PRODUCTION & OPERATIONS QUALITY CONCEPTS: DEFICIENT DIFFUSION INTO THE SERVICE SECTOR

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ABSTRACT

Over the past 25 years, America has migrated from an industrial economy toward information, technology and service. The shift is well documented by various statistics regarding the declining balance of manufacturing exports-to-imports, declining manufacturing employment and declining direct labor content within goods, as well as through the transformation of the Dow Jones Industrial Average components.

The production/operations management discipline has been slow to respond. Since 1992, only the smallest percentage of academic articles in the leading production/operations management journals have been devoted to service operations. Textbook content reveals only the weakest trend to alter the classic manufacturing paradigm toward services.

Accordingly, this paper hypothesizes that basic quality concepts embedded within the production/operations management body of knowledge have been slow to transfer into the service sector. The survey instrument, involving 126 service corporations across 32 industries, enjoyed a 91% response rate. The results find that the overall degree of knowledge in the service sector is very low. Many of the resulting means placed within the lowest quartile of the Likert scale. The authors hope that this paper and evidence will effectively serve as a call for production & operations management academics to more aggressively shift their discipline perspective toward services.

THE RISE OF SERVICE AND THE DISCIPLINE PERSPECTIVE

Over the past twenty-five years, America has migrated from an economy based upon industrial and manufacturing activity toward an economy, to great extent, based upon information, technology and service—in agreement with the prophetic 1980 perspective of futurist Alvin Toffler (1980). There is little doubt that the service sector has now all but replaced the dominance of the manufacturing sector within the American economy. By 1990, service accounted for 72% of U.S. Gross National Product (U.S. Bureau of Economic Analysis, 1991) and accounted for 70% of American employment (Schmenner, 1995). Employment in the manufacturing sector began a rapid

decline during the late 1990s, with 3 million jobs lost between 2000 and 2003, that being one-sixth of the total manufacturing sector (Anonymous, 2003a, 2003b) , while the number of Americans employed in service continues to increase (Stevenson, 1996). The American economic shift away from manufacturing toward service is also well documented with various other economic statistics regarding the declining balance of manufacturing exports-to-imports, declining manufacturing employment and declining direct labor content within goods.

Perhaps even more persuasive evidence of the American economic shift from manufacturing toward service in the last twenty-five years is found within the composition of the thirty component corporations of the Dow Jones "Industrial" Average (DJIA); during that time, the component basis of the DJIA has steadily moved toward service. Table 1 displays a number of significant changes evidencing the trend (Dow Jones & Company, 2004; Shell, 2004).

According to a recent USA Today article (Shell, 2004), the 1999 changes represented the point at which "the stodgy index that once tracked the smokestack economy went ‘new economy.'" The article also states that International Paper "was expelled because basic materials matter less in today's information-based economy." In addition, other long-standing DJIA component corporations such as IBM and Honeywell have clearly shifted a significant percentage of their core business into the service sector. With similar perspective, Fortune magazine stopped distinguishing between service and manufacturing within its Fortune 500 list during the 1990s.

The rise of service is also evidenced throughout much of the industrialized world as well, representing nearly 70% of the civilian labor force in Canada, Australia, France and the Netherlands and nearly 50% in Germany, Japan and Italy (U.S. Bureau of Economic Analysis, 2002).

Table 1
DJIA Component Replacements Toward Service Content

New Component	Replaced Component	Year
American Express	Manville Corporation	1982
McDonalds	General Foods	1985
Disney	U.S. Steel	1991
J. P. Morgan Chase	American Can	1991
Citigroup	Westinghouse	1997
Wal-Mart	Woolworth	1997
Microsoft	Chevron	1999
SBC Communications	Union Carbide	1999
Home Depot	Sears, Roebuck	1999
American International	International Paper	2004
Verizon	AT&T	2004
Pfizer	Eastman Kodak	2004

The academic perspective regarding production & operations management, however, remains stubbornly focused upon its manufacturing paradigm "roots" rather than shifting toward services. The authors reviewed 217 abstracts from Journal of Operations Management, generally recognized as the discipline's leading journal (Barman, Hanna, & LaForge, 2001; Barman, Tersine, & Buckley, 1991; Soteriou, Hadjinicola, & Patsia, 1999; Vokurka, 1996). The review, which included the articles published from 1993 through 2001, found no more than seven articles (3.2% of the total articles) squarely focused upon the topic of service operations (Heineke, 1995; Karmarkar & Pitbladdo, 1995; Kellogg & Nie, 1995; Miller, Craighead, & Karwan, 2000; Narasimhan & Jayaram, 1998; Soteriou & Chase, 1998; Stank, Goldsby, & Vickery, 1999) and no more than 18 articles with some significant degree of service operations content. In contrast, 68 articles (31.3% of the total articles) were found to have "classic" topics such as planning, scheduling, forecasting and production control intended for the manufacturing environment.

Even the most cursory longitudinal examination of production & operations textbooks reveals only the weakest trend to alter the classic manufacturing perspective or to add service content. For example, the index of the 1996 edition of the best-selling production & operations management textbook (Stevenson, 1996) identifies only 17 of its 897 pages (1.9%) as pertaining to services; the index of the 2005 edition (Stevenson, 2005) identifies only 35 of its 871 pages (4.0%) as pertaining to services. In 2003, a major production/operations textbook (Heizer & Render, 2003) did adopt a predominant service theme in its seventh edition, threading its examples through a case based upon the Hard Rock Café. For the most part, however, the production & operations management discipline persists in perceiving service operations as distinct from the production & operations discipline, as evidenced by brand-new textbooks dedicated solely to service operations such as Davis & Heineke (2003) as well as continuing editions of dedicated service operations textbooks such as Fitzsimmons & Fitzsimmons (2004).

There is even earlier evidence of the discipline's resistance to service issues. During the 1980s and early 1990s, much (though certainly not all) of the significant service operations research was actually conducted within the discipline of marketing, by researchers such as Martin Bell (1986), Mary Jo Bitner (1992), John Bowen (1990) and Christopher Lovelock (1980; 1983; 1984; Maister & Lovelock, 1982). Many of the articles authored by these researchers are still considered "service classics" and continue to strongly influence, and comprise no small portion of, the production/operations management body of knowledge with respect to services. The term "service factory" provides one example. The term, which refers to how service operations such as McDonalds are similar in nature to a traditional manufacturing operation, was popularized within the production & operations discipline by a Harvard Business Review article titled "The Service Factory," written by two productions & operations management academics possessing a special interest in services (Chase & Garvin, 1989). However, the term "service factory" actually appeared six years earlier in the marketing literature within an article authored by marketing professor Christopher Lovelock (1983). Another example involves the "classic" list of characteristics that differentiate manufactured goods from services, a list typically found in recent production & operations management textbooks;

that list is essentially derived from a Lovelock services marketing text published twenty years ago (1984).

HYPOTHESES

Based upon this delay in the conversion of the production & operations management academic perspective from that of manufacturing operations toward service operations, the authors hypothesize that:

H1: The degree of production & operations discipline concepts diffused into the practice of service operations is relatively low.

Since we suspect that there is little "formal" diffusion of these concepts, much of any existing diffusion is expected to be "informal" in nature. Under such informal diffusion, concepts that are easier for practitioners to conceptualize—or to transfer easily by "word of mouth"—may well possess higher degrees of diffusion into the service sector. Accordingly, the authors additionally hypothesize that

H2: Differences in diffusion exist between production & operations discipline concepts transferred into the practice of service operations.

The final hypothesis concerns industry effect. All service operations and industries differ substantially, and in similar fashion, from that of traditional manufacturing operations, hence no industry effect is anticipated:

H3: There is no industry effect upon the degree of production & operations discipline concepts diffused into the practice of service operations.

METHOD

The participants in this study were individuals selected from 126 service corporations across 32 service industries. With minimal exception, the corporations surveyed have significant national presence and were surveyed via a local unit operating within thirty miles of a specific medium-sized mid-Atlantic state university. One individual, in most cases an individual with some degree of managerial experience, was surveyed at each corporation. Table 2 presents the 32 service industries surveyed, each noted with the number of companies surveyed within that industry.

The survey employed nine-point Likert-style scales to capture self-reported degrees of knowledge regarding 24 major quality concepts (including three service quality concepts) commonly found within the production & operations management body of knowledge. The specific concepts measured are listed within Table 3 (displayed in the first Data Analysis section).

While the sample is intended to be representative of the population of all units of all the 126 service corporations, it is important to note that the selection of the participants in this study was based upon convenience sampling. According to Kerlinger (1986), in convenience sampling, probably the most frequent form of sampling, selection is based upon ease of accessibility. Such sampling is not truly random and therefore may impact generalizability, however, it often leads to intellectual insights not otherwise easily afforded and is generally acceptable in exploratory work. In this case, the convenience is the geographic proximity of the business establishments. Indeed, Babbie (1995) presents a specific example regarding how geographic proximity can easily result in a non-representative sample.

Table 2
Service Industries Surveyed

Accounting & Tax Services (2)	Consumer, Food & Beverage (28)
Automobile Rental (4)	Furniture/Appliance Rental (3)
Automobile Repair (non-dealer) (4)	Groceries (5)
Automobile Sales, New (7)	Home Furnishings, Retail (2)
Automobile Supplies, Retail (3)	Home Improvement, Retail Sales (2)
Banking (3)	Hospitality (7)
Books, Retail Sales (2)	Insurance, Consumer (3)
Cable a/o Internet Provider (2)	Letter & Package Delivery (3)
Clothing, Retail Sales (5)	Office Supplies, Retail Sales (2)
Consumer Loans (Non-Bank) (3)	Optical Goods, Retail (2)
Department Stores (5)	Real Estate Sales (3)
Drug & Sundries, Retail (5)	Retail, Miscellaneous (2)
Duplication and Binding (2)	Stock Brokerage (4)
Electronics, Retail Sales (3)	Telecommunications, Consumer (4)
Employment, Temporary (2)	Toys, Retail (2)
Extermination, Pest (2)	Video & Game Rental (2)

However, there is much academic license to legitimately employ convenience sampling within the context of this study. Kerlinger (1986) advises convenience sampling can be used "with reasonable knowledge and care" and so long as "circumspection in analysis and interpretation of

data" is used. Deming (1960) states that the reader "relies upon the expert's judgment" when encountering "judgment samples … in which an expert … makes a selection of 'representative' or 'typical' … business establishments." Babbie (1973) states that judgmental sampling "to be done effectively … requires … expertise ... well versed … in the area under consideration so that selection … is based on an educated guess as to its representativeness."

In this study, the authors exercise that allowed reasonable judgment and expertise to argue that there exists a reasonable degree of homogeneity and representativeness across individual units of a large service company with many units comprising its national presence. Such individual units are typically governed by centralized models, procedures, training and management practices. Hence, if one manager has not been trained or exposed to a specific quality concept by his company, there is fair reason to suspect that other managers at other units have likewise been untrained or unexposed. Accordingly, the authors believe that the sample is much more representative of the population than non-representative in nature, and so sufficient for the intent of this study, i.e., to find some exploratory support for the hypotheses that have been argued. (This argument simultaneously addresses any argument regarding the sufficiency of n.) Regardless, the authors must acknowledge that geographic proximity is a formal limitation upon any conclusions and generalizations drawn from this study.

One shortcoming of the research design was that since, in a number of industries only two or three companies existed or were proximate, less reliable measures of dispersion for those industries resulted. A second shortcoming of the design is that the survey instrument was not designed to distinguish the source of the respondent's knowledge of the concepts, i.e., whether the knowledge was internally or externally derived, formally or informally diffused into the organization. It was only after the design and distribution of the instrument that the authors recognized that they might wish to control or analyze this factor. Hence, the conclusions and generalizations are also limited by these design factors.

Of the 126 survey instruments distributed, 114 usable responses were received, which translates into a 91% overall survey response rate. The high response rate is primarily attributed to the use of face-to-face method in survey distribution and collection. While there is no general safe limit to nonresponse (Deming, 1960), such a high response rate greatly reduces the risk of any nonresponse bias. Further, of the twelve nonresponses, the surveyors reported that eight nonresponses were cited as due to company policies against the release of competitive information. Consideration of this additional information, in combination with the high response rate, leads the authors to conclude the likelihood of nonresponse bias is extremely low.

DATA ANALYSIS AND CONCLUSIONS FOR H1: DEGREE OF KNOWLEDGE

Table 3 presents the descriptive statistics for each of the 24 concepts measured. These descriptive statistics indicate the overall degree of knowledge of these concepts within the service

sector is very low. None of the 24 quality concepts measured resulted in a mean greater than five, the median value within the nine-point Likert scale employed. Fully one-third of the concept means fell within the lowest quartile of the scale. The grand mean of 3.04 and grand median of 2 are even stronger evidence of the overall low degree of knowledge.

Table 3: Descriptive Statistics for Concepts Measured

Concept Measured	Mean	SD	Min	Max	Median
Benchmarking	4.76	2.75	1	9	5
14 Points for Management	3.36	2.27	1	9	3
Hidden Factory	2.44	2.02	1	8	1
Ishikawa/Fishbone Diagrams	2.5	2.09	1	9	1
ISO 9000	2.73	2.39	1	9	1
Juran's 80:20 Rule	3.05	2.35	1	9	2
Kaizen/Continuous Improvement	3.61	2.58	1	9	3
Kanban/Pull Methods	2.75	2.14	1	9	1
Kano's "Delightful Quality" Model	2.48	2.19	1	9	1
Moments of Truth	3.47	2.74	1	9	3
Pareto Charts	2.31	1.94	1	9	1
PDSA Cycle	2.67	2.13	1	8	1
Poka-Yoke & Mistake-Proofing	2.41	2.12	1	9	1
Quality Circles	3.88	2.64	1	9	4
Quality Dikes	2.82	2.23	1	9	1
Root Cause Analysis	3.94	2.68	1	9	4
Service Bookends	3.05	2.34	1	9	2
Service Recovery	3.54	2.55	1	9	3
Shingo Methods	1.94	1.77	1	9	1
Six Sigma	2.23	1.8	1	7	1
Statistical Process Control Charts	3.35	2.6	1	8	3
Taguchi Methods	1.85	1.55	1	9	1
The Four Costs of Quality	3.68	2.51	1	7	3
Zero Defects	4.14	2.73	1	9	5
All Concepts	3.04	2.42	1	9	2

While similar descriptive statistics from a sample of the manufacturing sector would be required in order to perform a formal comparison between the two sectors, the extremely low

numbers tabled greatly increase the likelihood of significant difference between the two sectors. Based on the values tabled, so very near the lowest values possible, the authors conclude that the analysis provides reasonable informal evidence to support H1, that the degree of production & operations discipline concepts diffused into the practice of service operations is relatively low.

DATA ANALYSIS AND CONCLUSIONS FOR H2: DIFFERENCES IN CONCEPT DIFFUSION

Table 4 presents the 95% confidence intervals for the 24 concepts measured, tabled in decreasing order of the lower bound. The tabling of ranked confidence intervals, rather than a complete tabling of all possible t-tests and resulting p-values, greatly simplified the illustration of these comparisons within the confines of this paper. The confidence intervals adequately facilitate determinations regarding whether concepts significantly differ in degree of diffusion. For example, the lower bound for the benchmarking concept is greater than the higher bound of concepts 5 through 24. Hence we may conclude that the benchmarking concept has a significantly higher diffusion into the service sector than those twenty concepts. Examining the table from the bottom in similar fashion also yields significant differences. For example, the upper bound for the Taguchi Methods concept is lower than the lower bound for concepts 1 through 16. The authors note that the issues of lack of pooled variance and paired comparison place some minor limitations upon the claim of significance. The results of these comparisons are displayed in Table 5.

Table 5 facilitates an informal categorization of the concepts into five strata: concepts 1 through 4, concepts 5 through 12, concepts 13 through 16, concepts 17 through 22 and concepts 23 and 24. The authors offer some speculation regarding of the nature of these tiers. The first-tier concepts are relatively easy to verbalize and transfer "by word of mouth." Many of the second-tier and third-tier concepts have been highly visible in press, trade magazines and popular books. The nomenclature regarding a number of the fourth-tier concepts may well be unfamiliar—results might have been different had different nomenclature been used. The fifth-tier concepts are generally more technical and complex, not easily transferred without formal study. The authors believe this argument suggests that most of the service knowledge that was measured was not transmitted through formal organizational channels.

Again, while calculation and illustration of all possible t-tests and resulting p-values would have added a slightly more formal significance, would have added the additional information that p-values offer, and would have perhaps added a somewhat more precise stratification of the concepts, the confidence interval approach tabled above is more compact and yet still yields more than adequate statistical evidence to support H2, that differences in diffusion exist between the various production & operations discipline concepts transferred into the practice of service operations.

Table 4
95% Confidence Intervals for Concepts Measured

Concept Measured	Mean	Lower Bound	Upper Bound
1) Benchmarking	4.25	4.76	5.28
2) Zero Defects	3.63	4.14	4.65
3) Root Cause Analysis	3.44	3.94	4.44
4) Quality Circles	3.39	3.88	4.37
5) The Four Costs of Quality	3.21	3.68	4.14
6) Kaizen/Continuous Improvement	3.13	3.61	4.09
7) Service Recovery	3.06	3.54	4.01
8) Moments of Truth	2.97	3.47	3.98
9) 14 Points for Management	2.94	3.36	3.78
10) Juran's 80:20 Rule	2.92	3.05	3.49
11) Statistical Process Control Charts	2.87	3.35	3.83
12) Service Bookends	2.62	3.05	3.49
13) Quality Dikes	2.4	2.82	3.23
14) Kanban/Pull Methods	2.35	2.75	3.14
15) ISO 9000	2.28	2.73	3.17
16) PDSA Cycle	2.27	2.67	3.06
17) Ishikawa/Fishbone Diagrams	2.11	2.5	2.89
18) Kano's "Delightful Quality" Model	2.08	2.48	2.89
19) Hidden Factory	2.06	2.44	2.81
20) Poka-Yoke & Mistake-Proofing	2.02	2.41	2.81
21) Pareto Charts	1.95	2.31	2.67
22) Six Sigma	1.89	2.23	2.56
23) Shingo Methods	1.61	1.94	2.27
24) Taguchi Methods	1.56	1.85	2.14

Table 5: Confidence Intervals Comparisons

Concept Measured	Significantly Different By Upper Bound from Concepts	Significantly Different By Lower Bound from Concepts	Not Significantly Different from Concepts
1) Benchmarking		5-24	2-4
2) Zero Defects		10, 12-24	1, 3-9, 11
3) Root Cause Analysis		13-24	1-2, 4-12
4) Quality Circles		13-24	1-3, 5-12
5) The Four Costs of Quality	1	14-24	2-4, 6-13
6) Kaizen/Continuous Improvement	1	14, 16-24	2-5, 7-13, 15
7) Service Recovery	1	16-24	2-6, 8-15
8) Moments of Truth	1	17-24	2-7, 9-16
9) 14 Points for Management	1	17-24	2-8, 10-16
10) Juran's 80:20 Rule	1-2	19-24	3-9, 11-18
11) Statis. Process Control Charts	1	19-24	2-10, 12-18
12) Service Bookends	1-2	22-24	3-11, 13-21
13) Quality Dikes	1-4	23-24	5-12, 14-22
14) Kanban/Pull Methods	1-5	23-24	6-13, 15-22
15) ISO 9000	1-5	23-24	6-14, 16-22
16) PDSA Cycle	1-7	23-24	8-15, 17-22
17) Ishikawa/Fishbone Diagrams	1-10		11-24
18) Kano's "Delightful Quality" Model	1-10		11-24
19) Hidden Factory	1-11		12-24
20) Poka-Yoke & Mistake-Proofing	1-11		12-24
21) Pareto Charts	1-11		12-24
22) Six Sigma	1-12		13-24
23) Shingo Methods	1-16		17-24
24) Taguchi Methods	1-16		17-24

DATA ANALYSIS AND CONCLUSIONS FOR H3: INDUSTRY EFFECT

As displayed within Table 2, only two or three useable responses per industry were collected from a number of industries. While two responses within a specific industry would technically allow for the calculation of a standard deviation, the authors believe that such deviations would not be adequately representative of the population. Accordingly, pair-wise industry comparisons were not conducted. However, an overall analysis of variance was conducted to determine whether any industry effect was present. The results of that ANOVA are displayed in Table 6.

Table 6
Analysis of Variance, Industry Effect

Source of Variation	SS	df	MS	F	p-value
Industry	74.011	30	2.467	0.913	0.599
Error	224.276	83	2.702		
Total	298.287	113			

The ANOVA finds no significant industry effect and the resulting p-value indicates any industry effect present is, indeed, quite weak. This result displayed in Table 6 allows for the reasonable conclusion that the diffusion of production & operations quality concepts into the service sector is poor regardless of the specific service industry. Accordingly, the authors conclude that support is found for H3, that there is no industry effect upon the degree of production & operations discipline concepts diffused into the practice of service operations. The conclusion serves to strengthen the notion that services, as a single entity, suffer from deficient diffusion of production and operations management knowledge.

CONCLUSION

While this study is exploratory and, to some minor degree, informal in nature, the authors believe it represents a significant contribution to discipline knowledge, in that it provides sufficient evidence that, after nearly a quarter-century of "a service economy," the production and operations discipline perspective has not sufficiently metamorphosized in a manner that would facilitate the diffusion of its body of knowledge into the service industries.

The authors have noted other calls in the production & operations management literature for researchers to redirect their research efforts when the discipline is in need of alignment. For example, in the early 1990s, a number of calls to conduct more empirical production & operations research appeared in major journals (Flynn, Sakakibara, Schroeder, Bates, & Flynn, 1990; Meredith,

Raturi, Amoako-Gyampah, & Kaplan, 1989; Swamidass, 1991). The authors have found no equivalent call in the literature stating that a more significant shift in the production & operations management discipline toward service is warranted. It is hoped that this paper, as well as its exploratory evidence, illustrates the need for such a shift and that it will serve as such a call.

REFERENCES

Anonymous. (2003a). Flying on one engine. *The Economist, 368*(8342), 3.

Anonymous. (2003b, July 30). The nation; Bush team talks up tax cuts on bus tour. *Los Angeles Times*, pp. A13.

Babbie, E. R. (1973). *Survey research methods*. Belmont, Calif.: Wadsworth Pub. Co.

Babbie, E. R. (1995). *The practice of social research* (7th ed.). Belmont, California: Wadsworth Publishing Company.

Barman, S., Hanna, M. D., & LaForge, R. L. (2001). Perceived relevance and quality of POM journals: a decade later. *Journal of Operations Management, 19*(3), 367-385.

Barman, S., Tersine, R. J., & Buckley, M. R. (1991). An empirical assessment of the perceived relevance and quality of POM-related journals by academians. Journal of Operations Management, 10(2), 194-212.

Bell, M. (1986). Some strategy implications of a matrix approach to the classification of marketing goods and services. *Journal of the Academy of Marketing Science, 14*(1), 13-20.

Bitner, M. J. (1992). Servicescapes: the impact of physical surroundings on customers and employees. *Journal of Marketing, 56*(2), 57-71.

Bowen, J. (1990). Development of a taxonomy of services to gain strategic marketing insights. *Journal of the Academy of Marketing Science, 18*(1), 43-49.

Chase, R. B., & Garvin, D. (1989). The Service Factory. *Harvard Business Review, 67*(4), 61-70.

Davis, M. M., & Heineke, J. (2003). *Managing services: using technology to create value* (1st ed.). Boston, Massachusetts: McGraw-Hill Irwin.

Deming, W. E. (1960). *Sample design in business research*. New York, New York: Wiley.

Dow Jones & Company. (2004). *Dow Jones Indexes*. Retrieved from http://www.djindexes.com on March 1, 2004.

Fitzsimmons, J. A., & Fitzsimmons, M. J. (2004). *Service Management* (4th ed.). Boston, Massachusetts: McGraw-Hill Irwin.

Flynn, B. B., Sakakibara, S., Schroeder, R. G., Bates, K. A., & Flynn, E. J. (1990). Empirical research methods in operations management. *Journal of Operations Management, 9*(2), 250-284.

Heineke, J. (1995). Strategic operations management decisions and professional performance in U.S. HMOs. *Journal of Operations Management, 13*(4), 255-272.

Heizer, J., & Render, B. (2003). *Operations Management* (7th ed.). Upper Saddle River, New Jersey: Prentice Hall.

Karmarkar, U., S., & Pitbladdo, R. (1995). Service markets and competition. *Journal of Operations Management, 12*(3/4), 397-411.

Kellogg, D. L., & Nie, W. (1995). A framework for strategic service management. *Journal of Operations Management, 1995*(13), 4.

Kerlinger, F. N. (1986). *Foundations of behavioral research* (3rd ed.). New York, New York: Holt Rinehart and Winston.

Lovelock, C. (1980). Toward a classification of services. In C. W. Lamb & P. M. Dunne (Eds.), *Theoretical developments in marketing* (pp. 269). Chicago, Illinois: American Marketing Association.

Lovelock, C. (1983). Classifying services to gain strategic marketing insights. *Journal of Marketing, 47*(Summer), 9-20.

Lovelock, C. H. (1984). *Services marketing: text, cases & readings*. Englewood Cliffs, New Jersey: Prentice-Hall.

Maister, D., & Lovelock, C. (1982). Managing facilitator services. *Sloan Management Review, 23*(4), 19-31.

Meredith, J., Raturi, A., Amoako-Gyampah, K., & Kaplan, B. (1989). Alternative research paradigms in operations. *Journal of Operations Management, 8*(4), 297-326.

Miller, J. L., Craighead, C. W., & Karwan, K. R. (2000). Service recovery: a framework and empirical investigation. *Journal of Operations Management, 18*(4), 387-400.

Narasimhan, R., & Jayaram, J. (1998). Reengineering service operations: a longitudinal case study. *Journal of Operations Management, 17*(1), 7-22.

Schmenner, R. W. (1995). *Service Operations Management*. Englewood Cliffs, New Jersey: Prentice-Hall.

Shell, A. (2004, April 2). Dow sheds three of its oldest members. *USA Today*, pp. 1.

Soteriou, A. C., & Chase, R. B. (1998). Linking the customer contact model to service quality. *Journal of Operations Management, 16*(4), 495-508.

Soteriou, A. C., Hadjinicola, G. C., & Patsia, K. (1999). Assessing production and operations management related journals: the European perspective. *Journal of Operations Management, 17*(2), 25-238.

Stank, T. P., Goldsby, T. J., & Vickery, S. K. (1999). Effect of service supplier performance on satisfaction and loyalty of store managers in the fast food industry. *Journal of Operations Management, 17*(4), 429-447.

Stevenson, W. J. (1996). *Production/Operations Management* (5th ed.). Chicago, Illinois: Irwin.

Stevenson, W. J. (2005). *Operations Management* (8th ed.). Boston, Massachusetts: McGraw-Hill Irwin.

Swamidass, P. M. (1991). Empirical science: the new frontier in operations management. *Academy of Management Review, 16*(4), 793-814.

Toffler, A. (1980). *The third wave* (1st ed.). New York: Morrow.

U.S. Bureau of Economic Analysis. (1991). *Survey of Current Business*. April.

U.S. Bureau of Economic Analysis. (2002). *Comparative Civilian Labor Force Statistics for Ten Countries, 1959-2001.*

Vokurka, R. J. (1996). The relative importance of journals used in operations management research: a citation analysis. *Journal of Operations Management, 14*(4), 345-355.