SERVICE CLASSIFICATION AND MANAGEMENT CHALLENGES

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Abstract

Coincident with the increasing importance of services as a primary component of the economies in developed countries, a number of theoretically derived service typologies have been developed, yet there has been virtually no empirical validation of the proposed ideas. We conducted a survey of 273 managers in four service industries (Fast Food, Auto Repair, Retail Sales, Legal Services) to test how management challenges differ across different service industries. We also empirically tested a widely accepted service typology developed by Schmenner (1986) within the context of management challenges. Discriminant analysis was utilized to test the degree to which companies can be classified into groupings similar to the Schmenner's service process matrix according to empirical data rather than anecdotal observations. Our findings indicate that the while the service process matrix can be partially validated using empirical data, the distinctions between various industries are much "fuzzier" in practice. Different service industries can be classified according to empirical data, but misclassifications do occur. In particular, misclassifications are most prevalent where two service industries share a common characteristic as described by the service process matrix.

Introduction

As the post-industrial economy evolves, the service sector continues to increase in importance, both in terms of its contribution to the gross domestic product (GDP) of all advanced economies and in terms of the percentage of workforce employed in services. For example, it has been predicted that the service sector will account for more than 88% of the workforce in the United States by the year 2001 (Fitzsimmons & Fitzsimmons, 1994). Accordingly, the last decade has witnessed an increased emphasis on teaching and research of service management issues by business schools and professional organizations.

In response to the increased importance of services, numerous articles on issues related to the effective management of service operations have appeared in both academic and practitioner based publications (for example, Chase & Hayes; 1991, Karmarker & Pitbladdo, 1995; Kellogg & Nie, 1995; Lovelock, 1992; Roth & Van Der Velde, 1991). Several of these articles present typologies

of services and provide directions for improving quality, productivity and operating efficiency, however relatively little has been done to empirically test the proposed ideas.

This article presents an empirical assessment of the management challenges proposed by one of the widely accepted service typologies — the service process matrix (SPM) developed by Schmenner (1986). We gathered data relating to management challenges experienced by managers of four different types of service industries (Fast Food, Auto Repair, Retail Sales and Legal Services). These services were chosen because they differ in terms of various attributes of service delivery systems as suggested by the SPM. Based on empirical data collected from 273 managers, we show how management challenges differ across four types of services. In addition, we provide an empirical test of how well the four types of industries described by Schemnner (1986) can be classified using empirical data.

The remainder of the article is divided into four sections. First, we present a review of various service typologies; Next we describe the research methods used in the study; Third, we present the results of our analysis; and Finally, we present a discussion of the implications of the findings from this research.

Service Typologies

This section offers a review of various service classifications schemes that have been developed, as well as a discussion of their relative strengths and weaknesses (Table 1). This review is provided in order to illustrate that while a variety of insightful conceptual typologies have been developed, there is a need to provide empirical validation in order to identify whether these typologies accurately model reality, as well as identify any shortcomings.

The diversity of the service sector makes it difficult to come up with useful generalizations concerning the management of service organizations. Therefore, a considerable of amount of research has been focused on developing service classification schemes. For example, Judd (1964) classified services according to three categories: rented goods, owned goods and non-goods services. Similarly, Rathmell (1974) categorized services according to: type of buyer, buyer motives, buying practices, type of seller, and degree of regulation. Even though these classifications show how some services are different from the others, they do not provide much useful insight into the design and management of service processes from an operational perspective.

More recent classification schemes have explored the complex nature of service delivery systems with the goal of identifying differentiating characteristics, which affect quality and process improvement, as well as service design. For example, Shostack (1977) and Sasser, Olsen and Wyckoff (1978) developed the concept of "product-service package" based on the tangible versus intangible nature of services. Based on similar ideas, Levitt (1972, 1976) suggested

that services are commonly thought of in humanistic terms and manufacturing is thought of in technocratic terms. Accordingly, manufacturing is seen as efficient and forward-looking, whereas services are viewed as primitive and inefficient.

Table 1
Service Typologies

Author(s)	Categories/Groups
Judd, R.C. (1964)	• Rented Goods Services • Owned Goods Services • Non-goods Services
Rathmell, J.M. (1974)	• Types of seller • Types of buyer • Buying motives • Buying practice • Degree of regulation
Shostack, G.L. (1977) Sasser, W.E. Jr., Olsen, R.P., & Wyckoff, D.D. (1978)	Proportion of physical goods and intangible services contained in each "product-service package."
Hill, T.P. (1977)	• Services affecting people vs. those affecting goods • Permanent vs. temporary effects of service • Reversibility vs. non reversibility of service • Physical vs. mental effects of service • Individual vs. collective services
Chase, R.B. (1978, 1981)	Degree of customer contact
Kotler, P. (1980)	• People vs. equipment based • Extent of customers' presence • Public - Private vs. For-profit - Non-profit
Lovelock, C.H. (1980)	Five two-by-two classification matrices based on the following ideas: • nature of service act • relationship between service provider and customer • customization • demand and supply • service delivery
Schmenner, R.W. (1986)	Service Process Matrix based on two dimensions: • Customer contact and customization • Labor intensity
Mersha, T. (1990)	Degree of customer contact. Definition of customer contact expanded to include active and passive contact
Chase, R.B. & Hayes (1991)	Based on competitive stage
Kellogg & Nie (1995)	Service Product - Service Process Matrix

More recent researchers however believe in an integrated approach to service management. For example, Thomas (1978) argues that a large part of manufacturing experience is irrelevant to the management of service operations because services are very different from manufacturing. Sullivan (1981) and Bowen and Cummings (1990) also advocate an integrated approach to service management and suggest that operations management researchers must include organizational behavior and marketing constructs and techniques to address service operations problems adequately.

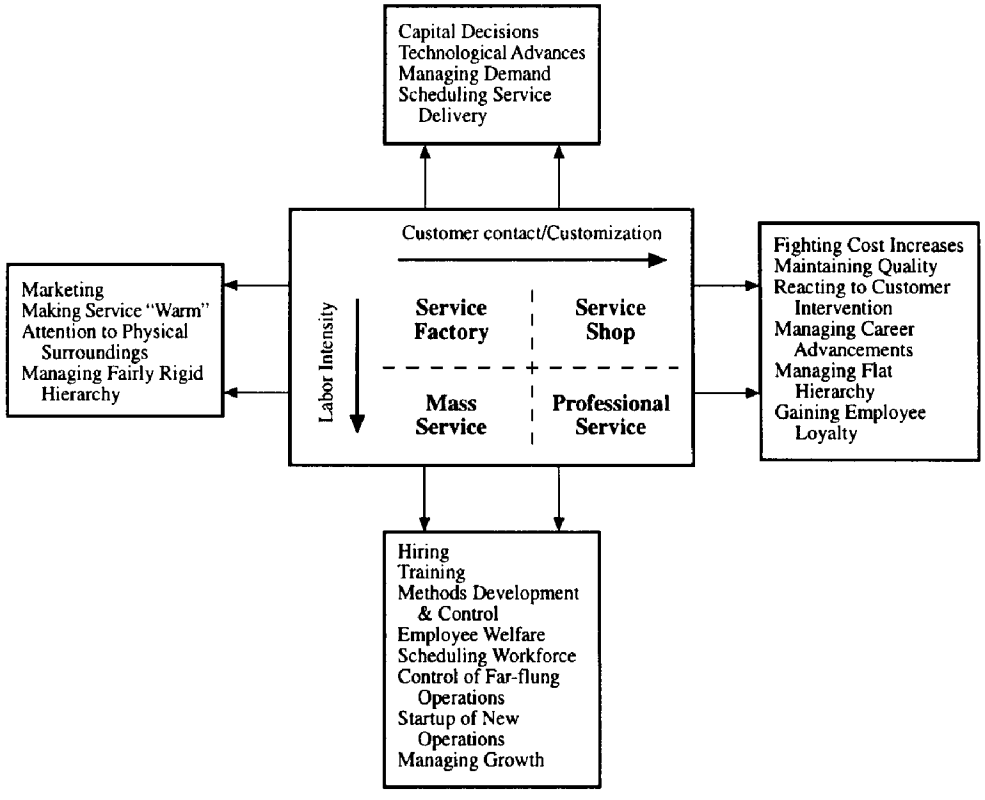
In addition to the above-cited studies, a number of articles and books emphasize the multi-functional nature of services. Therefore, recent service typologies build on managerially useful service delivery system attributes. For example, Lovelock (1992) classifies services in five different two-by-two matrices and examines how the specific nature of services in a particular class affects operations and marketing. Lovelock's (1992) framework addresses the following questions: (1) What is the nature of the service act? (2) What type of relationship does the service organization have with its customers? (3) How much room is there for customization and judgment on the part of the service provider? (4) What is the nature of demand and supply for the service? and (5) How is the service delivered? Lovelock (1992) proposed that his classification scheme addressing the above five questions can help managers develop a better understanding of their business.

Chase (1978, 1981) proposed that if there is less direct customer contact in the service system, then the service system is more likely to operate at its peak efficiency. Conversely, the system is less likely to operate at its peak potential with high direct customer contact. Mersha (1990) proposed a broadened definition of customer contact and differentiated between active and passive contact. Based on these distinctions, Mersha (1990) extended the customer contact model and addressed several earlier concerns about this classification scheme.

Building on the customer contact approach to services, Schmenner (1986) proposed the Service Process Matrix (SPM), based on three characteristics of service delivery systems. The SPM expands the *customer-contact model* and categorizes services on two dimensions: (1) labor intensity, and (2) Customer contact and service customization. Labor intensity is defined as the ratio of the labor cost incurred to the value of the plant and equipment. A high labor intensity business involves relatively small plant and equipment investment relative to a considerable amount of worker time, effort, and cost. The second dimension in the classification scheme combines two distinct concepts: customer interaction and customization. A service with a high level of interaction is one in which the customer can actively intervene in the service process. A service with high customization will work to satisfy an individual's particular preferences. The joint measure has a high value when a service exhibits both a high level of interaction and a high level of customization for the customers. Schmenner (1986) proposed a two-by-two service process matrix that classifies services as

service factory, service shop, mass service, and professional service. Figure 1 shows the service process matrix and the corresponding management challenges associated with each type of service. A brief description of each of the four service types is provided below.

Figure 1
Service Process Matrix (Schmenner, 1986)



Service Factory. Services with both low customer contact/customization and a low degree of labor intensity are classified as *Service Factories*. Similar to line type processes in manufacturing, the facilities and equipment account for a large fraction of costs. Much of the transportation industry (airlines, trucking companies), hotels and fast-food establishments can be classified as Service Factories because of low customer contact, customization and low labor intensity.

Service Shop. Services with low labor intensity but high customer contact/customization are classified as *Service Shops*. Similar to a Job-Shop type of operation in manufacturing industry, Service Shops can provide various types of customized services for their customers. Hospitals, auto and other repair services are excellent examples of Service Shops.

Mass Service. Mass Services have low customer contact/customization in combination with high labor intensity. Retail companies, wholesaling and schools are examples of Mass Service.

Professional Service. These services have both high customer contact/ customization and a high degree of labor intensity. Services provided by doctors, lawyers, accountant and architect all have a very high labor costs due to the large amount of education associated with these professions. In addition, these services tend to be highly customized according to the particular situation/need of each customer.

The single common characteristic of all the cited studies is that they are primarily conceptual or theoretical in nature. Each of the cited studies presents a typology of either ideal service management or theoretically derived differences between services. As a result, each of the studies provides important insights into important characteristics of services. Yet, although many of these studies are based on anecdotal or actual experience with a representative sample of companies, none have been empirically validated using a broad sample of quantitative data rather than subjective inferences. For example, even though the customer contact model was first proposed over fifteen years ago and is widely cited in business management literature, only recently has an empirically derived measure for customer contact been developed (Kellogg & Chase, 1995).

The development of empirical models or taxonomies to quantitatively measure differentiating characteristics of services is an area sorely deprived of adequate study. Empirical studies are needed not only to validate largely conceptual models, but also to highlight areas where such models fall short of providing a perfect explanation of important relationships in a service environment. In particular, empirical studies provide an opportunity to identify companies or industries, which are a little bit off the beaten path and don't fit the assumptions of the conceptual model well. These companies often are trendsetters that develop new techniques for providing a product that are then copied by competitors as an industry evolves. For example, Amazon.com (http://www.amazon.com) is changing the nature of book retailing through its use of the Internet to minimize customer contact while cutting costs and increasing choices. Competitors such as Barnes and Noble are also implementing online sales services in an effort to remain competitive. Empirical studies thus present an opportunity to develop or validate models that classify services, with much of the value in these models lying in their ability to identify outliers such as Amazon.com.

This study presents an empirical assessment of one of the more widely accepted service typologies. As described earlier, we use the service process matrix because it not only expands the customer contact model but also suggests how management challenges differ across different types of services (see Figure 1). We also seek to test the predictive accuracy of the service process matrix by means of discriminant analysis.

Research Methods

The data for this study was collected from service managers in four different types of industries: Fast Food, Automobile Repair, Retail Sales and Legal Services. A random sample of 70 firms from each of these industries was selected from the yellow pages phone directory of a large metropolitan area in the western United States.

Each service firm that was contacted received a cover letter from the lead researcher, a forwarding letter from the chairperson of the management department of the sponsoring university and a two-page questionnaire. The questionnaire asked the managers to rate twenty-two management challenges (identified by Schmenner, 1986) on a five point Likert scale (1 = not a challenge; 3 = average challenge; 5 = big challenge). The items addressing management challenges included in the questionnaire are shown in Table 3 and Figure 1. In addition, the instrument contained four demographic questions regarding the gender, age, work experience and education level of the respondent. The length of the questionnaire was intentionally kept to less than two pages so that the total time needed to respond to survey was less than 15 minutes. In order to increase the response rate, we offered to send a summary of the results to the managers. The respondents also had an opportunity to participate in a raffle and win a $200 cash prize. Each of these techniques has been shown to encourage participation in the data collection effort (Linsky, 1972).

The survey instrument was hand delivered to the managers of each of the 280 service firms sampled. The managers were asked to complete the questionnaire immediately (if possible) and told that it would take less than 15 minutes of their time. Almost 75% of the managers completed it immediately. The rest of the managers agreed to complete the survey within a week. A return visit was made to these companies after 4-8 days with another copy of the survey instrument. After the completion of data collection, only six firms chose not to participate in the study. One questionnaire was not complete and was therefore excluded from further analysis. The resulting final sample size was 273, or an effective response rate of 97.5%.

Results and Discussion

Table 2 provides demographic information for the sample. Several differences in education levels of the respondents can be readily identified. The Legal Service managers are most highly educated (91% have college degrees). Managers in Retail Sales also are highly educated, with 40% holding a college degree. In contrast, less than 20% of the managers in the Fast Food and Auto Repair industries have college degrees.

Another interesting demographic pattern was observed with respect to the gender of the respondents. There were no female respondents from the Auto Repair industry and only 7.25% of the managers in Legal Service are female. By

comparison, 39% of the Retail Sales managers and 29% of the Fast Food managers were female. Table 2 also shows the average ages, average work experience and the sample sizes for the four industries. It is interesting to note that managers in Auto Repair and Legal Service tend to be older and more experienced than managers in either Fast Food or Retail Sales.

Table 2
Sample Demographics

	Fast Food (n = 66)	Auto Repair (n = 69)	Retail Sales (n = 69)	Legal Service (n = 69)
Education (%)				
High School	48.5	39.4	26.1	0.0
Associate Degree/Some College	36.4	40.9	34.8	4.4
Four Year College Degree	13.6	19.7	29.0	4.4
Masters	1.5	0.0	10.1	31.9
Doctorate/JD	0.0	0.0	0.0	59.4
Total	100.0	100.00	100.0	100.0
Female Respondents (%)	28.8	0.0	39.1	7.3
Average Age (years)	28.2	38.7	31.3	44.5
Average Work Experience (years)	6.8	18.5	9.8	17.8

Scale Development

The service process matrix proposes that management challenges differ across different types of services (see Figure 1). These management challenges have not been empirically assessed in prior research. Instead, they are based on anecdotal evidence derived from limited samples. We therefore seek to develop scales to assess management challenges, which are more readily generalizable in a variety of situations. Therefore, we examine the twenty-two management challenges shown in Appendix 1 with the objective of developing reliable and valid scales. Many of the individual management challenges appear to be components of a larger, underlying construct. For example, employee hiring, training and welfare could be considered as individual management challenges which comprise a larger construct (employee management). In order to identify the underlying factors within the 22 management challenges, as well as reduce the size of the data set to facilitate further analysis, we conduct an exploratory factor analysis.

An exploratory factor analysis of the twenty-two management challenges was conducted and the results are summarized in Table 3. Seven eigenvalues exceeded the generally accepted cutoff value of 1.0 (Kim & Mueller, 1978) and are therefore retained in the analysis. The seven factors explain a total of 60.6% of

the variance in the data. In order to increase the interpretability, a Varimax rotation was performed on the principal components. Items were then assigned to the factor on which they had the highest loadings. Only items which had loadings of at least 0.40 on at least one factor were retained in the analysis. As a result of this cutoff, one item (Q10. Managing Growth) did not load on any factor and was therefore removed from further analysis. Table 3 shows the results of the Varimax factor rotation.

Table 3
Factor Analysis of Service Management Challenges

Factor	1	2	3	4	5	6	7
Eigenvalue	5.20	1.93	1.52	1.42	1.13	1.08	1.05
Cumulative Percentage of Variance	23.6%	32.4%	39.3%	45.8%	50.9%	55.9%	60.6%
EMPLOYEE	$\alpha = 0.77$						
Q5. Employee Hiring	**0.77**	0.21	-0.04	0.03	-0.07	0.07	0.12
Q6. Employee Training	**0.80**	0.13	0.07	-0.03	0.19	0.02	0.08
Q7. Employee Welfare	**0.70**	0.04	0.15	0.10	0.09	0.23	-0.12
Q9. Gaining Employee Loyalty	**0.59**	0.29	0.02	0.08	0.17	0.15	-0.03
SERVICE QUALITY	$\alpha = 0.70$						
Q1. Physical Surroundings	0.06	**0.71**	0.02	0.09	-0.04	0.05	0.04
Q16. Quality of Service	0.33	**0.63**	0.18	0.14	0.15	0.11	-0.13
Q17. Making Service Warm	0.29	**0.77**	-0.02	0.16	0.14	0.11	-0.03
OPERATIONS	$\alpha = 0.62$						
Q3. Capital Decisions	0.00	0.02	**0.83**	-0.03	0.00	-0.13	0.14
Q4. Developing Work and Control Methods	0.26	0.25	**0.59**	-0.06	0.20	-0.09	0.08
Q8. Fighting Cost Increases	0.26	-0.12	**0.44**	0.20	0.32	0.03	-0.07
Q11. Technological Advances	-0.15	-0.02	**0.68**	0.24	0.02	0.28	-0.14
MARKET							
Q12. Managing Demand	0.03	0.19	0.15	**0.56**	0.04	0.29	-0.06
Q18. Marketing	0.02	0.11	-0.02	**0.79**	0.15	-0.19	0.10
SCHEDULING	$\alpha = 0.65$						
Q19. Reacting to Customer Intervention	0.13	0.34	0.02	0.45	**0.49**	0.15	0.12
Q20. Scheduling Service Delivery	0.02	0.00	0.22	0.05	**0.81**	0.12	-0.04
Q21. Scheduling Workforce	0.41	0.23	-0.05	0.12	**0.61**	0.11	0.09
ORGANIZATION	$\alpha = 0.57$						
Q13. Managing Career Advancements	0.37	-0.15	0.09	0.38	-0.11	**0.51**	0.15
Q14. Managing Flat Hierarchy	0.18	0.09	-0.07	0.07	0.11	**0.74**	0.07
Q15. Managing Rigid Hierarchy	0.10	0.32	0.04	-0.09	0.28	**0.62**	0.14
CONTROL							
Q2. Controlling Work for Far Locations	-0.11	0.06	0.01	0.08	-0.10	0.19	**0.80**
Q22. Startup of New Operations	0.20	-0.13	0.08	0.26	0.17	0.01	**0.70**

NOTE: The highest loading for each item is indicated in **bold**.

We have labeled each of the seven factors shown in Table 3 according to the items which loaded on that factor. The EMPLOYEE factor is comprised of items relating to the hiring and training of employees, as well as employee welfare and gaining employee loyalty. The items loading on the SERVICE QUALITY factor pertain to the challenges associated with physical surroundings, quality of service and making service warm. The third factor, OPERATIONS, includes questions regarding capital decisions, work and control methods, cost increases and technological advances. The MARKET factor includes two items: managing demand and marketing. SCHEDULING is comprised of challenges relating to scheduling both the workforce and service delivery, as well as reacting to customer intervention. The ORGANIZATION factor includes items relating to managing career advancements, managing a flat hierarchy and managing rigid hierarchy. The final factor, CONTROL, is comprised of items regarding controlling work in far locations and the startup of new operations.

Scale Reliability Assessment

Since the scales developed via factor analysis are new, we must take care to assess the inter-item reliability of the questions comprising each scale (Flynn et al., 1990). Cronbach's coefficient alpha is used to assess inter-item reliability, with alpha values of 0.70 or higher considered to indicate acceptable reliability for established scales and 0.60 being acceptable for new scales (Churchill, 1979; Nunnally, 1978). As shown in Table 3, four of the seven scales possess alphas which exceed the 0.60 threshold and are therefore considered to exhibit acceptable reliability. Two of the remaining three scales have only two items, while the final scale (ORGANIZATION) does not meet the minimum threshold or reliability ($\alpha = 0.57$). Based on these results, we therefore discard these three scales and remove them from further analysis. Scores for the remaining scales are developed by taking the average of the items, which had their highest loading on that scale in the factor analysis shown in Table 3.

Industry Comparison

Dess, Ireland, and Hitt (1990) suggest that the variables of interest in a particular study should be examined in order to ascertain their sensitivity to industry conditions. Similarly, Ward et al. (1995) find between industry differences in manufacturing strategies with regard to a sample of Singapore-based manufacturing firms. We therefore test for industry level differences in the four remaining management challenges scales across the four service industries studied.

Table 4 contains the means for the four management challenges scales for both the entire sample and for each of the four service industries. The four scales are ranked in order of decreasing importance based upon the average response for the entire sample. SERVICE QUALITY is considered to be the most impor-

tant challenge (mean = 3.64), while SCHEDULING is considered to be the least important (mean = 3.07). Table 4 also provides a more intriguing analysis by breaking the sample down based on industry membership. If we examine the two industries with low customer contact (Fast Food and Retail Sales) separately from the two industries with high customer contact/customization (Auto Repair and Legal Services), several interesting differences appear. First, the low customer contact industries consider SERVICE QUALITY and EMPLOYEE challenges to be most important. In contrast, Auto Repair shops consider OPERATIONS to be their primary challenge.

Table 4
Group Means and One-Way ANOVA Results

		Industry				
		1	2	3	4	
	Entire Sample	**Fast Food**	**Auto Repair**	**Retail Sales**	**Legal Service**	
Service Quality	3.64	3.74	3.48	**3.83**	3.52	F = 2.58 p = 0.05
Employee	3.56	(4) **3.78**	3.49	(4) 3.74	(1,3) 3.23	F = 6.09 p < 0.01
Operations	3.25	(2) 2.98	(1,3,4) **3.79**	(2) 3.06	(2) 3.18	F = 17.36 p < 0.01
Scheduling	3.07	3.10	(4) 3.23	(4) **3.22**	(2,3) 2.73	F = 4.44 p < 0.01

NOTE: Numbers in parentheses indicate the group numbers from which this group was significantly different at the $p < 0.05$ level according to the Scheffe pairwise comparison procedure. F statistics and associated p-values are derived from one-way ANOVAs. The industry with the highest mean value for each management challenge scale is shown in **bold**.

Next, a series of one-way ANOVAs was conducted to test if the four management challenge scales differ across the four types of services identified by the service process matrix. The overall F-test indicates that there are significant differences across the four industries for each of the four management challenge scales (used as the dependent variable). In addition, a Scheffe pairwise comparison was conducted to test for differences between individual pairs of industries. No significant pairwise differences were found for SERVICE QUALITY, but the other three management challenge scales did exhibit dramatic differences. First, EMPLOYEE issues were much more important for the Fast Food and Retail Sales industries (means of 3.78 and 3.74) than they were for Legal Service (mean of 3.23). In addition, the importance of OPERATIONS was dramatically higher for Auto Repair (mean of 3.79) than for any of the other three industries.

Finally, Scheduling was of relatively little importance (mean of 2.73) for the Legal Services industries, but was of significantly greater importance for the Auto Repair and Retail Sales industries (means of 3.23 and 3.22, respectively).

Management Challenges and Service Process Matrix

One of the primary objectives of this empirical study is to determine whether the service process matrix typology developed by Schmenner (1986) can be validated and confirmed using empirical data. We therefore employ the four management challenge scales developed in section 4.1 in a discriminant analysis to test whether these scales can be used to differentiate and classify the four service types posited by SPM. Discriminant analysis is used because it permits examination of the differences between two or more groups with respect to multiple discriminating variables simultaneously (Klecka, 1980). The management challenges scales are used as the discriminating variables to predict the actual industries of the respondents.

The data are randomly divided into two samples, a calibration sample (n=180) and a validation sample (n=90). It is a common practice to use a calibration or training sample to derive the discriminant functions which best classify the data into groups. The coefficients derived from the calibration sample are then applied to the validation sample to test how well the discriminant functions actually classify a set of independent data into groups (Johnson & Wichern, 1988). If the discriminant functions derived from the calibration sample perform well in predicting the industry of companies in the independent validation sample, then the predictive ability is not merely an artifact of the set of companies contained in the calibration sample, thus demonstrating a base level of generalizability.

Calibration Sample.

The discriminant model is developed by applying a stepwise procedure in SPSS to the 180 companies included in the calibration sample. The independent variables are the four management challenge scales with high inter-item reliability which were retained in section 4.2 (EMPLOYEE, SERVICE QUALITY, OPERATIONS and SCHEDULING) and the dependent variable is the industry of the company (Fast Food, Auto Repair, Retail Sales or Legal Services). The stepwise procedure is analogous to the stepwise procedure for multiple regression, i.e. variables which explain a significant amount of variance ($p < 0.05$) are selected to enter the model in order of decreasing effect and variables can be removed at later stages if they are no longer significant due to the addition of other variables at earlier stages. The stepwise procedure selected two of the four management challenge scales, EMPLOYEE and OPERATIONS, for inclusion in the model. Table 5A shows the coefficients for each of the two discriminant functions, as well as Wilk's lambda and the industry means for each of the two functions for each of the four service industries.

Table 5
Discriminant Analysis Results

A. Standardized Canonical Discriminant Function Coefficients and Industry Means

		Function 1	Function 2
Scale	EMPLOYEE	-0.78	0.73
	OPERATIONS	0.96	0.47
	Wilks' Lambda	0.75	0.94
		$p < 0.01$	$p < 0.01$
Industry Means for Discriminant Functions	Fast Food	-0.59	0.02
	Auto Repair	0.65	0.28
	Retail Sales	-0.37	0.09
	Legal Service	0.32	-0.39

B. Classification Results for Calibration Sample

		Predicted Group Membership				
		Fast Food	Auto Repair	Retail Sales	Legal Service	Total
Actual Group	Fast Food	**21**	2	14	7	44
		47.7%	4.5%	31.8%	15.9%	100.0%
	Auto Repair	4	**26**	5	9	44
		9.1%	**59.1%**	11.4%	20.5%	100.0%
	Retail Sales	16	9	**13**	8	46
		34.8%	19.6%	**28.3%**	17.4%	100.0%
	Legal Service	6	16	2	**22**	46
		13.0%	34.8%	4.3%	**47.8%**	100.0%
	Total	47	53	34	46	180

As shown in Table 5A, both of the functions are statistically significant based upon Wilk's lambda ($p < 0.01$). In addition, the group centroids (industry means) for each of the four industries differ substantially. Discriminant function scores are standardized so that the entire sample has a mean of 0.00 with a standard deviation of 1.00. This allows easy comparisons between the groups being classified. For example, the mean for the Fast Food industry on function 1 is -0.59, while the mean for Auto Repair is 0.65, or a difference of 1.24. This substantial difference (more than one standard deviation) indicates that Auto Repair places a much greater premium on OPERATIONS than on EMPLOYEE concerns relative to Fast Food companies

(based on the negative coefficient for EMPLOYEE and the positive coefficient for OPERATIONS for function 1).

Although it is important to have statistically significant functions, it is at least equally important that the discriminant functions perform well in classifying companies into groups. Therefore, Table 5B presents the classification results for the calibration sample based on the two functions shown in Table 5A. The rows of Table 5B show the actual group/industry of which a company was a member, while the columns show the predicted group based on the discriminant functions. The companies in the diagonal have correct predictions (shown in bold), while companies off the diagonal have incorrect predictions. Without prior information, we could expect to guess group membership correctly in approximately 25% of the cases by guessing that all of the companies were in the Auto Repair industry (we simply pick the group with the most members and guess that each company will be a member of this group). Lacking prior information, this is the best guess we can make. In comparison, the discriminant model accurately predicts 45.56% (82/180) of the company's industry membership accurately.

Table 5B indicates that our discriminant model accurately classifies a substantially higher percentage of companies (45.6% versus 25%) than we could expect based on random guessing. The model works particularly well for the Auto Repair industry (59.1%), but not so well for Retail Sales (28.3%). The model clearly provides an increase in predictive power over random guessing and does provide support for the conceptually derived service process matrix.

Validation Sample.

Table 6 shows the classification results when the disciminant model shown in Table 5 is applied to the independent validation or holdout sample of 90 companies. The classification accuracy for the validation sample is consistent (41.1% or 37/90) with that of the calibration sample. Once again, the Auto Repair industry has the highest percentage of correct classifications (68.2%). In summary, the fact that the discriminant model works well on the validation sample in addition to the calibration sample indicates that the classification power of the model is not dependent on the data used to estimate and develop the model.

Conclusions and Future Research Directions

The objective of this research was to empirically assess the differences in management challenges experienced by managers in different industries using service process matrix (SPM) as the framework. Data collected from the managers of four different industries from separate cells of the SPM provide several interesting insights about the management of service operations. The results also serve to partially validate SPM while simultaneously illustrating the "fuzzy nature" of services.

Table 6
Classification Results for Validation Sample

		Predicted Group Membership				
		Fast Food	Auto Repair	Retail Sales	Legal Service	Total
Actual Group	Fast Food	**8** **36.4%**	5 22.7%	4 18.2%	5 22.7%	22 100.0%
	Auto Repair	1 4.5%	**15** **68.2%**	2 9.1%	4 18.2%	22 100.0%
	Retail Sales	7 30.4%	4 17.4%	**6** **26.1%**	6 26.1%	23 100.0%
	Legal Service	6 26.1%	6 26.1%	3 13.0%	**8** **34.8%**	23 100.0%
	Total	22	30	15	23	90

The exploratory factor analysis of the management challenge questions revealed seven underlying factors. These factors were than compared across the four distinct service industries, and the results yielded important insights. For example, it is interesting to note that service quality was identified as the top management challenge for all the respondents. This result reaffirms the importance of quality in service businesses as proposed by a number of researches (for example, Parasuraman, Zeithaml, & Berry, 1985). The importance attributed to service quality was relatively consistent across the four industries studied. Employee issues were the second ranked concern for the entire sample, and were of the greatest importance to the fast food industry. It is interesting to note that employee issues were of significantly less importance in legal services than for either fast food or retail sales. Another intriguing difference concerned the importance of operations issues. These were the foremost concern of auto repair shops, but were of significantly less concern to the other three industries. This result is consistent with the service process matrix, since auto repair is considered to be high customer contact/customization, yet the fact that operations issues were relatively unimportant to legal services (the other high customer contact/customization industry studied) underscores the difficulties inherent in clearly differentiating service types. Perhaps operations issues are less important for legal services that for auto repair because of the higher level of education and professionalism. Lawyers are known for working long hours to make partner - as a result, short term fluctuations in demand may be more easily handled by simply encouraging young associate attorneys to work long hours. In contrast, extensive overtime in auto repair is more likely to be very expensive because workers are paid on an hourly basis rather than a fixed salary.

The results of the discriminant analysis of management challenges serve to validate the descriptive power of the service process matrix, yet also demonstrate

that services are inherently "fuzzier" than manufacturing and more difficult to differentiate cleanly. The results show partial support for the SPM classification scheme but also reveal the limitations of theoretical classification schemes. While theoretical typologies provide an important intuitive model of the basic differences among disparate groups, there are distinct limitations to their ability to capture all (or most) differences among service firms. Theoretical service typologies are to an extent similar to classifying individuals based on demographic characteristics. Such classifications do have intuitive appeal and can broadly provide general guidelines for the groups, yet do not take into the account the individual differences among the group members. This is not to suggest that conceptual models and typologies are not valued. Instead, such typologies serve to focus our thoughts and provide an easily understood description of complex relationships.

A primary cause of many misclassifications is likely to be the relative similarity of different industry groups along one dimension of the service process matrix. For example, according to the service process matrix (Figure 1), both Fast Food and Retail Sales are characterized as low customer contact/customization, yet they differ in terms of labor intensity. Similarly, Fast Food and Auto Repair are both characterized by low labor intensity, but differ in terms of customer contact. In contrast, there is in no commonality between Fast Food and Legal Services, or between Retail Sales and Auto Repair. These two pairs of services exist in opposite corners of the service process matrix. It is not entirely unreasonable to assume that service industries in adjoining cells of the service process matrix might be misclassified as a member of the adjacent industry. On the other hand, we would expect it to be relatively rare that service industries in non-adjoining cells be mis-classified. In order to test this proposition, we break the classifications shown in Tables 5B and 6 into three groups: (1) correct classifications [119/270 = 44.1%], (2) mis-classifications along adjoining cells of the service process matrix [107/270 = 39.6%], and (3) complete mis-classifications of cells in non-adjoining cells [16.3%]. Table 7 presents the details. This analysis provides further support for the discriminant validity of the service process matrix. The discriminant model not only predicts a greater percentage of industries than could be expected due to random guessing (44.1% versus 25%), but the mis-classifications which do occur are more likely to be along adjoining cells in the service process matrix than in non-adjoining cells.

The role of empirical analysis is to test the extent to which such typologies fully represent reality and to suggest shortcomings, which lead to further research and refinement. Toward that end, further research should seek to add to the current findings by examining additional quantitative measures in an effort to develop a more accurate classification model. In particular, further analysis should seek to better differentiate fast food and retail sales, since these two groups were misclassified disproportionately by the discriminant model.

Table 7
Classification Accuracy

A. Calibration Sample

Actual Industry	Sample Size	Correct Classification	Partially Correct Classification (•)	Incorrect Classification (*)
1. Fast Food	44	21 47.7%	16 36.7%	7 15.9%
2. Auto Repair	44	26 59.1%	13 29.5%	5 11.4%
3. Retail Sales	46	13 28.3%	24 52.2%	9 19.6%
4. Legal Service	46	22 47.8%	18 39.1%	6 13.0%
TOTAL	180	82 45.6%	71 39.4%	27 15%

B. Validation Sample

Actual Industry	Sample Size	Correct Classification	Partially Correct Classification (•)	Incorrect Classification (*)
1. Fast Food	22	8 36.4%	9 40.9%	5 22.7%
2. Auto Repair	22	15 68.2%	5 22.7%	2 9.1%
3. Retail Sales	23	6 26.1%	13 56.5%	4 17.4%
4. Legal Service	23	8 34.8%	9 39.1%	6 26.1%
TOTAL	90	37 41.1%	18 20.0%	17 18.9%

• represents the following misclassification: 1 classified as 2 or 3; 2 classified as 1 or 4; 3 classified as 1 or 4; 4 classified as 2 or 3

* represents the following misclassification: 1 classified as 4; 2 classified as 3; 3 classified as 2; 4 classified as 1

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