996; Ulrich, 1995; Henderson and Clark, 1990). Understanding the architecture of a physical product helps developers partition the development work content, and also helps developers understand the potential interactions between different parts (modules) of the product (Bitran and Pedrosa (1998) discuss this with respect to NSD). This helps development managers plan the coordination of different organizational functional groups and task teams associated with specific modules. The notion of an architecture also provides a sense of the internal newness that must be coped with, as introduced in Section 2.1, and in turn provides an overall means to predict internal development uncertainty. The architecture also serves as a means of making the product concept quite specific, and allows a shared understanding of the new product between multiple disciplines (marketing, design engineering, and operations). To the best of our knowledge no classification of service architectures has been reported (though Meyer and DeTore (2001, 1999) discuss modularity and platform notions in service development), nor have tools which help service developers specify a service architecture been put in place. This area merits further study and may be a useful tool to integrate the "front" and "back" ends of the NSD process. As a result, a ninth RO for NSD exploration involves the following.

RO_9 : Developing and applying the concepts of architecture and modularity to NSD projects and the NSD process.

3.4. Design for implementation

The NPD literature has addressed the importance of "DFM" as a set of tools, guidelines and organizational practices which help the manufacturing arm of a firm develop a production process which can manufacture the product more easily. This increased ease of

manufacturing is reflected in fewer parts to purchase, manufacture or assemble; less complex and lower-tolerance parts and machinery; lower shop floor personnel skill requirements; faster production cycle times; greater production volumes; and higher product quality and lower unit cost (Swink, 1998; Tatikonda, 1994; Nevins and Whitney, 1989). This increased ease of manufacturing occurs when the product designs are carefully vetted by manufacturing engineers, or better yet, when the product designs are concurrently evaluated with the manufacturing process design.

Services have an analogue in that the back-end of NSD can develop a service delivery process that has greater, or lesser, ease of service delivery. Lower ease of service delivery can lead to greater personnel skill requirements, greater quantity and quality of facilitating goods, greater resource requirements in general, unnecessarily greater service variability, longer service transaction times, higher levels of customer dissatisfaction, and other elements of poor service quality. An abstract new service concept must be translated into a real service delivery process. To this end, a few service design principles, including the "failsafing" guidelines of Chase and Stewart (1995) have been promulgated. These guidelines set a foundation for future research that could develop a more comprehensive framework to aid in assessment of service concepts from the ease-of-implementation point of view. This is analogous to DFM for physical goods, and hence, we refer to it as "design-for-implementation" (DFI) for service development. The existence of a comprehensive set of DFI tools and procedures would facilitate: design of robust service delivery processes, quick ramp-up of a new service, and ease of replication of (branch-type) services. This would provide a significant competitive competency to those firms that desire high service quality and need to "roll-out" their services across many sites quickly. Hence, a tenth RO for NSD researchers' exploration involves the following.

> **RO_{10}** : Conceptualizing and testing design for implementation tools and procedures in NSD.

There has been little empirical research to date on the management process of developing a new service. Accordingly, in this section we borrowed from the extant NPD literature to assist service researchers in applying physical goods NPD concepts to the service arena or identify new areas for NSD study. Such application requires recognition of what makes service development unique relative to goods development. Services researchers must be careful to specify the intended unit of observation, and to draw conclusions from empirical studies accordingly. In particular, several lessons, opportunities and challenges arise at the level of analysis of the individual NSD project. The differential nature of the "front" and "back" ends of the process must be understood and properly integrated/coordinated. The external and internal newness of the service should be understood so that risks and resource requirements can be better assessed, and the service development process better managed. Service architectures need to be specified, tools to facilitate quick implementation and replication of the service delivery process ("DFI" guidelines) are necessary, and the development of the front and back-offices must also be coordinated and integrated. These issues represent rich areas for both exploitation and exploration. One additional and critical area—the Internet and e-services—requiring NSD-related exploration is discussed next.

4. New economy pressure and new service development: areas for exploration

The issues of NSD are further complicated by the emergence of the Internet and e-services. The Internet has prompted and enabled a wide variety of new services. Services such as personal auctions, chat rooms, and instant messaging would not have likely occurred on a widespread scale without an enabling technology like the Internet. Even so, these are simply substitutes for age-old processes: garage sales, social hubs, and the telephone. The issues of "external newness" and "internal newness" discussed in Section 2.1 are particularly salient for e-services.

Of particular interest here is the impact of the Internet on NSD processes. Is there a "new" NSD process for Internet service, or is the e-service development process simply an adaptation of traditional service development processes? This section will address that question. We will consider four major NSD issues which, while they also relate to brick-and-mortar services, are greatly magnified for e-services.

4.1. Entrepreneurial NSD

Entrepreneurial processes are likely to occur in all NSD, Internet-based or otherwise. However, there is reason to believe that Internet-based NSD is much more "entrepreneurship intensive" than brick-and-mortar NSD. This supposition is justified by considering the barriers to entry for new services.

The fundamental list of "barriers to entry" is attributed to Porter (1979): economies of scale, product differentiation, capital requirements, etc. The Internet dramatically reduces these barriers, as summarized in Table 3 (Porter, 2001). One reason is that the economies of information are dramatically different than the economies of physical items (Evans and Wurster, 2000). For example, information is infinitely duplicable—once it is sold it can be sold again and again without cost. Also, information transactions involve very small transaction costs. These lower costs mean lower barriers for new entrants.

With lower barriers to entry, new Internet-based services have and will emerge at a much greater rate than non-Internet services (and phenomenally greater than the emergence of new non-services). This is significant because two of the three categories of "radical innovation" described in Table 1 specifically apply to e-service NSD: major innovation and start-up business. It is, therefore, reasonable to suppose that research in new Internet-based services must include consideration of entrepreneurial processes, since entrepreneurship will drive the evolution of these services (Swartz, 2000).

Further, this susceptibility to new entrants prescribes designing in mechanisms to promote customer loyalty. This may include service design features such as extra security measures (to build trust) and rewarding customers for referring others (Rust and Lemon, 2001; Reichheld and Schefter, 2000). These design features additionally have implications for the management of service quality as well (Zeithaml et al., 2000). Therefore, an eleventh RO, representing an area for NSD exploration involves the following.

RO_{11} : Applying models of entrepreneurship to NSD for e-services, considering implications for service quality and building customer loyalty.

4.2. Rapid deployment of new Internet services

The low barriers to entry for Internet-based services imply that there will be little in the way of truly sustainable competitive advantages—other than continual

Table 3
Porter's (1979) barriers to entry and e-services

Barrier to entry	Why it is lower for e-services
Economies of scale (i.e. it is not worth it to enter a market in a small way)	E-services are almost infinitely scalable with minimal effort, allowing new entrants to quickly realize scale benefits similar to incumbents (Hallowell, 2000)
Product differentiation (i.e. it can be hard to overcome brand loyalty for current producers)	Internet-based services are easily duplicated and difficult or impossible to copyright, preventing sustained differentiation
Capital requirements (i.e. "physical" services start-up often involves significant capital investment: plant, equipment, working capital, etc.)	Internet-based services involve much lower fixed costs than physical-services, and almost no variable costs (other than product fulfillment)
Access to distribution channels (i.e. it may be difficult to compete in wholesale or retail channels that already carry competing products)	The Internet is public, giving all services on the Internet access to the same distribution channels
Government policy (i.e. it may be difficult to comply with government regulations, especially for a new market entry)	The Internet is very difficult to regulate, especially since it spans the boundaries of many governments
Porter's cost advantages independent of size	
Experience curves	New entrants study prior players
Proprietary technology	Public standards and licenses tend to dominate
Access to the best sources of inputs	B2B supplier networks can grant everyone access to the inputs
Assets purchased at pre-inflation prices	Technology assets continually lose value anyway
Government subsidies	Less likely for Internet services
Favorable locations	The Internet is everywhere for everyone

innovation (cf. Sunbo, 1997; Voss et al., 1992). A differentiation strategy is difficult to attain in a service environment where innovations are quickly and easily copied (Porter, 2001). An emphasis in NSD must be speed of development, especially in faster clock-speed environments (Mendelson and Pillai, 1999). Generally, traditional NPD is considered "rapid" if the cycle time from idea to product release is only 1 or 2 years. That is unacceptable for many Internet services, where the window of opportunity may be closed in 6 months. If a new Internet-based service design idea is conceivable, then it is likely to occur (if it has not already occurred).

How does one execute a NSD process where "2 months is the equivalent of 1 year?" Traditional approaches of "locking the designers away to work on the design" will not work because by the time they emerge, the design is likely to be antiquated (see, e.g. http://www.design-plus.com/skunkwor.htm). NSD processes for Internet-based services must be highly sensitive to the present environment, including new technologies, new competitive threats, new innovations of competitors, new expectations and preferences of customers, etc. The NSD process must be more agile than has ever before been demanded (see Menor et al. (2001) and Nayyar and Bantel (1994) for a discussion of agility). This suggests a twelfth RO for NSD exploration that involves the following.

RO_{12} : Assessing the process difference of NSD for services competing in "fast clock-speed" environments.

4.3. NSD for outsourced e-service

Outsourcing has always occurred in manufacturing, with components parts (or even entire products) being produced by suppliers who have advantages in the specific production. These days, much manufacturing is outsourced to developing nations where labor rates are a fraction of what they would be in the country of primary product markets. The customer often does not care, and may not even be aware, that production is outsourced to a remote location.

Traditional brick-and-mortar services often do not enjoy the luxury of outsourcing service production to an arbitrary remote location. Simultaneous production and consumption often implies that the customer is physically present at the service production location (Fitzsimmons and Fitzsimmons, 2001). Further, the experiential nature of many services implies that the new service developer must consider a broad gamut of service-production elements: attractiveness of the location, décor and ambiance of physical facilities, customer interaction points, physical limitations of customers, etc. Designing a new service (offering or concept) can, thus, be more complex than designing a new product, as suggested in Section 3.2.

However, Internet-based services can be much simpler to design than their physical-service counterparts. Why? Because, most of the service process occurs in the "back-office"—in facilities that are far from and unseen by customers. Discussions about the Internet "service experience" tend to focus on the front-office elements that appear on the customers' screens (Novak et al., 2000; Zeithaml et al., 2000).

This back-office transparency can simplify the new service design process, but also lead to its downfall (Hallowell, 2000). Many a dot-com company gained much fanfare in the popular press only to be destroyed by inadequate back-office infrastructure and systems. Recent e-commerce failures include eToys, Toys-Mart.com, Boo.com, Jewelry.com, Pets.com, Kibu.com, and others. The back-office problems (primarily in terms of customer support and logistics) are so transparent to customers that there may be no clues to the impending failure until the "we are closed" banner shows up on the company's website (Scandoval, 2000)."

Indeed, many on-line retail services consider back-office product fulfillment functions a headache (Luening, 2001). It is difficult enough to design a new service process involving new technologies and new customer expectations. Thus, the trend is for e-commerce companies to outsource these back-office operations, allowing them to focus their service development efforts on the website "front-office" and on building customer relationships through service offerings (Luening, 2001).

Such outsourcing can dramatically simplify the NSD process (as exemplified in WingspanBank.com (1999)). Outsourcing is particularly valuable in NSD for new start-ups, which was discussed in Section 4.1. The start-up is not likely to have a distinctive competence in all of the various service features, let alone the in-house resources to provide those features.

Outsourcing is likewise valuable in "fast clock-speed" NSD, since generic service delivery components such as web hosting can be quickly and easily turned over to service suppliers.

Much of the recent practicality of outsourcing information-intensive service functions can be attributed to the relatively low-costs of establishing transaction links over the Internet. The days of high-cost electronic data interchange (EDI) links are becoming old history (Hornback, 1994). Conducting electronic transactions over the Internet is much more efficient, without sacrificing reliability and security (Katsaros, 1994). Thus, a thirteenth RO for NSD research exploration.

RO_{13}: Exploring the ways outsourcing of e-service functions modifies the NSD process.

4.4. New channel design: clicks versus bricks

A rapidly emerging area of NSD is electronic disintermediation. Disintermediators are services that modify supply chain structures by eliminating supply chain members (see http://whatis.com) (this is different from the financial "disintermediation" term pertaining to direct investment in high-yield financial instruments).

The Internet allows manufacturers to establish relationships with and even sell products directly to end consumers, bypassing traditional distribution channels. This can provide certain advantages, such as centralized inventories (Boyer, 2001). However, it can also lead to so-called "channel conflict," which has implications for NSD. To illustrate, consider the case of Home Depot versus its suppliers (Black & Decker, Rubbermaid, Whirlpool, etc.). In a 19 May 1999 letter starting "Dear Vendor," Home Depot said, "it is important for you to be aware of Home Depot's current position on its (sic) vendors competing with the company via e-commerce direct to consumer distribution. We think it is shortsighted for vendors to ignore the added value that our retail stores contribute to the sales of their products ... We recognize that a vendor has the right to sell through whatever distribution channels it desires. However, we too have the right to be selective in regard to the vendors we select and we trust that you can understand that a company may be hesitant to do business with its competitors" (Brooker, 1999).

Various issues for NSD emerge from this example: do physical retailers such as Home Depot add value in a way that cannot be duplicated by Internet-based retail services? Some argue that Internet retailers have the potential to provide better customer service than brick-and-mortar counterparts because they are more quipped to use technology to truly customize the service experience (Walsh and Godfrey, 2000). Issues worth exploring are: should Internet-based retail services even attempt to duplicate brick-and-mortar retail service processes, or are there different and superior ways of delivering the service electronically? If Internet-based retail services are distinct from physical retailers in value-added functions, can both exist symbiotically? In what way might a company develop a new service such that it complements potentially competing channels in the "space?"

A further NSD issue relating to disintermediation is whether manufacturers even have the ability to re-design themselves as retail service providers. The development and operation of manufacturing processes is sufficiently different from the development and operation of service processes that an attempt to transfer skills may be problematic (Sampson, 1999). This and the prior issues are encapsulated in a final RO for NSD exploration.

RO_{14}: Analyzing the dynamics of e-service NSD in the presence of competing physical-services.

The effects of the Internet for NSD are many. We have discussed issues of barriers to entry, entrepreneurial processes, rapid deployment, back-office transparency, outsourcing, and disintermediation. Other issues exist in this rich field of opportunity for NSD research. Certainly, the challenges to be competent in NSD are heightened with Internet-bases services. While recognizing what is important in designing the Internet "store front" for ease of navigation, information content and customer support (Hallowell, 2000; Reichheld and Schefter, 2000; Zeithaml et al., 2000), few have systematically scrutinized how such Internet-based services are to be developed.

5. Conclusion

A summary of areas for NSD exploitation and exploration research opportunities, potential research questions, and referent literature is offered in Table 4.

Table 4
Summary of NSD research opportunities, research questions and referent literature

Research opportunities	Suggested research questions	Referent literature	Comments
RO$_1$: Develop more precise classifications of what constitutes a new service and, as a result, uncover how each of these types of new services differ	On what dimensions can service offerings be considered new?	Johnson et al. (2000)	The extant research is still largely conceptual in nature and based on anecdotal evidence
	What are the characteristics of "internal newness" and "external newness" for services?	Kellogg and Nie (1995)	
	How do radical and incremental new services differ?	Lovelock (1984)	
		Tatikonda and Zeithaml (2001) Tax and Stuart (1997)	
RO$_2$: Clarify the tactical or strategic nature of the research contribution given the different research traditions in service development and service innovation	What are the critical strategic and tactical issues related to NSD?	Barras (1986)*	Asterisked references (*) represent service innovation-oriented studies; much of the tactical related research focuses on service design issues; recent research (e.g. Verma et al. (1999)) begins to bridge service tactics and strategy issues
	Are there successful NSD strategies? How applicable are service classification schemes in the tactical and strategic design of service concepts?	Chase and Tansik (1983) Gallouj and Weinstein (1997)*	
		Menor (2000) Northcraft and Chase (1985) Pullman et al. (2001) Sunbo (1997)* Shostack (1984, 1987) Verma et al. (1999, 2001)	
RO$_3$: Understand the NSD process stages/activities and characteristics of successful NSD execution	What impact does the degree of newness have on the process of NSD?	Bitran and Pedrosa (1998)	Johnson et al. (2000) provide a comprehensive review of the NSD process literature; much of the OM research in this area is conceptual or based on small-sample field work
	Are there common stages of NSD and are these always necessary?	Bowers (1985)	
	How formalized does the NSD process need to be?	Deszca et al. (1999)	
	What activities are necessary for successful NSD execution?	Johnson et al. (2000) Tatikonda and Zeithaml (2001)	
RO$_4$: Address the widespread (or selective) importance and applicability of effectiveness and competitiveness performance metrics to measure and assess NSD efforts	How should NSD performance be measured?	Cohen et al. (2000)	This area has received conceptual, descriptive, and normative treatment in the NPD literature; recent empirical NSD investigations (e.g. Froehle et al. (2000)) suggest that process-based performance impacts outcome-based performance
	Are NPD metrics applicable to NSD? When should process-based or outcome-based performance metrics be used?	Cooper and Kleinschmidt (1995) Froehle et al. (2000)	
	Are process-based metrics related with outcome-based metrics?	Menor (2000) Storey and Easingwood (1999) Voss et al. (1992)	
RO$_5$: Investigate in greater detail the operational antecedents of NSD performance	Are there common antecedents for NSD success?	Brown and Eisenhardt (1995)*	Asterisked references (*) review NPD research; much of the service marketing NSD literature addresses the NSD antecedents issue in piecemeal fashion; research on the operational antecedents of NSD performance are emerging (e.g. Menor (2000))

Table 4 (*Continued*)

Research opportunities	Suggested research questions	Referent literature	Comments
	How applicable are findings on antecedents of NPD success to the study of NSD?	Cooper et al. (1994)	
	What types of marketing and operations interface exist in NSD and what role does this interface play?	de Brentani (1995) Froehle et al. (2000) Krishnan and Ulrich (2001)* Menor (2000) Schilling and Hill (1998)* Tatikonda and Montoya-Weiss (2001)*	
RO$_6$: Developing techniques for more effective and efficient "tangibilizing" of service concepts	How are service concepts actually mapped in practice?	Chase and Stewart (1995)	Conceptual research in this area focuses on techniques to map out the service delivery system; more recently, efforts to align operational design issues with customer preferences have emerged (e.g. Verma et al. (1999)
	How are operational issues aligned with customer requirements?	Shostack (1984, 1987)	
	Do efforts to "tangibilize" service concepts differ depending on what type of NSD effort is undertaken (e.g. radical versus incremental)?	Verma et al. (1999)	
RO$_7$: Determine the specific operational impact that differentiating characteristics of services have on the NSD process	What impact do service characteristics have on the effectiveness of antecedents in NSD?	Cooper and de Brentani (1991)	Investigating the characteristics of services that differentiate them from physical goods is common; research focused on the operational issues and service characteristics interaction is lacking
	How does the NSD process differ given particular characteristics of a service?	de Brentani and Cooper (1992) Fitzsimmons and Fitzsimmons (2001)	
RO$_8$: Investigate how NPD tools such as concurrent engineering and QFD are applicable, or are modified to be applicable, to NSD	Are there service analogs to NPD tools such as concurrent engineering and QFD?	Behara and Chase (1993)	Little of the extant NSD literature is directed at the NSD activity level; hence, few descriptive studies focused on the tools employed for successful NSD exist
	How are (or might) NPD tools modified for use in NSD?	Griffin and Hauser (1993) Nevins and Whitney (1989) Swink (1998)	
RO$_9$: Develop and apply the concept of architecture and modularity to NSD projects and the NSD process	What aspects of the service concept can be modularized?	Bitran and Pedrosa (1998)	Some conceptual work suggest the importance of platforms and modules in NSD; little descriptive work has been done addressing these issues in NSD
	What common service architectures exist? How beneficial are issues of service architectures and modules to the NSD process?	Meyer and DeTore (1999, 2001) Henderson and Clark (1990)	

		Sanderson and Uzumeri (1996) Tatikonda (1999) Ulrich (1995)	
RO$_{10}$: Conceptualize and test DFI tools and procedures in NSD	To what degree have the extant service design guidelines been employed in practice?	Chase and Stewart (1995)	There are a few service design guidelines that are focused on facilitating greater ease in service delivery (e.g. Chase and Stewart (1995)); formal tools and procedures focused on NSD are few
	What tools and procedures exist for quick ramp-up of a new service?	Khurana and Rosenthal (1997) Northcraft and Chase (1985) Nevins and Whitney (1989)	
RO$_{11}$: Apply models of entrepreneurship to NSD for e-services, considering the implications for service quality and building customer loyalty	How are new e-services designed with respect to building service quality and customer loyalty?	Novak et al. (2000)	Service marketers have quickly focused attention on service quality and customer loyalty issues related to the Internet; no systematic research on applying entrepreneurial models to NSD for e-services exists
	What resources are necessary for e-service quality design and development?	Reichheld and Schefter (2000) Rust and Lemon (2001) Zeithaml et al. (2000)	
RO$_{12}$: Assess the process difference of NSD for services competing in "fast clock-speed" environments	What constitutes effective NSD processes for e-services? How critical is speed of NSD in the development of e-services?		No systematic research on the NSD process for e-services currently exists
RO$_{13}$: Explore the ways outsourcing of e-service functions modifies the NSD process	What is the impact of outsourcing NSD activities in e-services?	Hallowell (2000)	Based on Hallowell (2000), aspects of navigation, information content, customer support and delivery—critical components of the e-service customer experience—may be outsourced; applied to NSD, the outsourcing issue has received no systematic attention
RO$_{14}$: Analyze the dynamics of e-service NSD in the presence of competing physical-services	What activities of NSD are best outsourced? Are e-service designs and development best achieved if based on physical-service designs and development efforts?	Heim and Sinha (2001)	Heim and Sinha (2001) present a conceptual framework discussing bundles of physical goods, off-line services, and digital content; few frameworks exist in classifying different types of e-services; identification of e-service types is necessary prior to any study of e-service NSD dynamics
	Additional research questions are posed in Section 4.4		

As noted in Table 4, this paper has highlighted a number of areas for further exploitation and exploration in the study of NSD and offered a number of research opportunities and challenges that may facilitate or hinder ongoing and future NSD investigation efforts. As we have suggested, technology is changing the way services are both delivered (Dabholkar, 2000, 1994; Haynes and Thies, 1991) and designed (Gaimon and Napoleon, 2000). Hence, the role technology plays in NSD is one critical area requiring further exploration. The substantive issues discussed in Sections 2 and 3 highlight the prevalence of the process- and practice-focus for much of the operations-based NSD research. However, opportunities exist along either foci to explore the design and development of service experiences (Gupta and Vajic, 2000; Pine and Gilmore, 1999). Further, the impact of this customer–supplier relationship common in most services, which is the basis for service supply chains (Sampson, 2000), deserves scrutiny. In short, we hope to have demonstrated the ample opportunities that exist for empirically studying NSD from an operational perspective. What is offered in this paper represents the views of the three authors and is in no way intended to be comprehensive. Others may differ in their assessments and hopefully add to the catalog of research opportunities and challenges offered here.

Early NSD research was largely service marketing driven; however, emphasis on the operational issues and their implications for NSD is becoming increasingly relevant. Further, informing NSD research from the operational perspective adds credence to the growing recognition and requirement for a more interdisciplinary focus on this important service competitiveness driver. Some of the NSD research opportunities raised here will require careful detailed conceptualization, extensive field protocol and survey instrument development, creation of reliable and valid measures, and access to knowledgeable NSD respondents and informants. In short, research opportunities—and challenges—abound for rigorous NSD empirical research. While much work is needed to better our understanding of NSD to be of greater assistance to practice, one inescapable fact remains: survival for many services rests on their ability to respond to the tenet of "innovate or die." It is our hope that these research opportunities offered here lead to more effort in understanding the NSD phenomenon.

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