5-2005

The Impact of High Performance Work System Practices on Small Manufacturer Performance

Stephen C. Jones

Tami L. Knotts

Wesley A. Scroggins

THE IMPACT OF HIGH PERFORMANCE WORK SYSTEM PRACTICES ON SMALL MANUFACTURER PERFORMANCE

Stephen C. Jones, Arkansas Tech University
Tami L. Knotts, Missouri State University
Wesley A. Scroggins, Missouri State University

ABSTRACT

This paper examines the effect of both quality operations and high performance work system (HPWS) practices on firm performance for 1200 small manufacturers wanting to market their products to a major mass merchandiser. All of these firms participated in a supplier evaluation program that assessed both their management and product characteristics. Performance for each firm in this study was categorized as either low, average, or high by comparing the stated or observed performance on each evaluation criteria to the minimum completion level. Our study found that both quality operations and HPWS practices significantly predicted performance among low, average, and high performing firms. We conclude that small firm managers should investigate and adopt the appropriate quality and human resources practices which will enable their firms to perform at higher levels.

INTRODUCTION

The bulk of small firm performance research focuses on factors such as TQM and financial management in leading to success. In fact, quite a bit of research has found strong ties between quality management and small firm performance over the last 10 to 15 years. Comparatively, little research has been directed at examining the role of human resource practices in small firm performance. Becker and Huselid's (1998) work on high-performance work systems (HPWS) suggests that high quality HR practices will have a positive effect on the financial performance of a firm. Small firm HRM research in this area has met with mixed results, and little agreement exists on a common canon of HPWS practices used by small businesses today.

This paper examines the effect of both quality operations and HPWS practices on small manufacturer performance among firms wishing to market their retail products nationally. First, we briefly examine a sample of both quality operations and human resource management research as they relate to small firm success. Then we describe the results of a study of almost 1700 small U.S.

manufacturers and their firm and product characteristics. Finally, we offer suggestions for small firms wanting to use HPWS practices to improve performance.

BACKGROUND AND HYPOTHESES

Quality Operations Research

Performance research for small firms has focused on operational issues such as quality management, quality control, and continuous improvement. For manufacturers, a formalized quality management program tends to be an important success factor (Roth & Miller, 1992); however, smaller firms may use much more informal means of quality assessment, such as inspection rather than sophisticated statistical techniques, because these firms lack skilled personnel (Abdul-Aziz, Chan, & Metcalfe, 2000). For example, Abdul-Aziz, Chan and Metcalfe (2000) noted that use of an in-process inspection system (along with pre- and post-process inspection) was critical for success. Yusof and Aspinwall (2000) found that quality practices such as process improvement, statistical process control, and employee involvement were all characteristics of successful smaller manufacturers.

Small firms also tend to place an emphasis on quality control rather than the quality assurance prized by large manufacturing firms (Sun & Cheng, 2002). They may measure customer satisfaction with traditional methods including customer surveys, along with non-traditional approaches such as counting the number of customer complaints and counting the number of items returned under warranty (Kuratko, Goodale, & Hornsby, 2001). Another qualitative control technique, first-piece approval, reflects the tendency of firms to inspect the initial output of their production cycles.

While large firms use training to support continuous improvement, smaller firms tend to rely on traditional incentive and suggestion programs (Sun & Cheng, 2002). Yusof and Aspinwall (2000) found that few small firms use continuous improvement tools and techniques. In addition, employees may not recognize the difference between continuous improvement and productivity improvement programs; they tend to be wary of efforts which may result in the loss of jobs (Townsend & Gebhardt, 1990). Even managers may be disillusioned by improvement efforts, as the results may diminish over time (Lillrank, Shani, & Lindberg, 2001). Wilkes and Dale (1998) suggest that small manufacturers need continuous improvement training and a development guide that outlines critical practices.

Human Resource Management Research

Much research on human resource practices has focused on Becker and Huselid's (1998) concept of a "high-performance work system" (HPWS), which suggests that the use of strategic

human resource practices can identify organizations with better developed HRM philosophies. These practices include such things as validated selection tests, written HRM plans, employee training, job descriptions and analysis, individual performance and compensation plans, employee participation in decision making, employee participation in TQM programs, alignment of HRM system with business mission and strategy, and experienced and effective management and leadership. Becker and Huselid (1998) theorized that firms using these types of practices would have higher overall performance levels than those that did not employ these practices. They advised against a "best practices" approach and instead suggested that a firm pay attention to HRM techniques that create a synergistic effect. Becker, Huselid, Pickus, and Spratt (1997) found that adoption of an HPWS increased shareholder value and market value per employee significantly.

The limited research on small business HR practices seems to support the ideas of Becker and Huselid (1998). Capelli and Crocker-Hefter (1996) suggest that a list of "universal" HPWS practices is inappropriate and that effective HRM systems need to be adapted to the firm's needs. Wagar (1998) also argues against a "best practices" approach in small firm HRM research. In fact, research tends to focus on the most commonly adopted HR practices, but in reality there seems to be a lack of agreement on which practices are most beneficial for small businesses.

Bacon, Ackers, Storey, and Coates (1996) surveyed more than 500 small British firms and found that most employed such practices as delegation, work teams, performance appraisals, job flexibility, and information sharing. However, few used psychometric testing or quality circles, and few linked HR practices to their mission. Golbar and Deshpande (1997) compared the HR practices of large and small firms and found very few differences between them. Firms were just as likely to encourage employee participation and use job training and performance-based pay, although the extent of these practices might vary due to the size of the business. Wagar (1998) found that a majority of sampled small firms had formal performance appraisal systems, used orientation programs, and shared business information with employees, but they did not have HR departments. Kaman, McCarthy, Gulbro, and Tucker (2001) surveyed HR professionals in small American service firms and found that most used formal performance appraisals, job descriptions, and flexible scheduling, but few used formal selection processes, policy handbooks, and universally available training.

Becker and Huselid's theory that a HPWS leads to better firm performance has met with mixed reviews in small business research. Hornsby and Kuratko (2003) cited multiple studies that linked effective HRM practices to some level of success, and their own research indicated that small firm executives consider HRM issues of critical importance. Barling, Kelloway, and Iverson (2003) surveyed Australian industrial relations employees on the amount of training, task variety, and autonomy found on their jobs. They found that these high quality work practices had a direct effect on job satisfaction and indirect effect on reducing job injuries. However, Chandler and McEvoy (2000) found no direct effect on performance from HR practices. Instead, they found that HR practices moderated TQM efforts which, in turn, positively affected performance.

In this paper, we argue that both quality operations and high performance work practices will have a positive effect on firm performance for small manufacturers. Therefore, we offer the following hypotheses:

H1: Quality operations practices will have a positive impact on firm performance for small manufacturers.

H2: HPWS practices will have a positive impact on firm performance for small manufacturers above and beyond the contribution made by quality operations practices.

SAMPLE, DATA COLLECTION, AND MEASURES

This study draws on data collected from a supplier evaluation program developed at a regional Midwest university for screening small manufacturers as potential vendors to a major mass merchandiser. All of the participating firms in this study were independently-owned manufacturers who were not dominant in their industry. Of 2113 potential suppliers, 1690 (80.0 percent) completed both the firm self-assessment and product evaluation portions of the assessment process. Nineteen percent (321 firms) were female-owned and managed. The respondents were from all states, and racial, ethnic and other minority information were not kept as part of the main database. All firms supplied products exclusively for consumer purchase. Products varied in suggested retail price from inexpensive and/or point-of-purchase to major purchase levels.

Success for a small manufacturer in this program meant that the firm was able to get its product onto the mass merchandiser's retail shelves. The supplier evaluation program consisted of two appraisals: an assessment of the firm's management practices and an assessment of its submitted product (see the Appendix for specific items). Each product was either forwarded or not forwarded to a mass merchandiser buyer for consideration based upon the results of these evaluations. The final decision as to whether the retailer accepted the forwarded product for sale on its shelves was left entirely to the retailer.

Firm Assessment

The firm assessment instrument, which evaluated the management practices of potential suppliers, was a self-administered tool for use by program participants. The 34 items were based on prior research conclusions and discussion with potential buyers from the mass merchandiser industry. The items generally fell into the areas of marketing management, strategic management, production operations, and financial management.

The firm self-assessment items were structured with evaluation statements and multiple levels of measurement scored from one to five points. For example, in the firm self-assessment instrument, owners were asked to rate their marketing planning with the following item:

Marketing Plan. Does your firm have a marketing plan for this project?

(1) We do not need a marketing plan for this project.
(2) We have an informal, unwritten marketing plan.
(3) We have an informal, written plan.
(4) A formal, written marketing plan is in progress.
(5) We have a formal, written marketing plan.

Each of the 34 items in the self-assessment instrument used this five-point scoring method. The three-point (or middle) response was the minimum performance level acceptable to retail buyers.

Product Evaluation

The product evaluation instrument consisted of 41 items based on the Product Innovation Evaluation System (PIES) developed at the University of Oregon (Udell, O'Neill, & Baker, 1977). Product areas included societal impact, business risk, demand analysis, market acceptance, competitive capabilities, and experience and strategy. An independent, trained evaluator completed this portion of the assessment process. The independent evaluator was typically a current or former retail buyer or an experienced small firm owner with a retail background. The evaluator's role was to assess the potential of the product in the mass retail market.

The product evaluation instrument was similar in structure to the firm self-assessment. Products were judged objectively on a five-point ordinal scale using specific achievement levels rather than a sliding subjective scale. For example, the independent evaluator rated each product using items like the one below:

Functional Feasibility. In terms of its intended functions, will it do what it is intended to do? This product:

(1) is not sound; cannot be made to work.
(2) won't work now, but might be modified.
(3) will work, but major changes might be needed.
(4) will work, but minor changes might be needed.
(5) will work; no changes necessary.

Each of the 41 items in the product evaluation instrument used this five-point scoring method. The three-point (or middle) response was the minimum performance level acceptable to retail buyers.

Quality Operations and HPWS Variables

For this paper, two variables were created from the firm assessment instrument. The first variable, quality operations (QUALOP), aggregated the following items from the productions

operations area: product testing, quality control, first-piece approval, in-process inspection, and continuous improvement. All of these items represent success factors in the quality operations literature, particularly for small manufacturers. The second variable, high performance work system (HPWS), combined items from the strategic management area including mission statement, job description, employee input, management experience, business plan, and employee autonomy. While our model did not include all of Huselid's HPWS variables, the five used here were deemed appropriate by prior research for firms like the small manufacturers in our sample.

Performance Levels

The performance levels for firms in this study were created by comparing a firm's stated or observed performance on each evaluation criteria from both the firm assessment and product evaluation instruments. The performance was judged as poor if it did not meet the minimum completion level established for the specific criterion, and it was judged superior if it exceeded that same minimum level. Poor performance merited a "fault" for the firm, and excellent performance merited a "strength." "Faults" and "strengths" were then added up for each firm in both management and product areas.

A firm was judged to be a low performance firm if its "faults" exceeded the population mean by more than one standard deviation and if its total "strengths" were less than one standard deviation below the population mean. High performance firms were those that had significantly more "strengths" and fewer "faults." The mean number of "faults" for management practices was 8.54 (s.d. = 5.88) and for product characteristics was 7.54 (4.43). The mean number of "strengths" for management practices was 16.84 (7.11) and for product characteristics was 20.08 (5.30). Average performance firms were those firms that were not judged as either high or low performers. Only firms whose evaluation criteria had been completed intact (no missing data) were used in this procedure. Of the original 1690 program participants, 1219 (72.1%) met this criterion. Using this classification system, 108 firms (8.9%) were classified as low performers, 688 (56.4%) as average performers, and 128 (10.5%) as high performers. The remaining 295 (24.2%) of the 1219 firms were classified as mixed performers because of combined low, average and high performance levels, but because of the lack of clarity in their performance level, these firms were classified as average performers in the discriminant analyses. These 1219 were the only firms examined in this study. The results are shown in Table 1.

RESULTS

We first ran a correlation analysis to determine the relationships between the dependent and independent variables. We found highly significant correlations between each of the independent variables and the dependent variable, firm performance, and this result led us to believe that a

regression analysis may be a useful next step in testing our hypotheses. The results of the correlation analysis are shown in Table 2 below.

Table 1: Categorization of Firms by Performance

		Combined Strengths (Above Expected Performance)			
		Low (> 1 SD below mean)	Average	High (> 1 SD above mean)	Total
Combined Faults (Below Expected Performance)	High (> 1 SD	108	83	0	191
	above mean)	(8.9%)	(6.8%)	(0.0%)	(15.7%)
	Average	37	688	118	843
		(3.0%)	(56.4%)	(9.7%)	(69.2%)
	Low (> 1 SD	0	57	128	185
	below mean)	(0.0%)	(4.7%)	(10.5%)	(15.2%)
	Total	145	828	246	1219
		(11.9%)	(67.9%)	(20.2%)	(100.00%)

Table 2: Correlation Analysis Results

	Quality Operations	Human Resources	Interaction
	(QUALOP)	(HPWS)	(QUALOP*HPWS)
Human Resources (HPWS)	.564		
Interaction (QUALOP*HPWS)	.893	.859	
Firm Performance	.488	.505	.557

Note: All correlations are significant at the $p < .001$ level. N = 1219.

Prior research suggested that quality operations was likely to have the most significant effect on firm performance. The effect of a high performance work system was considered to be an auxiliary effect. Therefore, we used hierarchical regression to test the impact of self-reported quality operations practices on firm performance followed by HPWS practices and by the interaction of quality operations and HPWS practices. Table 3 shows that a firm's focus on quality operations practices accounts for 32.5 percent of the variance, while a focus on HPWS practices added another

12 percent to the predictive value of the model. The interaction of QUALOP and HPWS was not shown to be significant.

Table 3: Hierarchical Regression Analysis Results

	R	Adjusted R-Square	R-Square Change	Sign. of F Change
QUALOP	.571	.325	.326	.000
QUALOP, HPWS	.667	.444	.120	.000
QUALOP, HPWS & QUALOP*HPWS	.667	.444	.000	.472

Note: Dependent variable is Firm Performance. N = 1219.

In previous research on the performance of these small manufacturers, we found that the regression model sometimes predicted one level of performance better than another. Specifically, in Jones, Knotts, and Udell (2004), the model was able to predict failure but not success for these firms. Therefore, we decided to use discriminant analysis to see if this effect was occurring again with the firm performance levels. Only QUALOP and HPWS were used as independent variables since the regression determined that the interaction variable had insignificant predictive value. Table 4 shows the results of this discriminant analysis.

Table 4: Discriminant Analysis: Classification Results

	Predicted Low Performers	Predicted Average Performers	Predicted High Performers	Total
Actual Low Performers	88	19	1	108
	(81.5%)	(17.6%)	(0.9%)	
Actual Average Performers	209	527	247	983
	(21.3%)	(53.6%)	(25.1%)	
Actual High Performers	0	16	112	128
	(0.0%)	(12.5%)	(87.5%)	
Total	297	562	360	
	(24.4%)	(46.1%)	(29.5%)	

Note: The chi-square for this procedure was 9.536 ($p < .002$). N = 1219

Random chance assignment of a firm to any one of the three performance categories (low, average, high) would seem to be 33 percent. As Table 4 shows, the independent variables (QUALOP and HPWS) correctly classified both low and high performers between 80 and 90 percent of the time. Even moderate performers were correctly classified more than 50 percent of the time. It would appear that the regression model, while having better success with low and high performers, is robust at all levels.

DISCUSSION AND CONCLUSIONS

Prior research suggested that both quality operations and HPWS practices would have a positive impact on firm performance. Using a sample of over 1200 small manufacturers, our study verified these conclusions. Our first hypothesis suggested that quality operations practices alone would have a significant effect on firm performance. The correlation of this independent variable with the dependent variable, firm performance, was highly significant. Using hierarchical regression, we found that this variable alone accounted for almost one third of the variance in the dependent variable. Our second hypothesis suggested that HPWS practices would have a significant effect on firm performance, above and beyond that contributed by operations. Once again, the correlation of HPWS practices to firm performance was highly significant, and in the same hierarchical regression analysis, it was found to contribute another 12 percent towards the prediction of variance. These results provide support for both hypotheses.

One conclusion that can be drawn from these results is that both quality operations and HPWS practices have a significant and positive effect on firm performance for small manufacturers. This may suggest that firms could make significant improvements in performance by simply adopting both of these sets of practices.

Another conclusion from this study relates to the discriminant analysis, where both quality operations and HPWS practices correctly classified all levels of firms. Low and high performers were correctly classified with a better than 80 percent accuracy rate. This could suggest that high performers were definitely those manufacturers using both sets of practices, while low performers were those firms that used neither or that poorly used the systems that they had in place. Moderate performers, while significantly well-predicted, were much harder to classify with this model. Perhaps it is this level of performer that uses either quality operations or HPWS practices but not both, or perhaps these manufacturers do a mediocre job of using both systems. Additionally, it could be possible that moderate performers have adopted a "best practices" approach that Becker and Huselid (1998) warned against, or they simply may not have chosen the best HR practices that fit their needs.

Huselid (2003) called for more research in the area of HR strategy to help small firms understand the "science and practice" of human resource techniques within their field. This paper focused on a select set of HPWS that proved successful at predicting performance levels for small

manufacturers in the retail marketplace. While small firms may be limited in their resources, the HPWS practices examined in this study (mission statement, job description, employee input, management experience, business plan, and employee autonomy) seem rather inexpensive when compared with the more highly developed systems found in much larger firms. The results of this study would suggest that while inexpensive, these practices have the potential of significantly increasing small firm performance for small manufacturers.

REFERENCES

Abdul-Aziz, Z., J. Chan & A. Metcalfe (2000). Quality practices in the manufacturing industry in the UK and Malaysia. *Total Quality Management*, 11(December), 1053-1065.

Bacon, N., P. Ackers, J. Storey & D. Coates (1996). It's a small world: Managing human resources in small businesses. *The International Journal of Human Resource Management,* 7(1), 82-100.

Barling, J., E. K. Kelloway & R. D. Iverson (2003). High-quality work, job satisfaction, and occupational injuries. *Journal of Applied Psychology,* 88(2), 276-283.

Becker, B. E. & M. A. Huselid (1998). High performance work systems and firm performance: A synthesis of research and managerial implications. *Research in Personnel and Human Resources Management,* 16, 53-101.

Becker, B. E., M. A. Huselid, P. S. Pickus & M. F. Spratt (1997). HR as a source of shareholder value: Research and recommendations. *Human Resource Management,* 36(Spring), 39-47.

Cappelli, P. & A. Crocker-Hefter (1996). Distinctive human resources are firms' core competencies. *Organizational Dynamics,* 24(3), 6-22.

Chandler, G. N. & G. M. McEvoy (2000). Human resource management, TQM, and firm performance in small and medium-size enterprises. *Entrepreneurship Theory and Practice,* 25(Fall), 43-57.

Golbar, D. Y. & S. P. Deshpande (1997). HRM practices of large and small Canadian manufacturing firms. *Journal of Small Business Management,* 38(July), 30-38.

Hornsby, J. S. & D. F. Kuratko (2003). Human resource management in U. S. small businesses: A replication and extension. *Journal of Developmental Entrepreneurship,* 8(1), 73-92.

Huselid, M. A. (2003). Editor's note: Special issue on small and medium-sized enterprises: A call for more research. *Human Resources Management*, 42(4), 297.

Jones , S. C., T. L. Knotts & G. G. Udell (2004). The effect of product-related factors on small business failure. *Business Journal*, 19(1-2), 68-72.

Kaman, V., A. M. McCarthy, R. D. Gulbro & M. L. Tucker (2001). Bureaucratic and high commitment human resource practices in small service firms. *Human Resource Planning*, 24(1), 33-44.

Kuratko, D. F., J. C. Goodale & J. S. Hornsby (2001). Quality practices for a competitive advantage in smaller firms. *Journal of Small Business Management*, 39(October), 293-311.

Lillrank, P., A.B. Shani & P. Lindberg (2001). Continuous improvement: Exploring alternative organizational designs. *Total Quality Management*, 12(January), 41-55.

Roth, A. V. & J. G. Miller (1992). Success factors in manufacturing. *Business Horizons,* 35(July-August), 73-81.

Sun, H. & T. Cheng (2002). Comparing reasons, practices and effects of ISO 9000 certification and TQM implementation in Norwegian SMEs and large firms. *International Small Business Journal*, 20(November), 421-442.

Townsend, P. & J. E. Gebhardt (1990). The quality process: Little things mean a lot. *Review of Business*, 12(Winter), 3-8.

Wilkes, N. & B. G. Dale (1998). Attitudes to self-assessment and quality awards: A study in small and medium-sized companies. *Total Quality Management*, 9(December), 731-739.

Udell, G. G., M. F. O'Neill & K. G. Baker (1977). *Guide to invention and innovation evaluation*. Washington, D.C.: National Science Foundation.

Wagar, T. H. (1998). Determinants of human resource management practices in small firms: Some evidence from Atlantic Canada. *Journal of Small Business Management*, 36(April), 13-23.

Yusof, S. M. & E. M. Aspinwall (2000). Critical success factors in small and medium enterprises: Survey results. *Total Quality Management*, 11(July), 448-459.

Appendix: Firm Assessment and Product Evaluation Items

Firm Self-Assessment Items
Marketing Management:
- Marketing Plan
- Marketing Organization
- Price Determination
- Market Demand
- Competitive Product Analysis
- Promotional Plan
- Company Orientation

Strategic Management:
- Mission Statement
- Job Descriptions
- Employee Input
- Management Experience
- Quality
- Firm's Primary Objective
- Use of Consultants
- Business Plan
- Board of Directors
- Board Involvement

Production Operations:
- Product Testing
- Research & Development
- Manufacturing Technology
- Management Planning & Control Systems
- Delivery Schedule Reliability
- Quality Control Measures
- Maintenance Program
- Cost Containment
- First Piece Approval
- In-Process Inspection
- Continuous Improvement Program

Financial Management:
- Cash Flow
- Budgetary Planning Cycle
- Budget Update Cycle
- Cost Accounting

Accounting
- Financial Planning

Product Evaluation Items
Societal Impact:
- Legality
- Safety
- Environmental Impact
- Societal Impact

Business Risk:
- Functional Feasibility
- Production Feasibility
- Commercialization Stage
- Investment Costs
- Payback Period
- Profitability
- Marketing Research
- Research & Development

Demand Analysis:
- Potential Market
- Potential Sales
- Trend of Demand
- Stability of Demand
- Product Life Cycle
- Product Line Potential

Market Acceptance:
- Use Pattern Compatibility
- Learning
- Need
- Dependence
- Visibility
- Promotion
- Distribution
- Service

Competitive Capabilities:
- Appearance
- Function
- Durability
- Price
- Existing Competition
- New Competition
- Protection

Experience & Strategy:
- Technology Transfer
- New Venture
- Marketing Experience
- Technical Experience
- Financial Experience and Resources
- Management & Production Experience
- Channels: Promotional Requirements
- Channels: Sales & Selling Price