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John E. Spillan
University of North Carolina at Pembroke, john.spillan@uncp.edu

Michael A. McGinnis
The Pennsylvania State University, mam47@psu.edu

Jonathan W. Kohn
Shippensburg University, SCM@ship.edu

PRIVATE WAREHOUSE INVESTMENT STRATEGIES IN SMALL VERSUS LARGE MANUFACTURING FIRMS

John E. Spillan
University of North Carolina at Pembroke

Michael A. McGinnis
The Pennsylvania State University

Jonathan W. Kohn
Shippensburg University

ABSTRACT

The research reported in this manuscript empirically compares the private warehouse investment strategies of small and large manufacturing firms. Mail surveys were administered to independent samples of small and large United States manufacturing firms. This research is based on a series of identically worded questions administered to both samples. Data was factor analyzed and cluster analyzed to identify three private warehouse investment strategies for small and large firms and two strategies for large firms. Analyses of three independent variables further evaluated differences in private warehouse investment strategies. Finally, the warehouse mix of small and of large firms was compared. This study identified specific private warehouse investment strategies, and warehouse mixes, in small and large United States manufacturing firms. Small firms were found to be less likely to use formal capital budgeting techniques and were less likely to consider strategic issues than large firms. Small firms were also found to be more likely to use private warehousing than large firms. This research increases the awareness of differences in logistics practice between small and large manufacturing firms and suggests that generalizations regarding logistics strategy should be approached with caution.

INTRODUCTION

Historically, warehousing performed the function of long term-storage for raw materials, goods in process, and finished goods. Manufacturers fabricated products for storage in warehouses and then sold from inventory. Many warehouses were required to have inventory levels of 60 to 90 days supply to meet productions needs, customer needs, and avoid stock outs. Warehousing of the past was perceived as an inescapable cost center that functioned as a large stock-keeping unit (Coyle et al, 2003).

As a result of global competition warehousing has become an important function in the supply chain for maintaining a competitive advantage in customer service, lead-times, and costs (De Koster, 1998). Warehouses have been redesigned and automated for high speed, high throughput rate, and high productivity in order to shrink processing and

inventory carrying costs. With the arrival of just-in-time, strategic alliances, and logistical supply chain philosophies in the 1990s, the role of warehousing changed to facilitate the supply chain's goals of shorter cycle times, lower inventories, lower costs, and better customer service. Warehouses are now less likely to be long term storage facilities. They are more likely to be fast paced facilities with greater attention focused on high levels of stock turnover and meeting customer service objectives. In most cases the product is in the warehouse for only a few days or hours (Nynke et al, 2002). More emphasis is now focused on flow-through warehouses where products remain in the warehouse for a short period of time and then move on to their destination (Nynke et al, 2002).

An additional influence on warehouse management is the importance of maximizing financial performance in all areas of the firm. Stock and Lambert (2001) use a Strategic Profit Model which emphasized the importance of logistics/supply chain management to organizational financial performance. They demonstrate the impact of investments in inventory and other assets (including warehouse investment), fixed and variable costs, and cost of goods sold on return on net worth.

One choice that can impact the firm's financial performance is whether to use private or for-hire (public or contract) warehousing. In addition to affecting financial performance, Stock and Lambert (2001) discuss the advantages and disadvantages of these two warehousing strategies. This discussion is summarized as follows; private warehouses provide a high level of control, flexibility to design and operate the facility to meet specific product and customer needs, are less costly if utilization is high, may make greater use of specialized human resources, and provide tax benefits. However, private warehouses offer less flexibility to respond to fluctuations in demand and require substantial investment.

Public (or for-hire) warehousing conserves capital, provides flexibility in responding to changes in market demand, avoids the risk of obsolescence of private facilities, offers a wide range of specialized services, may provide tax advantages, and may enable a manufacturer to better manage its storage and handling costs. Disadvantages of public (for-hire) warehousing include communication problems, uneven availability of specialized services, and space availability problems during peak demand. A hybrid of the above choices is contract warehousing. Here the firm and provider enter into a long-term agreement to outsource some, or all, of the manufacturer's warehousing requirements. When contract warehousing works well the advantages of both private and public warehousing can be realized. When it does not work well the disadvantages of both may dominate.

In a 1990 manuscript (McGinnis, Kohn, and Myers) examined a wide range of topics related to private warehouse investment decisions in large manufacturing firms. The research examined factors affecting private warehouse investment decisions, private warehouse investment strategies, items affecting private warehouse investment strategies, and the warehouse mix. In reviewing this study the authors recognized two challenges. First, the study has not been replicated so that changes in warehouse strategies have not been examined. Second, the logistics managers sampled were from large national firms. As a result little is known about how private warehouse investment strategies in small manufacturing firms differ (or are similar) from those of large firms. The research reported in this manuscript focuses on the second challenge.

The balance of the manuscript is composed of five sections. The first section presents an overview and brief up-date of the literature associated with private warehouse investment. Next the the methodology, survey used, and data collection process are discussed. The third section presents the data analysis. Findings based on the analysis section are discussed in the fourth section. The final section discussed the authors' conclusions and the implications of this research for practitioners, educators and researchers.

LITERATURE REVIEW

McGinnis, Kohn, and Myers (1990) have written about private warehouse investment decisions in large manufacturing firms and have provided some conclusions about firms' decision making processes. They found that 59.1% of the firms surveyed selected an Analytic-Intuitive approach to warehouse investment strategy that blended formal capital budgeting techniques with strategic considerations, subjective issues, and decisions in other logistics activities. 40.9 % followed an Intuitive Private warehousing Investment strategy that focused on subjective, strategic considerations, subjective issues, and decisions in other logistics activities with only modest consideration of capital budgeting techniques.

Other work, such as Thai and Grewal (2005), focused on location selection process for distribution centers. They recognized the importance of investment in

warehouse logistical operations and argue for its inclusion in the firm's strategic planning. Thai and Grewal argued that investment in warehousing is not a simple exercise, but that it requires choosing the right location with careful consideration to the firm's unique needs. Certainly mathematical models can do a comprehensive analysis of the financial alternatives and location schemas, but good investment decisions have to include a variety of factors such as customer access, manufacturing facility nearness/farness and the availability of transportation facilities (Anonymous, 2004). These arguments are supported by Sanchez (2005) who indicated that location tops the list of considerations in buying or leasing a warehouse. Nearness to major transportation routes-highways, arterial roads, airports, rail yards, ports and labor pools are critical, however, they raise the investment cost and considerations.

When considering investment in warehousing, paying too much can create a competitive disadvantage. Warehouse building budgets, as with all capital expenditures budgets, are always tight and hence there is little space for overruns. If the warehouse logistics market is tight and if costs are too high the firm will not be able to compete (Sanchez, 2005). A more contemporary approach is to use quantitative finance models to analyze the return on invest (ROI) or return on asset (ROA) from warehouse investment (McLemore, 2004). When dealing with small and medium size firms (SMEs), however, these organizations generally deal with a different quantitative approach to capital investment analysis.

The criterion for small businesses generally revolves around balancing wealth maximization alongside other business objectives such as maintaining the independence of their business. Moreover, small businesses do not have the human resources as large firms. This means that managers do not have the time or the expertise to analyze projects in the same depth as larger firms (Danielson and Scott, 2006). SME firms also have special capital constrains making project liquidity a major concern. In addition, SMEs frequently function in environments that do not fit the general theories of capital budgeting. Finally, SMEs may have to operate within capital market imperfections that create additional obstacles for the evaluation process, and constrain the financing (Danielson and Scott, 2006).

Capital constraints make it necessary for small firms to maintain sufficient cash balances in order to react to potentially profitable investments when they become available. Capital constraints provide small firms a valid economic reason to be worried about how rapidly the project will produce cash flows (Danielson and Scott, 2006). Therefore, while quantitative analysis is a key analytical technique for evaluating warehouse investments among SMEs, they must be careful that they use the proper assessment criteria within the capital constraints that they encounter.

In summary, warehousing or distribution center capabilities are very important consideration to an efficient supply chain management system. The key to successfully achieving this objective will depend upon how managers evaluate the qualitative and the quantitative aspects of the investment decision. This process will have implications on the direction of their warehouse investment strategies.

After reviewing the literature the authors developed a series of research questions. They are listed as follows:

a. Do private warehouse investment decisions in small manufacturing firms differ from large firms?

b. How are private warehouse investment decisions in small manufacturing firms similar to large firms?

c. If there are differences why might they be occurring?

d. What lessons can be learned from private warehouse investment decisions in small manufacturing firms?

METHODOLOGY

In 2006 a four-page, 41-item questionnaire was mailed to 700 small manufacturing firms selected randomly from the Directory of Manufacturers. The focus was on firms with annual sales of $5,000,000 or less. Ninety-nine (14.1%) usable responses were received for this questionnaire. While the response rate was low, one-way analysis of variance by order of response quartile found no significant differences at alpha = 0.05 among the eight questionnaire items that related to private warehouse investment decisions. The authors concluded that the data was adequate for use as study of private warehouse investment strategies in United States small manufacturing firms.

In 2008 a four-page, 46-item questionnaire was electronically sent to 905 to members of a large national supply chain management organization who worked for manufacturing firms in the United States.

One hundred and twenty-three were undeliverable for a net sample of 782 subjects. After two follow-ups at total of forty-nine (6.3%) usable responses were returned. While the response rate was low, it is understandable given the results of similar recent studies reported in the supply chain management literature (Flint, Larsson, and Gammelgaard, 2008).

ANALYSIS

The number of respondents, means, and standard deviations for the eight questionnaire items related to private warehouse investment decisions in this study were for this sample were calculated and is summarized as Table 1. A comparison of eight means from the two independent samples (small manufacturing firms and large manufacturing firms) indicated that five pairs of means did not differ by an amount greater than due to chance (alpha <0.05) and that there was no systematic direction of change among the three means that were significantly different (one mean from the 2006 data was larger and two means from the 2008 data were larger). In addition the pattern of differences among the eight questions was not systemic among the groups of items used in subsequent analyses. The authors concluded that the data was suitable for the subsequent analyses reported in this research.

The balance of analysis was conducted in three stages as described by McGinnis, Kohn, and Myers (1990). In the first stage five questionnaire items that addressed the private warehouse investment decision process were factor analyzed. Factor analysis is useful for identifying any underlying constructs that explain the variance in a set of questions. The factor analysis method was principle components. Factors with eigenvalues of one or greater than one were rotated orthogonally. These results are presented as Table 2.

In the second stage of the analysis scores were calculated for each factor for each respondent. The values for all questionnaire items loading on a factor at 0.5 or greater were added and the sum divided by the number of items loading on the factor. Based on the factor scores of each respondent, cluster analysis was used classify the subjects into mutually exclusive groupings. Each grouping was then examined and then named based on its factor score average values. Each name reflects the "Private Warehouse Investment Strategy" based on its average factor scores. Table 3 presents the results of this stage of analysis.

The third stage of analysis was comprised of two evaluations using the identified warehouse strategies as independent variables. The first evaluation assessed mean differences of three questionnaire items concerned with market/product mix uncertainties, perceived availability of warehouse providers, and auditing of warehouse decisions. Next, perceived warehouse mixes were identified and evaluated relative to warehouse strategies. These results are shown as Tables 4 and 5.

FINDINGS

Any analysis and findings must be presented as tentative given the response rates to the two surveys. However, these findings provide insights into similarities and differences of warehouse investment strategies in small and large USA manufacturing firms.

Patterns of Responses

An examination of Table 1 provides an overview of the response patterns from respondents from small (2006 data) and large (2008 data) USA manufacturing firms. It is interesting to note that five of eight means between small and large firms (WH-3, WH-4, WH-5, WH-7, and WH-8) were not significantly at the 0.05 level. The other three means (WH-1, WH-2, and WH-6) were significantly different but the direction of those differences was not systematic (i.e. the 2006 data's means were not all larger or smaller than the 2008 data). Based on these results the authors concluded that results would not be systematically skewed due to fundamentally different perspectives from the large and small firm respondents.

Further examination of the results from Table 1 suggest that formal financial analysis (WH-1) are more likely to influence private warehouse investment decision making in small manufacturing firms, strategic considerations (WH-2) are more likely to influence these decisions in large manufacturing firms, and that uncertainties in markets and product mix (WH-6) make private warehouse planning more difficult in small firms.

Continued inspection of Table 1 indicates that small and large USA manufacturing firms do not differ significantly when considering service issues (WH-3), tempering cost analysis with subjective factors (WH-4), and mingling private warehouse investment decisions (WH-5) with decisions in other logistics

TABLE 1
COMPARISON: MEANS/STANDARD DEVIATIONS OF QUESTIONNAIRE ITEMS:
2006 (SMALL USA MANUFACTURING FIRMS) & 2008 (LARGE USA MANUFACTURING FIRMS)

		N/Means*/ Standard Deviations		Mean Differences Significant
		2006	2008	< 0.05?
WH-1	Formal capital budgeting techniques, such as discounted cash flow, net present value, and/or payback period dominate the decision whether to invest in private warehousing capacity. (24)	114 3.04/ 0.911	49 2.57/ 1.021	Yes
WH-2	Strategic considerations dominate the decision whether to invest in private warehouse capacity in my company/ division.	114 2.75/ 0.948	49 2.16/ 0.800	Yes
WH-3	My company/division explicitly considers subjective, hard to measure, service issues when considering whether to invest in private warehousing. (27)	115 2.96/ 0.882	48 2.92/ 0.919	No
WH-4	Formal cost analysis is tempered by other subjective factors before final decisions are made in my company/division. (28)	117 2.33/ 0.871	49 2.18/ 0.727	No
WH-5	Decisions whether to invest in private warehousing are increasingly intermingled with decisions in other logistics activities. (31)	112 2.86/ 0.793	48 2.18/ 0.945	No
WH-6	Market and/or product mix uncertainties make it difficult to plan for future private warehouse needs. (26)	114 2.52/ 0.895	49 2.98/ 1.090	Yes
WH-7	The use of contract warehousing by my company/division is limited by the number of good providers that are available. (29)	111 3.24/ 0.789	49 3.43/ 1.080	No
WH-8	In my company/division private warehouse investment decisions are audited after the project is in place. (30)	111 3.10/ 0.852	48 2.71/ 1.031	No

**Scale: 1 = Strongly Agree, 2 = Agree 3 = Neither Agree nor Disagree, 4 = Disagree, 5 = Strongly Disagree

TABLE 2
FACTOR ANALYSES:
2006 (SMALL USA MANUFACTURING FIRMS) & 2008 (LARGE USA MANUFACTURING FIRMS

2006 – National Sample of Small Manufacturing Firms		
Factor 1: Integrated Analysis		
Questions		**Factor Loadings**
WH-1	Formal capital budgeting techniques, such as discounted cash flow, net present value, and/or payback period dominate the decision whether to invest in private warehousing capacity.	0.751
WH-2	Strategic considerations dominate the decision whether to invest in private warehouse capacity in my company/division.	0.844
WH-3	My company/division explicitly considers subjective, hard to measure, service issues when considering whether to invest in private warehousing.	0.705
WH-4	Formal cost analysis is tempered by other subjective factors before final decisions are made in my company/division.	0.583
WH-5	Decisions whether to invest in private warehousing are increasingly intermingled with decisions in other logistics activities.	0.687
(51.7% of variance, reliability coefficient = 0.761)		
2008 – National Sample of Large Manufacturing Firms		
Factor 1: Strategic/Subjective		
WH-2	Strategic considerations dominate the decision whether to invest in private warehouse capacity in my company/division.	0.755
WH-3	My company/division explicitly considers subjective, hard to measure, service issues when considering whether to invest in private warehousing.	0.689
WH-4	Formal cost analysis is tempered by other subjective factors before final decisions are made in my company/division.	0.801
(37.5% of variance, reliability coefficient = 0.6333)		
Factor 2: Analytical/Integrative		
WH-1	Formal capital budgeting techniques, such as discounted cash flow, net present value, and/or payback period dominate the decision whether to invest in private warehousing capacity.	0.857
WH-5	Decisions whether to invest in private warehousing are increasingly intermingled with decisions in other logistics activities.	0.856
(29.9% of variance, reliability coefficient = 0.651)		
Amount of variance explained by both factors = 67.4%		

TABLE 3
PRIVATE WAREHOUSE INVESTMENT STRATEGIES:
2006 (SMALL USA MANUFACTURING FIRMS) &
& 2008 (LARGE USA MANUFACTURING FIRMS)

2006 – National Sample of Small Manufacturing Firms

	Factor Score*		
	Factor 1		
Private Warehouse Investment Strategies	Integrated Analysis	Number of Respondents	Percentage of Respondents
1. Moderate Analysis	2.77**	77	70.0
2. Minimal Analysis	3.94	14	12.7
3. Intense Analysis	1.91	19	17.3
		110	100.0

*Scale: 1 = Strongly Agree, 2 = Agree, 3 = Neither Agree nor Disagree, 4 = Disagree, 5 = Strongly Disagree
**Differences among means significant, alpha = 0.05.

2008 – National Sample of Large Manufacturing Firms

	Factor Scores*			
	Factor 1	Factor 2		
Private Warehouse Investment Strategies	Strategic/ Subjective	Analytical/ Integrative	Number of Respondents	
1. Analytical	3.18**	1.81**	11	23.4
2. Strategic/Subjective	2.18	2.71	36	76.6
			47	100.0

*Factor Scores are the value (means) of the questionnaire item(s) loading on the factor
Scale: 1 = Strongly Agree, 2 = Agree, 3 = Neither Agree nor Disagree, 4 = Disagree, 5 = Strongly Disagree
**Differences between factor means significant, alpha = 0.05.

TABLE 4
COMPARISON OF MEANS (OF SELECTED ITEMS)
AMONG WAREHOUSE INVESTMENT STRATEGIES:
2006 (SMALL USA MANUFACTURING FIRMS) & 2008 (LARGE USA MANUFACTURING FIRMS)

2006 – National Sample of Small Manufacturing Firms

		Factor Score Means*			
		Strategy 1: Moderate Analysis	Strategy 2: Minimal Analysis	Strategy 3: Intense Analysis	
Questions		N = 77	N = 14	N = 19	Significance
WH-6	Market and/or product mix uncertainties make it difficult to plan for future warehousing needs.	2.55	2.71	2.37	0.553
WH-7	The use of contract warehousing by my company/division is limited by the number of good providers that are available.	3.19	4.07	2.95	0.000**
WH-8	In my company/division, private warehouse investment decisions are audited after the project is in place.	3.01	4.14	2.61	0.00**

*Scale: 1 = Strongly Agree, 2 = Agree 3 = Neither Agree nor Disagree, 4 = Disagree, 5 = Strongly
**Differences of means between Strategies 1 & 3 not significant, alpha = 0.05, according to Tukey B post hoc test.

2008 – National Sample of Large Manufacturing Firms

		Mean Responses*		
		Strategy 1: Analytical	Strategy 2: Intuitive	
Questions		N = 11	N = 36	Significance
WH-6	Market and/or product mix uncertainties make it difficult to plan for future warehousing needs.	3.27	2.89	Not Significant
WH-7	The use of contract warehousing by my company/division is limited by the number of good providers that are available.	3.45	3.47	Not Significant
WH-8	In my company/division, private warehouse investment decisions are audited after the project is in place.	2.45	2.78	Not Significant

*Scale: 1 = Strongly Agree, 2 = Agree 3 = Neither Agree nor Disagree, 4 = Disagree, 5 = Strongly Disagree

TABLE 5
WAREHOUSE MIX BY PRIVATE WAREHOUSE INVESTMENT STRATEGY:
2006 (SMALL USA MANUFACTURING FIRMS) & 2008 (LARGE MANUFACTURING FIRMS)

2006 – National Sample of Small Manufacturing Firms

	Warehouse Mix Percentages*				
N	Private	Contract	Public	Other	Total
88	89.1	2.6	1.0	7.3	100.0

*Warehouse Mix Percentages were not significant among the three warehouse investment strategies at alpha = 0.05

2008 – National Sample of Large Manufacturing Firms

		Warehouse Mix Percentages				
Strategy	N	Private	Contract	Public*	Other	Total
1. Analytical	11	51.4	31.4	15.9	1.4	100.1
2. Intuitive	34	54.2	37.1	3.0	5.7	100.0
Overall	46***	53.2	35.7	6.2	4.7	100.1

*Means for Public Warehousing significantly different at alpha = 0.05
**Total varies from 100% due to rounding.
***Respondents whose totals did not equal 100% were not included.

activities. These results suggest that private warehouse investment decision making processes in are generally independent of firm size. Finally, perceptions of availability of good providers (WH-7) and decisions to conduct post hoc auditing of private warehouse decisions (WH-8) were also independent of firm size. Overall, inspection of the results shown in Table 1 suggest that private warehouse investment decisions in large and small USA manufacturing firms are not fundamentally different. Rather, differences are specific rather than systematic.

After inspecting the pattern respondents' perceptions of private warehouse investment decisions processes (WH-1 thorough 5) and factors related to warehouse decisions (WH-6 through 8) the authors concluded that (a) small and large USA manufacturing firms were similar in their responses, and (b) that further analysis would be useful in responding to the research questions. The authors did not conclude that responses suggested that the respondents in either small or large firms were more knowledgeable or more competent than the other sample.

Factor Analyses

Examination of the factor analysis results, as shown in Table 2, suggest small USA manufacturing firms approach private warehouse investment decisions with an approach that blends quantitative and qualitative aspects of the decision process. All five warehouse decision questions loaded on one factor at the 0.500 level or higher. This factor explained 51.7% of the variance in the five questions. This factor was named "Integrated Analysis".

The factor analysis of large USA manufacturing firm respondents identified two factors, or constructs. One factor was comprised three questions that focused on subjective and strategic considerations (WH-2 through 4) and accounted for 37.5% of the items' variance. The other two questions (importance of capital budgeting

techniques, WH-1, and intermingling of private warehouse investment decision with decisions in other logistics activities, WH-5) were interpreted as having an analytical-integrative emphasis. The two factors were named "Strategic/Subjective" and "Analytical/ Integrative" respectively. These results are similar to the results of the earlier (McGinnis, Kohn, and Myers, 1990) where the results identified two factors, "Intuitive Decisions" and "Analytical Decisions."

Overall, the results of this research suggests that decision makers in small USA manufacturing firms visualize the private warehouse decision process as a *gestalt* where subjective, strategic, integrative, and analytical issues are considered in totality while large USA manufacturing firm decision makers visualize the process as having two components, one blending subjective and strategic considerations and the other blending analytical and integrative concerns. One possible explanation for these differences may be due to the number of individuals included in decision making in small versus large firms. In the small firms, annual sales of $5,000,000 or less, it is likely that warehouse investment decisions are made by a relatively small team, or by a single individual. As a result issues are likely to considered, and tradeoffs made, simultaneously. Conversely, in large manufacturing firms warehouse investment decisions are likely made by an array of decision makers at different organizational levels. In this scenario it is likely that various dimensions of decision making would be considered separately. These differences contribute to additional insights when the factors cluster analyzed.

Cluster Analyses

Examination of the cluster analyses results provides the preponderance of insights into private warehouse investment decisions for small and large USA manufacturing firms. As shown in Table 3 three private warehouse investment strategies were identified for small USA manufacturing firms. The majority of firms (70.0%) pursue a "moderate" level (mean = 2.77) of analysis that is on the "agree" of "neither" on the scale. This suggests that the level of analysis is moderate, indicating that capital budgeting, strategic considerations, subjective issues, formal cost analysis, and integration of warehouse decisions are considered, but intensely. The balance of small manufacturing strategies were roughly divided between an "intense" (mean = 1.91) and "minimal" (mean =3.94) levels of analysis.

These results indicate the small USA manufacturing firms make private warehouse investment decisions with a modest level of analysis. This may because a) these decisions are infrequently made, b) information is readily available and easily understood, c) warehouse investment decisions are less important than other business decisions, and/or d) past warehouse decisions are seldom revisited.

Further examination of Table 3 indicates that large USA manufacturing firms pursue two different private warehouse investment strategies. A majority (76.6%) of respondents pursue a "Strategic/Subjective" strategy that emphasizes the integration of strategic and subjective (qualitative) considerations. A minority (23.4%) of respondents places heavy emphasis (mean = 1.81) on capital budgeting and integrating the warehouse investment decision with other logistics activities. These results are substantially different from the results of the 1989 results of McGinnis, Kohn, and Myers (1990) where much greater emphasis was placed on "Analytical-Intuitive" strategies (59.1%) than on "Intuitive" strategies (40.9%) and suggest a decrease emphasis on quantitative analysis and an increase in strategic considerations during this 19 year interval. Possible reasons for this shift include a) less emphasis on private warehousing investments due to outsourcing to third-party providers, b) an increasing importance of integrating investment decisions within a strategic context, c) less environmental uncertainty on which to base capital budget estimates, d) an increased emphasis on moving assets off the balance sheet rather than investing in fixed assets, and e) a greater need to integrate investment decisions across business units and channel members.

Overall, the results of the cluster analyses indicate that small USA manufacturers vary in their private warehouse investment strategies along a continuum of integrated analysis that ranges from minimal (12.7%) to intense (17.3%) with the majority (70.0%) of respondents at the moderate level. This suggests that most small manufacturing firms approach private warehouse investment decisions with some degree of quantitative, subjective, integrative, and strategic assessment. However, the intensity of these assessments is not exhaustive. By contrast the majority (76.6%) of large USA manufacturing firms pursue an integrated analysis that emphasizes strategic and subjective issues to a greater extent than analytical and integrative concerns. However, this strategy (Strategic/Subjective) is more intense than that found in most small manufacturing firms. A

minority of large manufacturing firms (23.4%) pursue strategies (Analytical) that emphasize analysis and integration with modest emphasis on strategic and subjective issues. The findings of these strategies are examined further in the following paragraphs.

Strategies: Additional Findings

Three additional questions included in the McGinnis, Kohn, Myers (1990) study were assessed to determine whether market/product mix uncertainties, availability of good warehouse providers, and post hoc analysis of private warehouse investment decisions a) differed between small and large manufacturing firms and b) differed among strategies within small and large firms. While market and/or product uncertainties made it more difficult for small manufacturing firms to plan for private warehouse needs (See Table 1) this issues was not significant among small firm strategies or between large firm strategies (See Table 4).

As shown in Table 1 respondent means regarding a) whether the use of contract warehousing was limited by the number of good providers and b) post audits of warehouse investment decisions were not significant at the 0.05 level between small and large manufactures. However, as shown in Table 4, small manufacturing firms following Minimal Analysis Strategies (N = 14, 12.7%) were less concerned about the availability of good contract providers and were less likely to conduct post audits of warehouse investment decisions. Overall, the authors concluded that (except for a small percentage of small firm respondents) the availability of good contract providers is a minor problem for small and large manufacturing firms. Similarly, post audits of private warehouse investment decisions occur with at a comparable level of frequency in small and large and large manufacturing firms.

Inspection of Table 5 led to the conclusion that the blend of private, contract, public, and other (usually supplier or customer storage) was substantially different between small and large USA manufacturing firms. As seen from Table 5 the percentage of "permanent" (private plus contract) warehousing was 91.7% in small firms and 88.9% in large firms. However, the mix of this "permanent" warehousing is about 97% private/3% contract in small firms and about 60% private/40% contract in large firms. The overall importance of public and other warehousing were relatively minor in both large and small manufacturing firms. The relevance of these results will be discussed further in the following section.

CONCLUSIONS AND IMPLICATIONS

While tentative, given the response rates to both questionnaires, the following paragraphs respond to the first three research questions. Later in this section the manuscript addresses the final research question, presents additional conclusions, and discusses the implications of this research.

The answer to the first question "Do private warehouse investment decisions differ in small manufacturing firms, compared to large firms?" is yes, to some extent. The results shown in Table 1 indicate that small manufacturing firms are less likely to use formal capital budgeting techniques, and less likely to consider strategic issues than large firms. In addition small manufacturing firms are more likely than large firms to perceive that market/product mix uncertainties are likely to increase the difficulty of planning for warehouse needs. The factor analysis of five questionnaire items, shown in Table 2, indicates that small manufacturing firms are less prone to make distinctions among capital budgeting, strategic, service, subjective, integration issues than large firms. This suggests that either (a) small firms more effectively blend these issues, or (b) large firms more effectively identify unique constructs relevant to private warehouse investment decisions. The authors suspect the latter.

Examination of the clusters shown in Table 3 indicate that small manufacturing firm strategies differ along a one-dimensional continuum with the majority of respondents (70.0%) placing moderate emphasis on integrated private warehouse investment analysis. Large USA manufacturing firm strategies grouped into clusters that were distinct. One cluster of strategies (76.6% of respondents) balanced the two dimensions, analytical/integrative and strategic/subjective, while the other cluster (23.4%) placed greater emphasis on the analytical/integrative dimension than the strategic/subjective dimension. These finding indicate that private warehouse investment decisions in large manufacturing firms are more likely to use a wider range of strategies than small firms. This finding suggests that, overall, large manufacturing firms may be more sophisticated than small firms in their approach to evaluating private warehouse investment decisions.

The final area of difference between small and large USA manufacturing firms is in warehouse mix, as shown in Table 5. Small firms are much less likely to use contract warehousing than large firms, and more likely to place heavy emphasis on private

warehousing. There are several possible reasons for this difference. First the scale and scope of small firms may not be adequate to justify for-hire warehousing (note that the percentages of contract and public warehousing are small). Second, the higher use of "other" – which usually means supplier or customer storage – may reduce the need to seek for-hire warehouse alternatives. Finally, short channels of distribution may alleviate the need for for-hire warehousing. Large firms may be more likely to used contract warehousing because of several factors. First, fluctuating market and seasonal demand my make contract—and to some extent public—warehousing attractive. Second, a need to manage assets may make contract warehousing financially attractive. Finally, complex channels of distribution may make contract warehousing an attractive choice in the warehouse mix..

In response to the second research question "How are private warehouse investment decisions in small manufacturing firms similar to large firms?" the results indicate several similarities. First the results, as shown in Table 1, do not suggest a pattern of systematic differences in item means between small and large USA manufacturing firms. This suggests that neither group of respondent has a better grasp of the issues relevant to private warehouse investment decisions. One interpretation is that the differences may be due to genuine dissimilarities faced by small and large manufacturing firms. An alternate interpretation is that respondents in large firms benefit from a greater understanding of the issues than do small firm respondents. The authors lean toward the former interpretation.

Except for a small percentage (14/12.7%) of small manufacturing respondents that choose a strategy of minimal analysis, see Table 4, the differences in means of the three questions (market/product uncertainties, limited choices of contract warehouse providers, and post audit of private warehouse investment decisions) did not vary within small and within large USA manufacturing firms. These results suggest that each group of respondents is internally homogenous. Finally, while the percentages differ substantially, as shown in Table 5, both small and large USA manufacturing firms use private warehousing for more than half their storage needs. This indicates that private warehouse investment decisions are major concerns for both small and large manufacturing firms.

Overall, private warehouse investment strategies vary between large and small manufacturing firms more in degree than in type. In both instances, the same questionnaire items entered into the factor analysis results, variations between private warehouse investment strategies or small and large manufacturing firms were not dramatically different, and the differences of item means on questionnaire items did not indicate substantial differences in respondent perceptions. The major differences between private warehouse decisions in small and large USA manufacturing firms are shown in differences in approaches to evaluating private warehouse investment decisions, and in the mix of private and for-hire warehousing.

Several implications can be identified for practitioners, educators, and researchers. First, the process of evaluating private warehouse investment decisions is similar for large and small manufacturing firms. The differences, as discussed above, are more of form rather than substance. As a result it is appears that insights gained from logistics research may be relevant to a wide range of firm sizes. Because the subjects of this research were USA manufacturing firms, extrapolations of these findings to other sectors of the economy, such as retailing, health care, and services should be conducted with caution. The similarities of results of this research among USA manufacturing firms of differing sizes suggests that they can be a beginning point for the evaluation of private warehouse investment decisions in other sectors of the economy. Specifically, the results of this research suggest that practitioners from manufacturing firms of all sizes could find insights that provide information and guidance to their own organizations.

Because the subject of this research was USA manufacturing firms the applicability of these results to other countries would be dependent on a wide range of factors being similar to the United States. For example, the legal, economic, regulatory, and business customs can vary widely among counties that are similar in forms of government, forms of legal systems, and extent of private enterprise. As a result the results of this research should be applied to private warehouse investment decisions in situations outside the United States with caution.

Logistics/supply chain management educators can benefit from the insights that processes, such as private warehouse investment decisions, are relevant to a wide range of firm sizes. While this research has focused on manufacturing firms, analogies in reselling, retail, and health care are likely to be relevant for instructional purposes, especially when the supply

chains of non-manufacturing firms are integrated with suppliers that are manufacturers.

Logistics/supply management would benefit from a wider range of comparative research, including, but are not limited to, transportation choice, customer service measures and standards of performance, the effectiveness of multinational supply chains, the importance of financial performance versus logistics/supply chain performance, and integration of supply chains versus maintaining independence. While this study focused on small and large manufacturing firm in the United States, comparative studies of logistics strategy in different economies would further increase the understanding of logistics/supply management thought and practice.

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AUTHOR BIOGRAPHY

John E. Spillan is associate professor of business administration at the University of North Carolina at Pembroke, School of Business. He received a M.B.A. degree from the College of Saint Rose in Albany, New York and a Ph.D. from the Warsaw School of Economics. His research interests center on crisis management, international marketing, entrepreneurship and international business with specific interest in Latin America and Eastern Europe.

AUTHOR BIOGRAPHY

Michael A. McGinnis, CPSM, C.P.M. is associate professor of business at Penn State University New Kensington Campus. He holds B.S. and M.S. degrees from Michigan State University and a D.B.A. degree from the University of Maryland. His research areas are purchasing, logistics strategy, negotiations, and supply chain management.

AUTHOR BIOGRAPHY

Jonathan W. Kohn is professor of supply chain management, John L. Grove College of Business, Shippensburg University at Shippensburg, PA. He received his masters in electrical engineering and Ph.D. in industrial engineering from New York University. His research interests are in logistics and supply chain strategic management, structural modeling of the housing market, and student assessment of faculty.