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Benchmarking in the purchasing function: impact on purchasing performance and business performance.

Abstract

The importance of benchmarking in the achievement of better results in the purchasing function and in overall business performance has been asserted in several textbooks, and in the practitioner and academic literature. However few studies have addressed the implementation of benchmarking in purchasing and its impact on purchasing and business performance. Data was collected from 306 companies and structural equations modeling is used to develop valid and reliable instruments for benchmarking, purchasing performance and business performance. The results show a significant positive impact of benchmarking on purchasing performance and an indirect positive effect on business performance. Implications of the findings for purchasing management are discussed.

Introduction

Since the 70's the organizational buying behavior has been changing drastically due to a wide variety of factors. Increasing foreign and domestic competition and an increasing quality awareness of customers have forced organizations to develop and implement a number of different quality assessment and improvement initiatives in

order to remain competitive. The inclusion of benchmarking in the Malcom Baldrige National Quality Award manifests its widespread use and its importance in quality management (Hackman and Wageman, 1995). The purchasing literature is full of examples of how close supplier relationships and human resource management practices based on teamwork can improve quality performance. However, other quality-oriented purchasing practices have not received the same degree of attention by researchers in the purchasing area. This is the case of benchmarking. Very few studies have been published concerning the importance of benchmarking in the purchasing function and its impact on performance improvement. In fact no previous study has attempted to empirically demonstrate the relationship among benchmarking in purchasing, purchasing performance, and business performance.

This study is important because purchasing professionals in many companies still need to demonstrate the contribution they make to the firm. Purchasing professionals need further evidence that their involvement in benchmarking is profitable for the company. This study enables them to demonstrate that efforts in purchasing towards benchmarking have an impact on purchasing performance and the firm's corporate performance.

Consequently, the purpose of this research is to examine the relationship between benchmarking in the purchasing function with purchasing performance and corporate performance. Specifically this paper attempts to empirically answer the questions: 1) do firms that implement benchmarking in the purchasing function have greater purchasing performance? Do firms that implement benchmarking in the purchasing function enjoy higher levels of business performance? Responding to the later question encompassed answering to three other secondary questions; does benchmarking in purchasing have a positive direct effect on business performance? Does purchasing performance have a positive effect on business performance? Does benchmarking in purchasing have a positive indirect effect on business performance?

The remaining of this article is structured as follows. The next section introduces the literature review and hypotheses. Following, the research methodology is described. The third section displays the results and discussion of hypotheses. The article ends with a section dedicated to conclusions.

Literature review and hypothesis

Benchmarking has become an increasingly common management practice in recent years. Managers use benchmarking as a tool to ultimately identify performance gaps and improve performance. A good review of the benchmarking literature can be found in Yasin (2002). Summarizing, previous studies of benchmarking have addressed such issues as:

- Types of benchmarking (e.g. Bogan and English, 1994; Sackman, 1992).

- How to perform bechmarking (e.g.Camp, 1989; McNair and Leibfried, 1992; Spendolini, 1992; Bendell et al., 1993)

- What to benchmark (e.g. Parvoti, 1994)

- Decision support systems for bechmarking (e.g. Korpela and Tuominen, 1996)

- The relationship between benchmarking, learning orientation and firm's operational and business performance (e.g. Voss et al., 1997)

- Analytical methods for benchmarking (e.g. Landeghem and Persoons, 2001; Forker and Mendez, 2001)

In the past ten years, benchmarking has also become a widely implemented practice in purchasing departments (Carr and Smeltzer, 1999). Purchasing managers have started to use benchmarking as a way to identify and understand what practices are necessary to reach world-class standards.

The importance of benchmarking in the purchasing function has been widely stressed in the purchasing literature (e.g. Monczka and Morgan, 1993; Purchasing, 1994a; 1994b; Stork, 1996). Independent organizations such as The

Center for Advanced Purchasing Studies (CAPS) and The Global Procurement and Supply Chain Benchmarking Initiative at Michigan State University, are conducting purchasing benchmarking studies across industries allowing participating companies to assess their individual performance against aggregate data (Carr and Smeltzer, 1999). The popularity of benchmarking in the purchasing function has also been included in several purchasing textbooks (e.g. Leenders et al., 2002; Dobler and Burt, 1996).

The academic literature about benchmarking in the purchasing function is rather scarce. For instance Gilmour (1999) developed a methodology to benchmark operations in the supply chain and reported an example using data from six companies. Andersen et al. (1999) used the SMArTMAN SME project to identify best practices in several supply chain management areas: information technology tools, make or buy decision, supplier searches and progress reporting and supplier-customer relationships. Carr and Smeltzer (1999) collected data from 739 firms and analyzed the relationship between purchasing benchmarking, strategic purchasing and firm performance. Although the authors offered an operational definition for benchmarking in purchasing, it didn't include the use of a formal procedure and the use of information from other organizations (competitors and/or non competitors) as the basis for comparisons. Landeghem and Persoons (2001) developed a method to benchmark logistical operations. This method was designed to facilitate managers to detect performance gaps and following the causal model identify the effective logistic actions that need to be implemented to improve performance. Forker and Mendez (2001) collecting data from 292 firms developed an analytical method for benchmarking best peer suppliers. The method is intended to help purchasing managers to identify suppliers that could benefit most from supplier development efforts.

Although its popularity within purchasing, there is still little empirical research about the impact of benchmarking on purchasing and business performance. In relation to this, Yasin (2002) urges the necessity to develop methodologies to guide benchmarking practices in emerging technologies and practices such as supply chain management and stressed the lack of studies that quantify the costs and benefits associated with the implementation of benchmarking.

Benchmarking has been defined as "the search for industry best practices that lead to superior performance" (Camp, 1989, p. 12). Consequently and for the purpose of this research, benchmarking in purchasing was defined as the formal process of gathering and analyzing information about the purchasing process and purchasing performance of other organizations (competitors and/or non-competitors) in order to improve the company's own purchasing process and performance.

Voss et al. (1997) collected data from 660 managers and found a positive relationship among benchmarking, operational performance. According to these authors benchmarking improves performance by helping a company identify best practices, set challenging performance goals, and through a better understanding of its strengths and weaknesses relative to competitors, implement decisions based on real needs. Therefore, it is hypothesized that purchasing benchmarking has a positive impact on purchasing's performance.

H1: benchmarking has a positive impact on purchasing's performance

Voss et al. (1997) also found a positive relationship among benchmarking and business performance. More recently, Carr and Smeltzer (1999) found in their empirical study a positive relationship between benchmarking in purchasing, strategic purchasing and business performance. Therefore it is hypothesized that benchmarking in purchasing has a positive impact on the firm's corporate performance. However, the effect of benchmarking on corporate performance can be direct and/or indirect, i.e. mediated by the positive effect of purchasing performance on corporate performance, therefore hypotheses H2a and H2b were also formulated.

H2: benchmarking has a positive total effect on business performance
      H2a: benchmarking has a positive direct impact on business performance
      H2b: benchmarking has a positive indirect impact on business performance

A third hypothesis was enunciated in order to test H2. Business performance is the result of the effects of the individual business areas that comprise a company (i.e., production, marketing, finance, purchasing, etc.). Improvements in purchasing performance should have an effect on business performance. Thus hypothesis 3 states that a positive relationship exists between purchasing performance and business performance.

H3: purchasing performance has a positive impact on the firm's business performance

Figure 1 depicts the model to be tested along the hypothesized relationships (H1, H2, H2a, H2b, and H3) presented above. Hypothesis 1 has a unidirectional arrow between benchmarking and purchasing performance. Hypothesis 2a has a unidirectional arrow between benchmarking and business performance. Hypothesis H2b is represented by the combination of two arrows: the unidirectional arrow between benchmarking and purchasing performance and the unidirectional arrow between purchasing performance and business performance. Hypothesis 3 has a unidirectional arrow between purchasing performance and business performance. The research methodology is described next.

"Take in Figure 1"

Methodology

Sample description

A questionnaire was mailed to a sample of 1182 purchasing managers drawn from the Duns and Bradstreet Database of the largest manufacturing companies in Spain. The survey was designed following a modified version of Dilman's (1978) Total Design for survey research consisting in three mailings. Initially the sample members were sent a cover letter explaining the purpose of the study and requesting their participation. The questionnaire

and a postage-paid return envelope accompanied the cover letter. Three weeks after the initial mailing a reminder letter was sent to non-respondents. Six weeks after the initial mailing, a second survey and cover letter were sent to the remaining non-respondents.

Ultimately, 306 usable responses were received, for a response rate of 25%. Non-response bias was investigated using two separate approaches. First, non-response bias was examined by comparing the responses of early respondents and late respondents in terms of variables relevant to the problem investigated (Armstrong and Overton, 1977). This is based on the argument that late respondents are more like non-respondents than early respondents (Armstrong and Overton, 1977). The comparisons yielded non-significant differences among the survey variables.

The second approach involved examining the original sample; in this case we had some quantitative information about all firms in the sample frame (number of employees and sales) obtained from Duns and Bradstreet database. We then compared the profile of the responding firms with the profile of the entire sample frame (see Table I). No significant differences were found, indicating that the respondents were representative of the entire sample. Therefore, we conclude that non-response bias is not a problem in our data set.

The respondent sample was composed of high level purchasing executives including 145 directors of purchasing (48 percent), followed by 89 general managers of purchasing (29 percent) and 19 purchasing managers (6 percent) and 45 "other" titles (17 percent).

Respondents reported an average number of employees of 779 and a total of 50 percent of the companies employed between 101 and 500 employees (155 firms). Although there was significant difference between the mean number of employees reported by respondents and the data provided by Duns & Bradstreet (t-value = 3.86, $p < 0.01$), the high correlation between the two (0.765) confirmed the validity of using both measures. The largest firm employed 15,000 workers and had the highest annual sales of € 5.4 billion. Average annual sales was € 141 million and an

approximate half the respondents reported annual sales of less than € 68 million. Respondents were from a variety

of manufacturing industries as shown in Table II. In descending order food, automotive components,

miscellaneous manufacturing, and chemical were the most widely represented industries in the respondent group.

Annual 2000 gross sales of the companies ranged from 5 million euros to 35 million.

"Take in Table I"

"Take in Table II"

Instrument validation

Based on the existing literature a comprehensive survey was developed to study the purchasing benchmarking

activities and the relationship with purchasing performance and business performance. Before the final

questionnaire was completed, a pretest was conducted in a 5 companies multiple case study. Comments were

collected and modifications were made into the design of the final survey instrument.

Two were the dependent variables in this study: purchasing performance and business performance. Five aspects of

purchasing performance were measured: quality, delivery, degree of achievement of inventory goals, order lead-

time, and level of internal customer satisfaction. Respondents were asked to rate their level of agreement on a 5-

point Likert scale, where 1 represented "totally disagree" and 5 represented "totally agree". Additionally, three

elements of business performance were measured: return on assets, gross margin, and market share. For these three

indicators respondents were asked to indicate the position of their company with respect to its competitors on a 5-

point scale, where 1 represented "well bellow" and 5 represented "well above". The means and standard deviations

for the items included in purchasing performance and business performance are shown in Table III.

The independent variable in the study, benchmarking, was measured on a 5-point Likert scale. For the benchmarking items (bmk1-bmk3 in Table III), respondents were asked to indicate the degree of agreement or disagreement with the statements with 1 corresponding to "totally disagree" and 5 corresponding to "totally agree". Descriptive statistics (means and standard deviations) of the independent variable items are presented in Table III.

To determine the validity of the scales, several tests were performed. Items related to a specific construct (e.g. benchmarking) were submitted to exploratory factor analysis and principal components was chosen as the extraction procedure. This test resulted in one single factor extracted for each construct and items loadings ranging from 0.60 to 0.91. The reliability of the scales used was also evaluated using Cronbach's alpha. Coefficient alpha levels should be over 0.70 for established scales and 0.60 for new scales (Churchill, 1979). For this study, reliability values ranged between 0.71 and 0.77 (see Table III).

"Take in Table III"

Results and discussion of hypotheses

Correlation analysis

Mean responses for the 3 benchmarking practices and 8 performance measurements ranged from 2.15 to 4.34. The most commonly used benchmarking practices are collecting data about the prices and level of quality of purchases of other companies in our industry (mean = 3.51) and analyse the purchasing process of other companies to improve their own purchasing process (mean = 3.11). Establishing a formal procedure to compare the company's performance with the purchasing performance of other companies was rated the least used benchmarking practice (mean = 2.15) and below the scale median threshold of 3. This indicates either a lack of awareness of the benefits of such practice, or that many organizations are just beginning to implement it.

Respondents evaluated their firm's purchasing performance most highly on materials quality conformance (mean = 4.34), followed by ordering process lead-time (mean = 3.94) and customer service level (mean = 3.89). Inventory and delivery performance received the lower rating from respondents (mean = 3.78 and 3.34 respectively). Respondents reported similar levels of performance for return on assets, gross margin and market share (mean = 3.60, 3.50 and 3.64 respectively). These levels of purchasing and corporate performance indicate that performance could be further improved.

Bivariate correlation analysis was used to make an initial assessment of the relations between the constructs (Table IV). A composite measure for each construct was calculated by summing the individual scores for each item and then dividing by the number of items. For example, the responses to bmk1, bmk2 and bmk3 were summed and then divided by three to determine the composite measure BMK. The results showed that benchmarking in purchasing was positively correlated with purchasing performance at $\alpha = 1$ percent providing initial support for H1. Similarly, purchasing performance and business performance had a positive relationship at $\alpha = 10$ percent initially supporting H3. On the other hand, no significant relationship was found between benchmarking in purchasing and business performance. This result initially suggested the rejection of H2. However, bivariate correlation analysis does not take into account the effect of third variables when calculating the correlation between two variables, as is the case in this research. The correlation between benchmarking and corporate performance does not inform us of the direct effect of benchmarking on corporate performance (H2a), and it doesn't inform us of the indirect effect through the mediating effect of purchasing performance on corporate performance (H2b). In order to overcome this limitation and further investigate the impact of benchmarking on purchasing and business performance and test the hypothesis formulated a structural equations analysis was performed.

"Take in Table IV"

Structural equations analysis

Structural equation modeling (SEM) is a statistical technique that combines elements of both multiple regression and factor analysis. SEM is often used to specify the phenomenon under study in terms of linkage between constructs and their indicators and provides the researcher with a straightforward method of dealing with multiple relationships simultaneously while providing statistical efficiency.

Two parts can be differentiated when estimating a structural equation model: the measurement model and the structural model. The measurement model examines the relationship between the observable variables (indicators) and the latent variables (constructs) they intend to measure. The structural model differs from the measurement model because it includes causal paths based on hypothesized relationships between specific latent variables in the model.

The data analysis performed followed the two-step approach recommended by Anderson and Gerbing (1998). The first step involved a confirmatory factor analysis to purify and test the measurement part of the model. As recommended by many researchers, multiple fit criteria are presented to rule out measuring biases inherent in the various measures (Bollen and Long, 1993; Hair et al., 1995).

Table V shows the fit statistics for the measurement model. The chi-squared statistic was significant, which was expected given the relatively large sample size (n=268) (Bagozzi and Yi, 1988; Byrne, 1994; Hair et al., 1995). Other fit indices indicated an acceptable fit of the measurement model to the data (see Table V). The ratio of chi-square to degrees of freedom and the Root Mean Square Error of Approximation (RMSEA) were below the recommended maximum of 3.00 and 0.10 respectively (Chau, 1997). The AGFI was above the minimum recommended value of 0.80 (Byrne, 1994; Hair et al., 1995). The remaining indexes, i.e., NFI, NNFI, CFI and GFI were all above the minimum acceptable 0.90 level as well (Byrne, 1994; Hair et al., 1995). Table VI shows the standardized factor loadings and *t*-statistics for each indicator in the measurement model. These numbers provide

information about how well each individual item is related to its respective latent variable. The computed t-values ranged from 11.31 to 44.02 well above the minimum acceptable t-value of 1.96 ($p < 0.05$, two tailed). The alpha coefficient and explained variance for the latent variables were above the minimum acceptable of 0.70 and 0.50 (Hair et al., 1995) respectively, and therefore confirmed the reliability of the latent variables.

"Take in Table V"

The second step involved a test of the structural model. The fit statistics for the structural model are displayed in Table V. The indices indicated an adequate fit for the structural portion of the model. The ratio of chi-square to degrees of freedom and the Root Mean Square Error of Approximation (RMSEA) were below the recommended maximum of 3.00 and 0.10 respectively (Chau, 1997). Additionally, the indexes NFI, NNFI, CFI, and GFI were all above the minimum acceptable 0.90 level. The AGFI index was also above the 0.80 value suggested by Byrne (1994) and Hair et al. (1995). The model resultant from the estimation of the structural model is the one shown in Figure 2. LISREL coefficients between latent variables give an indication of the relative strength of each relationship (Joreskog and Sorbom, 1993). The test of the proposed hypotheses is based on the total effects in the structural model (see Table VII). A positive significant coefficient estimate (t-values greater than 1.65 are significant at $p < 0.05$, one tailed) for the hypothesized paths reveals that support is found for each hypothesis.

"Take in Table VI"

In view of the results H1 was supported. The path between BMK and PPF was positive and significant (path coefficient = 0.16, t-value = 4.06) indicating that a positive relationship exits between purchasing benchmarking and purchasing performance. This result suggests that purchasing managers that invest more resources in establishing a formal procedure to benchmark the purchasing performance of other companies, monitor prices and quality levels of materials purchased, and analyse the purchasing process of other companies in order to improve

their own purchasing process, achieve higher levels of purchasing performance, in terms of quality, delivery, inventory, order lead-time and internal customer satisfaction, than firms with lower levels of investment.

According to Table VII purchasing benchmarking had a significant positive indirect effect over business performance (coefficient = 0.05, t-value = 1.77) and thus confirmed H2b. On the contrary the results indicated that purchasing benchmarking had a direct negative effect on business performance (path coefficient = -0.17, t-value = -2.36). Similarly, the total effect of BMK on BPF was also negative and significant (path coefficient = -0.12, t-value = -1.96). Therefore H2a and H2 were not supported. This result was surprising and not expected by the researchers. A plausible explanation for this result could be found in the existence of a time lag between the implementation of benchmarking and the achievement of positive results. However in the long run implementation of benchmarked practices should result in an improvement of the company's corporate performance. An additional explanation could be based in the fact that all areas of a company affect corporate performance, and the efforts of a single area could not be sufficient if the other areas of the company do not support it. Further research is needed to fully understand this relationship.

Hypothesis 3 stated that purchasing performance has a positive direct impact on business performance. The structural path between PPF and BPF was positive and significant (path coefficient = 0.16, t-value = 2.14). Hence H3 was supported. This result implies that when purchasing performance levels increase, business performance indicators of return on assets, gross profit and market share improve as well.

This study is important because it is the first empirical research to establish relationships between benchmarking (BMK), purchasing performance (PPF) and business performance (BPF) using a structural equation model. Therefore, this research fills a gap between theory and practice in the purchasing area concerning the application of this practice and its impact on purchasing performance and business performance. The implications of this study are also important because the results suggest that firms can improve their purchasing performance through an increased emphasis in benchmarking the purchasing process and purchasing performance.

"Take in Figure 2"

"Take in Table VII"

Conclusions

The primary purpose of this research was to investigate the impact of purchasing benchmarking on purchasing and business performance. Specifically we asked the questions: do firms that implement benchmarking in the purchasing function have greater purchasing performance? Do firms that implement benchmarking in the purchasing function enjoy higher levels of business performance? Does benchmarking in purchasing have a positive direct effect on business performance? Does benchmarking in purchasing have a positive indirect effect on business performance? Does purchasing performance have a positive effect on business performance? The analysis of a large-sample, organizational-level survey of manufacturing firms from Spain was used to examine the research questions. In the process of addressing these questions, valid and reliable instruments were developed to measure benchmarking, standardization, purchasing performance and business performance. The research included a rigorous literature review and pre-test in a multiple case study. Great care was taken during item generation, pre-testing, and pilot testing to ensure content validity. The instruments are unidimensional with strong evidence of convergent, discriminant, and predictive validity. The instruments have high reliability for all industries in the sample, which lends support to the claim that the instruments and results are generalizable across industries.

When the impact of benchmarking is examined on purchasing performance and business performance, three of the five hypothesized relationship were supported. The study showed that, benchmarking in the purchasing function has a significant positive impact on purchasing performance. The research also confirmed the notion that firms with high levels of purchasing performance achieve high levels of business performance as well. Accordingly, the

results of structural equation model testing indicated that there is a positive indirect effect of benchmarking on business performance. The implications for purchasing managers are clear. Having in place a formal procedure to benchmark relevant purchasing performance indicators (e.g. prices and quality levels) and purchasing processes of other companies increase performance through higher levels quality of purchased materials, supplier delivery performance, inventory performance, and internal customer satisfaction. This result will in turn improve business performance (return on assets, gross margin and market share).

The results of this research provide additional support to the relationships between benchmarking and performance as enunciated by Voss et al. (1997). Hence, purchasing managers may use benchmarking to improve purchasing performance in several ways: 1) as a tool to identify more advanced purchasing practices, 2) set challenging purchasing performance goals, and 3) acquire a better understanding of the company's purchasing strengths and weaknesses relative to competitors and implement improvement activities based on existent needs.

The study has a number of limitations that should be noted. A more stringent test of the relationships among benchmarking, purchasing performance and corporate performance requires a longitudinal study, or field experiment, which could gather information about benchmarking, purchasing performance and business performance on an appropriate time span. Then the association between the variation of independent factors and the variation of performance could be further investigate. Future research should also expand the model in this study by including additional factors, such as, the role of purchasing management commitment towards quality and the use of participative personnel management practices.

References

Andersen, B., Fagerhaug, T., Randmael, S., Schuldmaier, J. and Prenninger, J. (1999), "Benchmarking supply chain management: finding best practices", Journal of Business and Industrial Marketing, Vol. 14, No. 5/6, pp. 378-389.

Anderson, J. C and Gerbing, D. W. (1988), "Structural equation modelling in practice: a review and recommended two-step approach", Psychological Bulletin, Vol. 103, No. 2, pp. 411-423.

Armstrong, J. S. and Overton, T.S. (1977), "Estimating nonresponse bias in mail surveys" Journal of Marketing Research, Vol. 14, No. 3, pp. 396-402.

Bagozzi, R. P. and Yi, Y. (1988), "On the evaluation of structural equation models", Academy of Marketing Science, Vol. 6, No. 1, pp. 74-93.

Bendell, T., Boulter, L. and Kelly, J. (1993), "Benchmarking for competitive advantage", Pitman Publishing, London.

Bogan, C. and English M.J. (1994), "Benchmarking for Best Practices: winning through innovative adaptation", McGraw-Hill, New York.

Bollen, K. A. and Long, J. S. (1993), "Testing structural equation models", Sage Publications, Newbury Park, CA.

Byrne, B. M. (1994), "Structural equation modelling with EQS and EQS/Windows: basic concepts, applications, and programming", Sage Publications, Thousand Oaks, CA.

Camp, R.C. (1989), "Benchmarking: the search for industry best practices that lead to superior performance", ASQC Press, Milwaukee, WI.

Carr, A.S. and Smeltzer, L.R. (1999), "The relationship among purchasing benchmarking, strategic purchasing, firm performance, and firm size", The Journal of Supply Chain Management, fall, pp. 51-60.

Chau, P. Y. K. (1997), "Reexamining a model for evaluating information center success using a structural equation modelling approach", Decision Sciences, Vol. 28, No. 2, pp. 309-334.

Churchill, G.A.Jr. (1979), "A paradigm for developing better measures of marketing constructs", Journal of Marketing Research, Vol. 16, No. 1, pp. 64-73.

Dillman, D. A. (1978), "Mail and Telephone surveys: The Total Design Method", John Wiley, New York.

Dobler, D. W., Burt, D. N. (1996), "Purchasing and supply management. Text and cases", McGraw-Hill, New York.

Forker, L.B. and Mendez. D. (2001), "An analytical method for benchmarking best peer suppliers", International Journal of Operations and Production Management, Vol. 21, No. 1/2, pp. 195-209.

Gilmour, P. (1999), "Benchmarking supply chain operations", International Journal of Physical Distribution & Logistics Management, Vol. 5, No. 4, pp. 259-266.

Hair, J. F. Jr., Anderson, R. E., Tatham, R. L. and Black, W. C. (1995), "Multivariate data analysis with readings", 4th edition, Prentice Hall, Englewood Cliffs, NJ.

Jöreskog, K. G. and Söbom, D. (1993), "LISREL 8: Structural equation modelling with the SIMPLIS command language", Scientific Software International, Chicago, Ilinois.

Korpela, J. and Tuominen, M. (1996), "Benchmarking logistics performance with an application of the analytic hierarchy process", IEEE Transactions on Engineering Management, Vol. 43, No. 3, pp. 323-333.

Landeghem, R.V. and Persoons, K. (2001), "Benchmarking of logistical operations based on a causal model", International Journal of Operations and Production Management, Vol. 21, No. 1/2, pp. 254-266.

Leenders, M.R., Fearon, H. E., Flynn, A.E. and Johnson, P. F. (2002), "Purchasing and supply management", 12th Ed., McGraw-Hill Irwin Chicago, IL.

McNair, C.J. and K.H.J., Leibfried (1992), "Benchmarking: a tool for continuous improvement", HarperCollins Publishers, New York, NY.

Monczka, R. and Morgan, J. (1993), "Benchmarking. What you need to make it work", Purchasing, Vol. 114, No. 1, pp. 63-66, 69.

Parvoty, F. Y. (1994), "Determining what to benchmark: an analytic hierarchy process approach", International Journal of Operations and Production Management, Vol. 14, No. 6, pp. 25-39.

Purchasing (1994a), "How the best in the world buy", Purchasing, Vol. 116, No. 5, pp. 25-27.

Purchasing (1994b), "Benchmarking turns a corner", Purchasing, Vol. 117, No. 7, pp. 74-76.

Sackman, S.A. (1992), "Culture and Subcultures: an analysis of organizational knowledge", Administrative Science Quarterly, Vol. 37, No 1, pp. 140-161.

Spendolini, M.J. (1992), "The benchmarking process", Compensation and benefits review, September-October, pp. 21-29.

Stork, K. (1996), "Benchmarking What's in it for me", Purchasing, June 20.

Voss, C.A., Ahlstrom, P. and Blackmon, K. (1997), "Benchmarking and operational performance: some empirical results" International Journal of Operations and Production Management, Vol. 17, No.10, pp. 1046-1058.

Yasin, M.M. (2002), "The theory and practice of benchmarking: then and now", Benchmarking: an International Journal, Vol. 9, No 3, pp. 217-243

Table I

Comparison between sample and population

	N	Mean	Standard Deviation	Significance[1]
Sales (million Euros €) Non-Respondents	898	169,381,344	514,118,518	0.383
Respondents	302	141,613,431	349,833,642	
Number of employees Non-Respondents	890	536	1024	0.637
Respondents	302	568	932	

[1] Significance level was based on a t-test for equality of means

Data used from Duns and Bradstreet database.

Table II

Respondent's industries

Industry	Frequency	Percentage
Food and beverage	58	18.9%
Auto components	46	15.0%
Miscellaneous manufacturing	40	13.4%
Chemicals	38	12.4%
Machinery	20	6.5%
Pharmaceutical products	15	4.9%
Construction materials	14	4.6%
Telecommunications & electronic equipment	12	3.9%
Electricity materials	12	3.9%
Primary metals	12	3.9%
Paper	11	3.6%
Electric appliances	10	3.3%
Non ferrous metallurgy	9	2.9%
Textile	9	2.9%
Total	306	100.0%

Table III

Survey items, alpha values, means and standard deviations

	Construct / Item	Mean	SD
BMK	*Benchmarking α=0.71*		
bmk 1	We gather information about prices and level of quality of purchases of other companies in our industry	3.51	1.06
bmk 2	We analyse the purchasing process of other companies to improve our own purchasing process	3.11	1.12
bmk 3	There is a formal procedure to compare our performance with the purchasing performance of other companies	2.15	1.06
PPF	*Purchasing Performance α=0.76*		
ppf1	Most of raw materials and parts received are in conformance with specifications	4.34	0.63
ppf2	All raw materials and parts arrive within the delivery date	3.34	0.97
ppf3	The quantity of materials purchased in inventory meets the quantity performance objective	3.78	0.86
ppf4	Customer departments are satisfied with the level of attention and commitment shown by purchasing when there is a problem	3.89	0.79
ppf5	Customer departments are satisfied with the speed with which we process their orders	3.94	0.75
BPF	*Business Performance α=0.77*		

bpf1	Return on Assets (profit / total assets)	3.60	0.75
bpf2	Gross Margin (profit / sales)	3.50	0.75
bpf3	Market share	3.64	0.84

Table IV

Bivariate correlation

	Benchmarking (n=306)	Purchasing Performance (n=306)	Company Performance (n=268)
Benchmarking	1		
Purchasing Performance	0.145**	1	
Company Performance	0.035	$0.083^{\dagger}$	1

** Correlation is significant at the 0.01 level (1-tailed)

† Correlation is significant at the 0.10 level (1-tailed)

Table V

Results of the overall model fit

Fit Measures	Suggested values	Measurement model	Structural model
Chi-Square		66.15	66.15
Degrees of freedom		41	41
P- value	≥ 0.05	0.007	0.007
Chi-Square / degrees of freedom	≤ 3.00	1.61	1.61
Root Mean Square Error of Approximation (RMSEA)	≤ 0.10	0.048	0.048
Normed Fit Index (NFI)	≥ 0.90	0.97	0.97
Non-Normed Fit Index (NNFI)	≥ 0.90	0.98	0.98
Comparative Fit Index (CFI)	≥ 0.90	0.99	0.99
Goodness of Fit Index (GFI)	≥ 0.90	0.99	0.99
Adjusted Goodness of Fit Index (AGFI)	≥ 0.90	0.98	0.98

Table VI

Measurement model

Constructs and Indicators	Standardized loadings	*t*-values	Reliability	Explained variance
BMK			0.78	0.55
bmk1	0.76	15.41		
bmk2	0.86	15.33		
bmk3	0.57	11.31		
PPF			0.87	0.57
ppf1	0.67	13.36		
ppf2	0.81	23.69		
ppf3	0.81	19.96		
ppf4	0.74	14.58		
ppf5	0.73	19.41		
BPF			0.93	0.82
bpf1	0.96	43.26		
bpf2	0.98	44.02		
bpf3	0.77	19.78		

Table VII

Direct, Indirect and Total Effects

| Constructs	Purchasing Performance	Business Performance
Direct effects		
BMK	Coefficient = 0.30	Coefficient = -0.17
	t-value = 4.06	*t*-value = -2.36
		H3a: NOT SUPPORTED
Indirect Effects		
BMK	Not Applicable	Coefficient = 0.05
		t-value = 1.77
		H3b: SUPPORTED
Total Effects		
BMK	Coefficient = 0.30	Coefficient = -0.12
	t-value = 4.06	*t*-value = -1.96
	H1: SUPPORTED	H2: NOT SUPPORTED
PPF	Not Applicable	Coefficient = 0.16
		t-value = 2.14
		H3: SUPPORTED

Figure 1

Proposed model
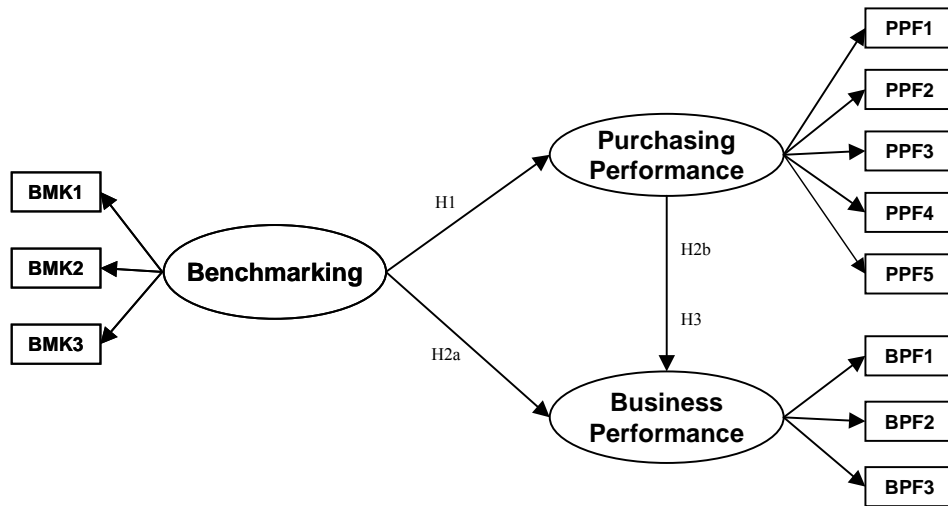
Figure 2

Structural model estimated