IESE Business School
University of Navarra

Working Paper
WP-149
November, 1988

A TAXONOMY OF RETAIL BANKS' DELIVERY SYSTEM STRATEGIES

Luis Mª Huete

Aleda V. Roth

IESE Business School – University of Navarra
Av. Pearson, 21 – 08034 Barcelona, Spain. Phone: (+34) 93 253 42 00 Fax: (+34) 93 253 43 43
Camino del Cerro del Águila, 3 (Ctra. de Castilla, km 5,180) – 28023 Madrid, Spain. Phone: (+34) 91 357 08 09 Fax: (+34) 91 357 29 13

A TAXONOMY OF RETAIL BANKS' DELIVERY SYSTEM STRATEGIES

Luis Mª Huete [1]

Aleda V. Roth [2]

Abstract

This paper presents the results of an empirical study of delivery patterns for typical banking products. The study is based on a national sample survey of 117 United States retail banks. The paper uses clustering techniques to identify general "strategic groups" of retail banks. Each group is characterized by a distinctive type of service delivery system design strategy.

Note: Paper presented to the 1988 National Academy of Management Meeting, Anaheim, CA., August 7-10.

[1] Professor of Production, Technology and Operations Management, IESE

[2] Professor, Boston University

A TAXONOMY OF RETAIL BANKS' DELIVERY SYSTEM STRATEGIES[1]

Delivery systems are an important element in a firm's overall service strategy (Sasser, Olsen, and Wycokff, 1978; Normann, 1984; Heskett, 1984; Czepiel, Solomon, and Surprenant, 1985). This paper explores differences in relative industrialization levels and the number of distinct delivery channels (span) among service delivery systems of American retail banks and how these differences match with proxy variables for bank size, marketing orientation and managerial concerns.

A numerical taxonomy will be used for classifying retail banking service systems according to their delivery design. The numerically derived delivery system designs are examined within the theoretical framework discussed at length elsewhere (Huete, 1987) and empirically examined in Huete and Roth (1988). This analysis further provides clues regarding managerial challenges faced by leading banks.

In this paper a numerical taxonomy of retail banks is developed using "industrialization" and "span." These two variables were found in Huete (1987) and Huete and Roth (1988) as one meaningful way to characterize service delivery systems. Industrialization refers to the degree of substitution of systems and technology for people in the delivery channel most emphasized by a retail bank for a particular set of service contents. For service content, a retail bank can give primary emphasis to any one of a number of distinct delivery channels. Each channel entails a different level of industrialization.

A bank can also provide its customers with a number of distinct choices about how to interact with it; the greater the number of choices available to the customer, the greater the span of delivery channels. It will be shown that a comparison of retail banks' service delivery systems strategies, in terms of their industrialization and span, leads to a natural, empirically-based taxonomy. The natural taxonomy lends further credence to the theoretical framework proposed in Huete (1987).

---

[1] The data for this research was obtained from the Financial Service Research Project, a collaborative study between the Boston University School of Management and the Retail Financial Services Group at the Bank Administration Institute. For further information on the project contact Aleda V. Roth, Principal Investigator. The analysis and interpretation of data in this report is the author's own.

Although necessarily limited to retail banking, Huete (1987) provides a theoretical framework for assessing the changes taking place in the delivery systems of many service firms. Included is a matrix for matching the design of delivery channels with service contents. The matrix draws on an emerging body of service operations management literature to construct a framework for understanding delivery system changes in services - and more specifically in retail banking.

It is expected that the natural structure of retail banks' delivery systems derived from the numerical taxonomy is related to bank size, as well as geographic and demographic markets. Similarly, it is expected that clusters of retail banks with similar delivery system designs will have a common set of managerial concerns related to their delivery activities.

Background

Numerical taxonomies are empirically-derived classification schemes. Although systems of classification are standard scientific tools, the use of empirical methods in business research as a basis for establishing classifications is a recent phenomenon, having been introduced only in the past two decades.

A variety of techniques have been used to classify competitors in strategic management research, ranging from the *a priori* groupings typical of early strategic management research to classification schemes generated by computer algorithms. Among numerical methods, cluster analysis is the multivariate technique most often used (Romesburg, 1984).

One of the expected benefits of using a multivariate algorithm is that a more objective categorization is possible when:

1. There are many observations.
2. There are several variables involved as classification criteria.
3. There is a desire to minimize the differences along all of these dimensions simultaneously.

Harrigan (1985) has discussed at length the use of cluster analysis to study the mapping of industry strategies and dynamics. She noted that the compactness of the cluster is indicative of the relative homogeneity of the strategic group. Similarly, the distance between groups indicates the relative height of the mobility barriers between the strategic groups. When these distances are great, she noted, there is less likelihood of convergence between firms having dissimilar strategic policies.

According to Harrigan (1985), when the concept of "strategic groups" was first proposed it was used to examine the behavior of firms within single industries. More recently some empirical studies of strategic groups (Newman, 1978; Porter, 1979; Oliva, Day, and Desarbo, 1987) have used cross-sectional data, while others (Hatten, Schendel, and Cooper, 1978; and Harrigan, (1985) have focused on single industries.

In this paper the construct of strategic groupings (clusters) of retail banks is addressed based upon their delivery system characteristics. Therefore, given the conceptual model of Huete (1987) and delivery system design differences found in Huete and Roth (1988), three research questions are proposed:

1. Do retail banks tend to cluster together into groups, each characterized by a different type of service delivery system design? That is, how does the level of industrialization and span incorporated in the delivery system design tend to form a natural taxonomy of retail banks?

2. Are there marketing and size connotations associated with the different clusters of banks?

3. Do managerial concerns differ according to service delivery system design strategies? That is, are specific sets of management concerns associated with the delivery system structure?

Given that banks can be classified by the degree of industrialization and span of delivery channels, research questions (2) and (3) will be explored by means of two explicit hypotheses.

Hypothesis 1: Banks with similar service delivery system design characteristics will differ from other dissimilar banks on their size and in demographic and geographical markets.

Hypothesis 2: Banks with similar service delivery system design characteristics will differ from other dissimilar banks on important managerial concerns.

Data and Methods

Sample

The research report in this paper is based on data gathered from American banks concerning the current status of traditional banking service contents, delivery channels, and industrialization plans. The 1987 Retail Banking Delivery Systems Survey from which this paper draws its data was specifically designed to provide insight into how senior retail banking and operations executives are responding to delivery system challenges they face and to test hypotheses proposed in this paper. This section summarizes the research methodology of the project that is discussed at length elsewhere (Roth and Van der Velde, 1988).

In relation to the sample design, Roth and van der Velde (1988) report that a probability sample of 1,244 retail banks was chosen from the FDIC Call Report tapes of approximately 16,000 commercial banks in the United States as of January 1986. To maximize the chances of obtaining information on the forces that influence the design of delivery systems, the universe of banks was stratified into five groups by asset size: less than $100 million, $100-$499 million, $500-$999 million, $1-$3 billion, and over $3 billion. The objective of the sampling plan was to obtain an established minimum number of responses in each asset size category.

The overall response rate was slightly less than 10%, yielding 117 usable surveys. In view of the considerable length and complexity of the survey, this response rate is considered to be fair. The results are comparable with the response rates generally obtained in studies using similar populations.[2] Roth and Van der Velde (1988) report that the survey respondents are biased towards industry leaders, regardless of asset size.

---

[2] See Greenberg, Barnett A., and L. Harris, "*Consumer Banking in the United States: The Service Delivery Gap, Special Report No. 220,"* The Harris Group Management Consultants, The Economist Publications Limited, New York, 1987, p. 1.

For the purposes of this paper, a reduced sample of 90 banks was used in the analysis due to problems of missing data. Based on special analysis, the reduced sample data used in the study does not appear to be different from the full sample along several important variables (see Table 1). Thus, there is no evidence that any systematic bias was introduced by the exclusion of cases with missing data.

A questionnaire was mailed in March 1987 to top retail banking executives (typically, the retail unit's vice-president of operations) to capture information on the forces that influence the design of delivery systems. The questionnaire was modeled after the Manufacturing Futures Project Survey conducted annually since 1983 by Boston University, INSEAD and Waseda University. It was developed by the authors, and benefited from inputs from the Bank Administration Institute and other colleagues. It included multi-item instruments to measure the variables of interest for the research. The questionnaire has been pre-tested with banks from the Boston area to ensure completeness, relevance and feasibility.

Table 1

Sample Characteristics*

	Full sample (n=117)	Study Sample (n=90)
Total assets		
- Assets greater than $1 billion	38	36
- Assets lower than $1 billion	62	64
Primary demographic market		
- Mass consumer market	29	30
- Middle consumer market	42	42
- Upscale and small business market	29	28
Primary geographical market		
- Local markets	76	79
- Not-local markets	24	21

* All figures are percentages.

The survey procedures included: advance notice letters announcing the survey to the sampled banks, sent two weeks before mailing the survey itself; two follow-up mailings at approximately two week intervals followed by telephone calls to nonrespondents; manual coding and verification of all survey items;[3] and a review of the tabulations before data analysis to check for accuracy and consistency.

Variables and Measures

The testing of Hypotheses 1 and 2 requires an *a priori* classification (grouping) of retail banks based on service delivery system design characteristics. These groups of banks can be contrasted by the variables relevant for the hypotheses. The variables used to classify banks

[3] In addition, each questionnaire underwent a computer consistency and edit check. All discrepancies and selected item nonrespondents on the surveys were followed up by mail and telephone calls to the respondent. All updates were applied to the final database.

into homogeneous groups were banking services' industrialization scores and span scores on each banking service content scale. The instruments for measuring these variables along with the development of eight scales representing banks' typical banking services were explained in Huete and Roth (1988). See Appendix A for detailed information concerning these scales and their reliability.

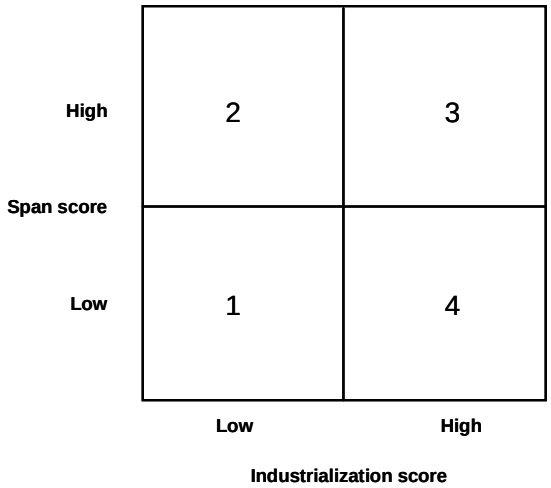
In addition to these variables, this study also used a set of eight individual variables representing managerial concerns related to delivery systems design, a set of three variables related to targeted demographic markets, and two groups of two variables each, dealing with geographic market and size.

Respondents were asked to rate each of the managerial concerns using a seven-point scale, ranging from "no concern" to "critical concern." Data on demographic and geographical markets were collected in the survey by asking respondents to indicate the category that best describes their current (1987) primary 1) demographic market ("mass", "middle" or "upscale and/or small business") and 2) geographical market ("local", "no-local"). Banks' asset size data was collected exogenously using the FDIC tapes of all financial institutions. Banks were classified into two groups: those with less than $1 billion in assets and those with more than $1 billion.

Cluster analysis was used to allocate banks into homogeneous groups according to service delivery system design. Four groups of service delivery systems were hypothesized *a priori* to emerge from this analysis. It was anticipated that one group of banks would be characterized by a small span and low industrialization. Small community banks and some banks seeking specialized market niches were envisioned as likely candidates for this group. A second group of banks which was expected to cluster would display a wider array of delivery channels and lower levels of industrialization. Large, urban banks targeting upscale markets might fall into this category. Third, it was expected that there would be a group showing both a large span and a high emphasis on industrialization. Banks that are targeting the mass consumer market are expected to be typical of this group. Fourth, a group of banks with a high emphasis on industrializing and low span was also predicted. A large number of banks falling in this category were not expected, although it seems clear that this kind of service delivery system design will become more common in the future (see Figure 1 for a two-by-two matrix depicting the hypothesized relationships).

Figure 1

A Matrix Depicting Hypothesized Service Delivery System Designs



A hierarchical clustering routine (Sneath and Sokal, 1973) was used to reduce the heterogeneity of the sample. This technique allows one to make a special purpose classification which can then be related to the two dimensional map of service delivery system strategies described in Figure 1. The variables used in defining homogeneous delivery system design strategies totaled sixteen variables dealing with the industrialization score and span score of each of the eight banking services scales. Appendix B presents the selection of these criteria and the clustering procedure used in the analysis.

From the sample of 90 banks, the clustering procedure produced three clusters of retail banks. Each cluster is homogeneous with respect to the delivery system design approaches and represents a unique service delivery system strategy. These three clusters are described in Table 2 by their respective mean scores (and cluster effects) on each of the sixteen design variables. A statistical significant variation among the mean cluster values for each design variable was found.

To investigate service delivery system design contrasts of Table 2 in more detail, the "mean values" of each of the sixteen variables of configuration were pair-wise compared using the Turkey (outlined in Winer, 1962) method. This analysis provided further insight into the meaning of the different groups. The following variables included in Table 2 are significantly different at the .05 level or less for the three groups:

Cluster I: Low Industrialization-Low Span

This cluster is distinguished by its low span and low industrialization. It has the lowest span score in every category of service contents, with the exception of depository transactions, in which its score is not significantly different from that of Cluster III. It is interesting to note that although Clusters I and II have almost identical industrialization scores, they differ in span score for every one of the eight service contents. In that respect, if one controls for industrialization, Cluster I is "focused" and Cluster II "unfocused." More than half (51%) of the banks belong to the service delivery system design represented by this cluster.

Cluster II: Low Industrialization-High Span

This cluster has the highest span score for each of the service contents and, along with Cluster I, it has the lowest industrialization scores for all types of service contents (except asset transactions). The span scores are especially high, compared of those of Cluster I, for the four scales pertaining to inquiries. This indicates that these banks make available a far greater number of channels for handling inquiries regarding credit, assets, protection and accounts.

Cluster III: High Industrialization-High Span

This cluster contains the highest industrialization scores, while its span scores are slightly above average. The industrialization scores, as measured by the cluster effect, are especially high, in three of the four scales pertaining to inquiries. These banks seem to be far ahead of the rest in terms of industrializing their handling of inquiries regarding credit, assets and accounts and their handling of payment transactions. At the same time, their span scores are not significantly different from those of Cluster II, except in the case of protection inquiries.

Table 2

Differences between Clusters With Respect to Service-Design Characteristics

Banks' delivery system Design characteristics	**Cluster I** Low I/Low S (n=46)	**Cluster II** Low I/High S (n=21)	**Cluster III** High I/High S (n=23)	F-Value* (p=probability)
1. Cash transactions industrialization				
Cluster mean	3.17	2.86	3.76	F=7.72
Cluster effect [a]	-.08	+.39	+.51	p=0.001
2. Applications for loans industrialization				
Cluster mean	2.00	1.98	2.73	F=11.58
Cluster effect	-.18	-.20	+.55	p=0.000
3. Payments industrialization				
Cluster mean	3 .49	3.71	4.70	F=12.09
Cluster effect	-.36	-.14	+.85	p=0.000
4. Assets transactions industrialization				
Cluster mean	2.19	2.28	2.52	F=3.25
Cluster effect	-.11	-.02	+.22	p=0.044
5. Credit inquiries industrialization				
Cluster mean	2.17	2.35	3.92	F=55.57
Cluster effect	-.49	-.31	+1.26	p=0.000
6. Assets inquiries industrialization				
Cluster mean	1.97	2.04	3.27	F=46.53
Cluster effect	-.35	-.28	+.95	p=0.000
7. Protection inquiries industrialization				
Cluster mean	2.48	2.40	3.00	F=10.93
Cluster effect	-.11	-.19	+.41	p=0.000
8. Accounts inquiries industrialization				
Cluster mean	2.74	2.36	3.80	F=18.25
Cluster effect	-.18	-.56	+.88	p=0.000
9. Cash transactions span				
Cluster mean	2.79	3.71	3.24	F= 6.57
Cluster effect	-.33	+.59	+.12	p=0.002
10. Applications for loans span				
Cluster mean	1.60	2.65	2.30	F= 9.44
Cluster effect	-.43	+.62	+.27	p=0.000
11. Payments span				
Cluster mean	2.25	3.17	2.96	F=11.40
Cluster effect	-.40	+.52	+.31	p=0.000
12. Assets transactions span				
Cluster mean	1.83	2.65	2.31	F=12.52
Cluster effect	-.31	+.51	+.17	p=0.000
13. Credit inquiries span				
Cluster mean	2.05	4 .03	3.43	F= 26.40
Cluster effect	-.82	+1.16	+.56	p=0.000
14. Assets inquiries span				
Cluster mean	1.93	3.58	3.10	F=22.33
Cluster effect	-.68	+.97	+.49	p=0.000
15. Protection inquiries span				
Cluster mean	1.33	3.00	2.15	F=22.58
Cluster effect	-.60	+1.07	+.22	p=0.000
16. Accounts inquiries span				
Cluster mean	2.82	4.43	3.89	F=14.55
Cluster effect	-.65	+.96	+.42	p=0.000

* F-value Is a test of mean equivalence across clusters.

[a] The difference between the cluster's mean and the grand mean.

Given these clusters, the results of testing hypotheses 1 and 2 are given in the next section.

Data Analysis and Results

Overall it was found that about one half (51%) of the banks belong to Cluster I, and approximately one quarter each comprise Clusters II and III (23 and 26%, respectively). Chi-square statistical tests were used to determine whether the clusters differed from each other when bank asset size and marketing orientation were taken into account. Finally, several 2-way analyses of variance (ANOVA) were used to test the effect of two factors – delivery system design represented by cluster membership and bank asset size – on specific measures of managerial concerns.

Bank Size and Market Characteristics

Table 3 presents the results of chi-square tests comparing size and market orientation of clusters representing service delivery system designs of retail banks.

The majority (60% vs. 36%) of banks with low industrialization and low span (Cluster I) belong to the "less than $1 billion" category. Banks belonging to Cluster II (low industrialization, high span) are distributed equally between the "below" and "above $1 billion" size category. In Cluster III, by contrast, the proportion of banks with assets above $1 billion is higher (39% vs. 17%).

Banks targeting "mass markets" normally show a delivery system design characterized by low industrialization and low span (Cluster I). On the contrary, most banks targeting "upscale and/or small business" markets show service system designs characterized by low industrialization and high span (Cluster II). Finally, the majority of RBUs aiming at "middle markets" are characterized by high industrialization and high span (Cluster III).

Geographical markets do not show strong evidence of being related to service delivery system design groups. But some weak evidence (p=.15) suggests that low industrialization-low span designs (Cluster I) are more common among local banks. Delivery designs characterized by high industrialization and high span (Cluster III) are found in banks having more geographically diverse markets.

The statistical tests described earlier showed the differences among clusters in terms of bank asset size and marketing orientation. The characteristics of the clusters are described below:

- A high proportion of banks belonging to Cluster I (low industrialization and low span) fall into the categories "less than $1 billion" (size variable), "mass market" (demographic variable) and "local" (geographical variable).
- Banks of Cluster II (Low industrialization and high span) are evenly distributed among the different size and geographic market categories. A high proportion of these banks target "upscale" and/or small demographic markets.
- Table 3 indicates that a high proportion of the banks belonging to Cluster III (high industrialization and high span) fall into the categories "more than $1 billion" (size variable), "middle market" (demographic variable) and "non-local" (geographical variable).

The results given here support Hypothesis 1 that anticipated differences among delivery system design groups in terms of size and marketing orientation.

Table 3

Differences between Clusters With Respect to Assets and Market Characteristics

	Cluster I Low Indust. Low Span (n=46)	**Cluster II** Low Indust. High Span (n=21)	**Cluster III** High Indust. High Span (n=23)	X^2
Bank size				
Percent[a] of cluster members with assets valued:				6.14 (p≤0.046)
Less than $1 billion	60	23	17	
More than $1 billion	36	24	39	
Cluster average (percent of total)	51	23	26	
Primary demographic market				
Percent[a] of cluster members targeting				8.49 (p≤0.075)
Mass markets	69	15	15	
Middle markets	46	22	32	
Upscale and small business	38	43	19	
Cluster average (percent of total)	51	23	26	
Primary demographic market				
Percent[a] of cluster members targeting				3.80 (p≤0.149)
Local markets	56	23	21	
Nonlocal markets	37	21	42	
Cluster average (percent of total)	51	23	26	

* A row percentages add to 100%.

Managerial Concerns

Hypothesis 2 is tested by way of 2-way analyses of variance (ANOVA) models, the results of which are presented in Table 4. The ANOVA experiments were designed to test the effect of two factors – delivery system design cluster membership and bank assets size – on specific measures of managerial concerns related to distribution channels. The results in Table 4 are presented as follows: 1) the means and standard deviations (in parenthesis) of each dependent variable, presented for each of the three clusters. This is followed by the results of a general two-way analysis of variance and an indication of whether the delivery system design's (DSD) main effect on the clusters' concerns values is significant in a Tukey pair-wise comparison at the .05 level. Several of these contrasts were found to be significant and are described below:

- Cluster I (Low industrialization-Low span) banks have similar concerns to those of the other two groups with exceptions. Banks in Cluster I are less concerned about the inadequacy of the retail distribution channel structure and the existence of too many products and services than in Cluster III.
- Cluster II (Low industrialization-High span) have the lowest scores for all types of managerial concerns although, when compared pair-wise, the scores are not significantly different from those of Cluster I and for most of Cluster III. In particular, Cluster II banks are significantly less concerned than their counterparts in Cluster III about the inadequacy of the retail distribution channel structure, the emphasis in cost control and the existence of too many products and services.

Table 4

Analysis of Variance (General and Pair-wise)[a] Among the Three Delivery System Design (DSD) Groups for Selected Managerial Concerns

				Cluster I Low Indust. Low Span (n=46)		**Cluster II** Low Indust. High Span (n=21)		**Cluster III** High Indust. High Span (n=23)	
	Concerns								
1.	**Inadequate retail distribution channel structure**			**3.05 (1.05)**		**2.91 (1.44)**		**4.00 (1.59)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	4.56	.013		N.S.		*		*
	Size	.31	N.S.						
	Two-way interaction	1.05	N.S.						
2.	**Falling behind in technology**			**3.78 (1.50)**		**3.28 (1.52)**		**3.82 (1.64)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	3.09	.051		N.S.		N.S.		N.S.
	Size	.08	N.S.						
	Two-way interaction	1.46	N.S.						
3.	**Cost of technical personnel to support current distribution channels**			**3.72 (1.50)**		**3.35 (1.72)**		**4.13 (1.29)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	2.06	.0134		N.S.		N.S.		N.S.
	Size	.02	N.S.						
	Two-way interaction	.57	N.S.						
4.	**Measurement of customer service quality**			**4.85 (1.38)**		**4.28 (1.42)**		**4.95 (1.36)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	1.83	.0167		N.S.		N.S.		N.S.
	Size	.12	N.S.						
	Two-way interaction	.91	N.S.						
5.	**Lack of investment in technology**			**3.54 (1.42)**		**2.90 (1.37)**		**3.08 (1.37)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	2.70	.074		N.S.		N.S.		N.S.
	Size	.05	N.S.						
	Two-way interaction	.73	N.S.						
6.	**Emphasis in cost control**			**4.69 (1.72)**		**3.76 (1.70)**		**5.26 (1.39)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	3.82	.026		N.S.		N.S.		*
	Size	.00	N.S.						
	Two-way interaction	.05	N.S.						
7.	**Too many products/services**			**3.45 (1.32)**		**3.38 (1.16)**		**4.52 (1.41)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	5.48	.006		N.S.		*		*
	Size	.07	N.S.						
	Two-way interaction	2.02	.140						
8.	**Difficulty in identifying unprofitable products**			**3.95 (1.51)**		**3.47 (1.72)**		**4.52 (1.50)**	
					Cluster I and II		Cluster I and III		Cluster II and III
	Main effects of:	*F*	*Significance*						
	DSD	2.62	.080		N.S.		N.S.		N.S.
	Size	.00	N.S.						
	Two-way interaction	.46	N.S.						

[a] Produced by Manova procedure; data presented as a two-way design (DSD-delivery system design clusters controlled by bank size) with one managerial concern taken as a dependent variable each time. The data are presented for each concern as follows: first, the means and standard deviations (in parentheses) of each cluster. This is followed by the results of a general two-way design and an indications (*) of whether the clusters differ in a pairwise comparison at the .05 level.

- Cluster III (high industrialization-high span) has the highest scores for all types of managerial concerns (except lack of investment in technology where it is second to Cluster I). This illustrates a greater concern regarding the inadequacy of the retail distribution channel structure and the existence of too many products and services than do the other two groups. Furthermore, Cluster III banks show greater concern over cost control than do those in Cluster II.

These results indicate that a delivery system design combining low industrialization and high span is associated with lower levels of managerial concerns than designs characterized by either low industrialization and low span or high industrialization and high span. Cluster III, is surprisingly uniform, with high levels of concern over almost the entire list. This result strongly indicates that the road toward industrialization and low focus presents a high degree of complexity, and hence, many significant problems for retail bankers.

Conclusions

This paper presents a numerical taxonomy of banking service delivery systems based upon their characteristics. Cluster analysis was used to develop a numerical taxonomy of retail banking delivery system design strategies. Data analysis yielded three of the four groups that were expected to find at the outset of the study. Service delivery systems characterized by high industrialization and low span were not found in the sample of banks; however, it is expected that this strategy will become more common in the future as bankers develop market niches since they represent the theoretically more efficient service delivery design.

Using the three clusters, the paper describes the matches of delivery system designs by market orientation and bank asset size. Furthermore, the set of managerial concerns associated with bankers within each delivery system cluster is also reported.

Variables for clustering were selected on the basis of the conceptual framework outlined in Huete (1987) which takes industrialization level and span as the two key characteristics of service delivery system design. Although a large element of judgment was necessary in developing the cluster dimensions and interpreting the results, the empirical results were evaluated in accordance with validating norms commonly used in the field.

As expected, a higher proportion of banks with low industrialization and low span was found among small banks than among large banks. Service delivery systems having low industrialization and high span were found more frequently among banks targeting upscale customers, while a combination of low industrialization and low span was found more often among banks serving the mass market. This finding is in agreement with Heskett's (1986) suggestion that service firms ought to choose delivery systems that are suited to the market segment they are targeting.

The differences in managerial concerns found among the three delivery system design clusters suggest that American retail bankers are having difficulties in implementing plans to industrialize service delivery channels. This is a most interesting finding. A plausible reason may rest in Norman's (1984) claim that, although industrialization has great potential for making services more cost-effective and for increasing their quality, it also creates the need for profound modifications in the total service system.

Further research is needed to identify the sources of these delivery system design difficulties and the impact of various combinations of delivery design and demographic markets on service performance outcomes.

Appendix A

Banking Services Scales and Included Items[4]

Banking Transactions

1. Depository transactions (0.973)

Operationalized by using an eight-point scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- withdrawals of checking accounts
- withdrawals of savings accounts
- deposits of checking accounts
- deposits of savings accounts
- cash advances

2. Applications for loans (0.867)

Operationalized by using an eight-point scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- applications for installment loans
- applications for home equity loans
- applications for home mortgages

3. Bill payments (0.741)

Operationalized by using an eight-point scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- payments to the bank
- payments to third parties (utilities)
- payments to third parties (other bills)

4. Asset transactions (0.800)

Operationalized by using an eight-point scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- applications for deposit accounts
- applications for discount brokerage
- applications for club accounts
- financial planning
- securities
- trust management

[4] Figures in parentheses are the reliability coefficients (Cronbach's alpha) for the respective constructs.

Banking Inquiries

5. Credit inquiries (0.924)

Operationalized by using an eight-paint scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- inquiries on credit cards
- inquiries on installment loans
- inquiries on home equity loans
- inquiries on home mortgage
- inquiries on educational loans
- inquiries on personal credit lines

6. Asset inquiries (0.775)

Operationalized by using an eight-point scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- inquiries on securities brokerage
- inquiries on IRAs and Keogh accounts
- inquiries on trust management

7. Protection inquiries (0.893)

Operationalized by using an eight-point scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- inquiries on traveler's checks
- inquiries on credit life insurance

8. Account inquiries (0.808)

Operationalized by using an eight-point scale referring to the delivery option (ranging from personal visit to customer to home banking) currently most emphasized for the following items:

- inquiries on deposit accounts
- inquiries on money market funds

Appendix B

Formation of Homogeneous Service Delivery System Design Clusters

Methodology

Cluster analysis was used to group retail banks having similar service encounter designs. This technique consists of a set of algorithms designed to identify similar objects and group them together, using a set of pre-specified criteria. The advantage of using cluster analysis was that it allowed us to use more than two variables as criteria for sorting retail banks into strategic groups. The variables chosen as sorting criteria were two basic characteristics of delivery system design: industrialization and span.

An agglomerative hierarchical clustering procedure was used. To measure pair-wise similarities, we used the average between-linkage method (Sneath and Sokal, 1973) of clustering, together with a vector cosine similarity matrix. This resemblance coefficient does not allow size displacement to contribute to their dissimilarity. The clustering method used defines the similarity between any two clusters as the arithmetic average of the similarities between the objects in the one cluster and the objects in the other. Depending on how strictly "similarity" is defined, this process can yield a hierarchy of different cluster solutions, ranging from a solution containing just one large cluster to a solution containing as many clusters as there are objects. High-order clusters can contain several lower-order clusters, but within each order the clusters are disjointed (each item belongs to only one cluster).

To determine the most appropriate number of clusters a dendogram was used, provided by the SPSS-X software routine CLUSTER, which prints the jump in mean squared error at each stage of the clustering. When a set of 'natural' clusters has been reached, the transition to the next stage of clustering will be accompanied by a pronounced increase in the mean squared error.

Rosemburg's (1984) suggestions were followed for cutting the dendogram tree at a point that: 1) produces classes that are maximally related to specific variables of interest (industrialization and span in this case), and 2) within a wide range of the resemblance coefficient for which the number of clusters remain constant (a wide range indicates that the clusters are well separated in the attribute space). Another rule of thumb used in selecting the cut-off for the number of clusters was to look for a pronounced increase in the tightness of the clusters (as measured by mean square error) as the algorithm progressively generated the groups (Hambrick, 1983).

The composition of clusters was tested for significance differences, using both F-ratio comparisons of variances about the mean of criterion variables and paired comparison tests of homogeneity. Lehmann (1979) suggests that it is generally impossible to get more than n/30 reliable clusters from survey data. Despite these general aids, there is no absolutely reliable statistical test for 'natural' clusters (Hambrick, 1983; Harrigan, 1985). Hence the researcher's own judgment necessarily played an important role in the determination of the clusters.

Clustering criteria

The selection of clustering criteria drew on the conceptual model developed in Huete (1987). Sixteen attributes were selected: two (industrialization and span score) for each of the eight service content scales developed in Huete and Roth (1988). Following the suggestion of Romesburg (1984) we standardized the input distance measures for clustering purposes, to eliminate the arbitrary effects involved in measuring the attributes. Standardization allows the attributes to contribute more equally to the calculation of similarities among objects. For that purpose we used the CON DESCRIPTIVE routine of SPSS-X software. The data matrix variables and their definitions are listed below.

Cluster criteria

(1) Depository transactions industrialization score: average industrialization score of a retail bank for the service content scale variable "depository transaction."

(2) Applications for loans industrialization score: average industrialization score of a retail bank for the service content scale variable "applications for loans."

(3) Bill payments industrialization score: average industrialization score of a retail bank for the service content scale variable "bill payments".

(4) Asset transactions industrialization score: average industrialization score of a retail bank for the service content scale variable "asset transactions."

(5) Credit inquiries industrialization score: average industrialization score of a retail bank for the service content scale variable "credit inquiries."

(6) Asset inquiries industrialization score: average industrialization score of a retail bank for the service content scale variable "asset inquiries."

(7) Protection inquiries industrialization score: average industrialization score of a retail bank for the service content scale variable "protection inquiries."

(8) Account inquiries industrialization score: average industrialization score of a retail bank for the service content scale variable "account inquiries."

(9) Depository transactions span score: average span score of a retail bank tor the service content scale variable "depository transaction."

(10) Applications (or loans span score: average span score of a retail bank for the service content scale variable "applications for loans."

(11) Bill payments span score: average span score of a retail bank for the service content scale variable "bill payments."

(12) Asset transactions span score: average span score of a retail bank for the service content scale variable "asset transactions."

(13) Credit inquiries span score: average span score of a retail bank for the service content scale variable "credit inquiries."

(14) Asset inquiries span score: average span score of a retail bank for the service content scale variable "asset inquiries."

(15) Protection inquiries span score: average span score of a retail bank for the service content scale variable "protection inquiries."

(16) Account inquiries span score: average span score of a retail bank for the service content scale variable "account inquiries."

Cluster solution

A three-cluster solution was selected, based on the analysis of solutions ranging from two to ten cluster. The distribution of observations in the three clusters was 21, 46 and 23. Although data was standardized we reported non-standardized data in presenting the clusters and testing their homogeneity, because the analysis of group homogeneity requires dispersion measures.

References

Czepiel, J. A., M. R. Solomon, and C. F. Surprenant (1985), "The Service Encounter: Managing Employee/Customer Interaction in Service Businesses," Lexington, MA: Lexington Books.

Hambrick, D. C. (1983), "Strategies for Mature Industrial-Product Businesses: a Taxonomic Approach," Paper presented at the International Business Policy/Strategic Management Conference, Arlington, Texas.

Harrigan, K. R. (1985), "An Application of Clustering for Strategic Group Analysis," *Strategic Management Journal*, 6:1, pp. 55-73.

Hatten, K. J., D. E. Schendel, and A. C. Cooper (1978), "A Strategic Model of the United States Brewing Industry, 1952-1971," *Academy of Management Journal*, 21:4, pp. 592-610.

Heskett, J. L. (1986), "Managing in the Service Economy," Boston, Ma: Harvard Business School Press.

Huete, L. M. "A Matrix for Linking Service Contents with Delivery Options," Paper presented at the annual meeting of the 1987, Decision Science Institute, Boston, Massachusetts.

Huete, L. M. and A. V. Roth (1988), "The Industrialization and Span of Retail Banks' Delivery Systems," *International Journal of Operations & Production Management*, 8:3, forthcoming.

Lehmann, D. R. (1987), "Market Research and Analysis," Homewood, Ill.: Richard D. Irwin.

Newman, H. H. (1978), "Strategic Groups and the Structure-Performance Relationship," *Review of Economics and Statistics*, 59:8, pp. 417-423.

Norman, R. (1984), "Service Management: Strategy and Leadership in Service Business," Chichester, U.K.: John Wiley & Sons.

Oliva, T. A., L. D. Day, and W. S. Desarbo (1987), "Selecting Competitive Tactics: Try a Strategy Map," *Sloan Management Review*, spring, pp. 5-15.

Porter, M. E. (1979), "The Structure Within Industries and Companies' Performance," *Review of Economics and Statistics*, 60:5, pp. 214-227.

Romesburg, H. C. (1984), "Cluster Analysis for Researchers," Belmont, Ca.: Lifetime Learning Publications.

Roth, A. V. and M. Van Der Velde (1988), "The Future of Retail Banking Delivery Systems," Rolling Meadows, Ill: Bank Administration Institute.

Sasser, W. E., R. P. Olsen, and D. D. Wyckoff (1978), "Management of Service Operations: Text, Cases and Readings," Boston, MA.: Allyn and Bacon.

Sneath, P. H. and R. R. Sokal (1973), "Numerical Taxonomy," San Francisco: W. H. Freeman.

Winer, B. J. (1962), "Statistical Principles in Experimental Design," New York: McGraw-Hill.