

VARIATIONS IN SELECTION CRITERIA IMPORTANCE
FOR INDUSTRIAL MICROCOMPUTER PURCHASES

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ABSTRACT

Very little is known about the rapidly growing product category of microcomputer purchases especially in the industrial sector. This article deals with one part of the industrial purchase process, specifically choice criteria prior to purchase. Hypotheses regarding variations in choice criteria are proposed and tested. The results show that criteria for choice vary by industry, by organization size and by organizational computer expertise.

INTRODUCTION

Microcomputers have become part of the organizational setting. The importance of microcomputers as productivity tools has prompted the administrators of some industrial organizations to examine the issues concerning equipment acquisition and use (Acton 1983).

The necessity of having a microcomputer on every desktop is not agreed to by everyone (Wilson 1983); there does seem to be some risk associated with the microcomputer purchase (Senn and Gibson 1981); but in the near future all organizations will have to face the acquisition question (Raddon 1982). This view is becoming a reality (Archbold 1984) and enhances the market potential for microcomputer sales in the industrial sector.

The major difference between microcomputer purchases and other industrial purchases are:

1. The micro could be used by all industrial organizations; a characteristic that differentiates it from other purchases that are utilized by a more specialized set of industries.
2. The product life cycle of micros in the workplace is shorter than other industrial products due to technology.
3. The micro is a general-purpose machine. The degree of familiarity that purchasers have with micros is much less than their familiarity with other items bought in the normal conduct of the business. The time available to become familiar with machines is much shorter in the case of micros due to their unavailability. Increases in productivity may not be immediately forthcoming.

To be able to compete effectively in such a dynamic and growing market, it is essential to understand the methods used by organizations to resolve the micro acquisition and usage issue and the decision-making process that is used to decide on what to buy, how to use it and the information utilized to make these decisions. This purchasing behavior is the end result of a series

of activities used to make the purchasing decision. Academics and practitioners have tried to depict these decisions as a hierarchical process (Choffray and Lilien 1980). A significant aspect of this model are the criteria used to evaluate competing brands prior to choice.

The effort to focus on particular aspects of the industrial purchasing process can be attributed to the need to isolate and determine who is involved in a purchase decision, how the purchase is made, and why the purchase choice was made (Lilien and Kotler 1983). The interest in choice criteria as a part of the process is reflected in the stages of industrial buying models in a variety of ways. Two types of these criteria are product specification (Webster and Wind 1972; Wind 1978) or product/supplier characteristics (Robinson and Faris 1967; Lehmann and O'Shaughnessy 1974; Wind 1970). It is important to be able to match product-service offerings and marketing efforts with what target segments believe are important considerations in purchase. This "product positioning" approach might well be the key to successfully competing in the microcomputer industry.

RESEARCH HYPOTHESES

In the case of microcomputers, variation in criteria for choices should be related to the industry within which the organization competes. The factors dictating success vary from industry to industry; the latitude for error might also vary; as well as the degree of sophistication. As a result, Hypothesis 1 (H_1) reflects the expectation that there is a relationship between the organization's industry and the importance of microcomputer/supplier characteristics.

There should be differences in the degree of importance of various criteria based on size of the firm. Assuming all other factors are equal, larger firms might have different requirements, different financial constraints and different purchasing patterns. As such, Hypothesis 2 ($2H_1$) reflects the expectation that there is a relationship between organization size and the importance of microcomputer/supplier characteristics.

There might also be a case for suggesting that organizational experience and expertise yield differences in the degree of importance of computer/supplier characteristics. Organizational decision-makers have some variance in their history of contact with microcomputers and have to satisfy users with variable computer expertise. The characteristics which are important during the purchase should be different from those of organizations without that expertise and experience. Thus, Hypothesis 3 ($3H_1$) reflects the expectation

that there is a relationship between levels of experience/expertise and importance of computer/supplier characteristics.

In summary, this research tested the hypotheses that the importance of computer/supplier characteristics will be related to:

- 1H₁: ... the industry within which the organization competes.
- 2H₁: ... the size of the organization.
- 3H₁: ... the computer experience/expertise of the organization.

Methodology

The sampling units consisted of individuals in businesses in a major Southwestern metropolitan area. These individuals were screened for their influence on the microcomputer decision by their respective businesses. Out of 440 businesses randomly sampled in the SMSA during the Spring of 1984, 129 interviews were usable. The sample frame was constructed by using three sources: a list of the largest businesses in the state, a list of the manufacturers provided by the state office of Economic Development, and the telephone book.

The data were collected using a structured non-disguised questionnaire. The questionnaire contained three parts: identifying information, demographics, and questions related to the purchase of microprocessors; the questions relating to the purchase process were operationalized in the following manner:

Choice criteria - A perusal of the literature (Lehmann and O'Shaughnessy 1984) led to the development of the criteria. These were presented to respondents with a Likert-type 5-point scale. They were asked to indicate how important these criteria had been during the microcomputer decision process. This yielded 17 intervally-scaled pieces of data (see Appendix A).

Industry type - Respondents were asked to provide the Standard Industrial Classification number appropriate for their company. These SIC code numbers were later used to produce 3 categories of firms: Those firms who were largely "producers" were placed together (agricultural, mining, construction and manufacturing); wholesalers and retailers were classified together; and the balance of the firms were grouped into a "service industry" category.

Organization size - Organization size was measured by the number of employees. It is reasonable to assume that sales and number of employees should be positively related.

Computer literacy - History and expertise with microcomputers was operationalized by asking respondents to indicate the percentage of the firm which was "computer literate."

Data Manipulation

While there were seventeen characteristics for which respondents indicated a range of importance during the microcomputer purchase decision, it seemed unlikely that any one firm would have used all seventeen criteria for evaluation of microcomputers (Lilien and Kotler 1983, p. 278). Addi-

tionally, even if the criteria were representative of computer characteristics deemed important, it is unlikely that all seventeen were independent characteristics (Green and Tull 1978, p. 419). There would be some logical appeal for an underlying series of dimensions used by all decision-makers with the primary variability added in the evaluative/brand assessment stage. That is, all firms would have a common set of dimensions on which to evaluate every brand of microcomputer, but decision-makers would evaluate the brands differently. This situation argued strongly for the use of factor analysis (Green and Tull 1978, p. 419; Jackson, p. 139; Stewart, D.W., 1981). The FACTOR subroutine in SPSS-X was used to factor analyze the raw data. With no a priori data structure to guide the analysis, the criteria for the number of factors was the unity criteria, where the number of factors is determined by the eigenvalues greater than one. The rotation of the resultant matrix was guided by the VARIMAX option, where rotation preserves the orthogonality of the factors and maximizes the differences in variance between the factors. VARIMAX was chosen because it was thought that more than one dimension was inherent in the "importance" structure (Jackson, pp. 149-150).

There was also a need to create, for each respondent, a series of composite measures which would represent the importance dimensions by respondents. This composite measure is a factor score (Green & Tull, p. 423; Muliak 1972) and is a linear combination of a standardized score weighed by a factor loading. These factor scores were produced using regression procedure (Muliak, p. 331).

The final data used in the analysis were the factor scores for each respondent, the SIC code group, organization size and computer literacy.

In order to test hypothesis 1, multiple t-tests comparing mean factor scores across the organization types (SIC groups) were performed; to test the second and third hypotheses, the factor scores were correlated with organization size and computer literacy.

TABLE 1a
Organization Type - Summary Statistics

SIC Group	Frequency	% of Sample
1*	69	54
2**	15	12
3***	45	35

* Agriculture/Mining/Construction/Manufacturing
 ** Wholesale/Retail
 *** Service

TABLE 1b
Organization Size/Computer Literacy -
Summary Statistics

Variable	Mean	Std. Dev.
Size	102.3	338.5
Computer Literacy	30.5	29.8

Research Results

The summary measures for the classification variables used in this study are presented in Tables 1a and 1b. Most of organizations interviewed were in the "productive" industries (54%), followed by the service industries (35%), with wholesalers and retailers representing the smallest group in the study (12%). The mean size of organizations was about 102 employees, with an average 30.5% computer literacy rate. These findings clearly indicate a nonrepresentative sample. This is due to the sample frame and the qualifying question. In order to be included in the sample a business had to have made a microcomputer decision.

The results of the factor analysis are shown in Table 2. Because there was no a priori expectation regarding the structure, some interpretation of the results is in order. Using the information from the rotated factor matrix (see Appendix B), the naming of the factors was guided by common sense, parsimony and the factor loadings. The procedure used was to identify the factors where each variable "loaded" the best (factor loading was the highest). The grouped variables are then used to help "name" the factor.

TABLE 2
Factor Structure of Importance Criteria

Factors	Factor Loading
<u>Factor 1-Service and Sales Support Characteristics</u>	
Availability of installation services	.789
Availability of training classes	.728
Availability of equipment servicing	.651
Availability of advice	.559
Retailer's reputation	.499
<u>Factor 2-Product Quality Characteristics</u>	
Engineering quality	.698
Product warranty	.569
Equipment reliability	.430
<u>Factor 3-Product Performance Characteristics</u>	
Equipment operating capacity	.627
Availability of peripheral equipment	.571
Equipment operating speed	.554
Compatibility with existing equipment	.282
<u>Factor 4-Use/Cost Characteristics</u>	
Case of use of equipment	.717
Initial price	.355
Software availability	.352
<u>Factor 5-Brand and Manufacturer Characteristics</u>	
Equipment brand name	.705
Equipment manufacturers' reputation	.493

The naming of the factors was facilitated by the rather "clean" (greater than .4 on only 1 factor) loadings on the rotated factor matrix shown in Appendix B. The factors were associated with Sales and Service Support (Factor 1), Product Quality (Factor 2), Product Performance (Factor 3),

Use/Cost (Factor 4), Brand Name/Manufacturer (Factor 5). Since the results of the factor structure were logically appealing and consistent with other findings, the analysis continued to the calculation of factor scores.

TABLE 3
Factor Score Descriptive Properties

Factor Scores	Mean	Std. Dev.	Min.	Max.
1-Service and Sales Support	0	.906	-3.431	1.516
2-Product Quality	0	.824	-3.436	1.398
3-Product Performance	0	.816	-2.835	1.559
4-Use/Cost	0	.799	-4.489	1.300
5-Brand Image/Manufacturer's Reputation	0	.788	-2.800	1.510

As seen in Table 3, the factor scores appear to be part of very small ranges of values. The weighting procedure used contributed to this. Not only are the weights small, but the individual data are first standardized, also yielding smaller numbers. It is also noteworthy that the "scores" have no absolute meaning. The only meaning which can be attached to these "importance scores" is in a relative sense.

The results of the hypotheses tests are shown in Tables 4 and 5. The differences in Factor 1 means between Groups 1 and 2, and Group 3 are both significant. In the case of Factor 3, the mean of Group 1 is significantly different from the means of Groups 2 and 3. The means of Groups 1 and 3 on Factor 5 are significantly different. These results are mixed. Of the 15 planned comparisons, 5 produced significant results. But when the pattern of results is examined, however, Hypothesis 1 is partially accepted.

TABLE 4
Factor Scores Difference - t-Test Results
SIC Group Means

Factor Scores	Group 1	Group 2	Group 3	Significant Differences
1-Service and Sales Support	.130	.300	-.299	1-3***
2-Product Quality	-.003	-.017	.011	2-3**
3-Product Performance	-.154	.266	.147	1-2* 1-3*
4-Use/Cost	.008	.007	-.015	
5-Brand Image/Manufacturers' Reputation	.121	-.076	-.160	1-3*

* differences significant at $\alpha < .10$
 ** differences significant at $\alpha < .05$
 *** differences significant at $\alpha < .01$

The relationship between organization size and factor scores shows mixed results. Factor score 4 and Factor score 1 are significantly correlated with size. Hypothesis 2 is partially accepted. In the case of computer literacy, Factor score 1, Factor score 2, and Factor score 4 are significantly correlated with computer literacy, but the relationship is inverse; Factor score 3 is significantly positively correlated with computer lit-

eracy. Hypothesis 3 is supported.

TABLE 5
Correlation Coefficients and Significance
Levels for Factor Scores

Factor Scores	Organization Size	Organization Computer Literacy
1-Service and Sales Support	-.147*	-.149*
2-Product Quality	-.071	-.207**
3-Product Performance	.055	.175*
4-Use/Cost	.161*	-.245**
5-Brand/Manufac- turer's Reputation	.026	.012

* Significant at $\alpha < .05$

** Significant at $\alpha < .01$

DISCUSSION AND CONCLUSIONS

From the pattern of results in Table 4, it is clear that factors vary in importance within an industry. In the "Production" group (1), the most important factors are 1 (Sales and Service Support) and 5 (Manufacturers' Reputation). In the case of retailer and wholesaler, sales and service support is paramount, followed by product performance. In the service industries, Factor score 1 (Sales and Service Support) is the most important factor with Product Performance (Factor 3) and Brand Image (Factor score 5) also important.

Between industries, Factor 1 (Sales and Service Support) is significantly different between both Group 1 and 2, and Group 3. Factor 2 shows no differences between industries and in all cases is negative; the same is true for Factor 4, the Use/Cost factor. Not only are these seen as neutral, there are no differences between industries. Regarding Product Performance (Factor score 3), the Productive group is essentially neutral, with both Group 2 and Group 3 showing significantly greater importance of this dimension.

Brand/Manufacturers' reputation is important only to the productive group, which is significantly different from the service group. In conclusion, there are some demonstrable differences between these industries regarding what factors are important to them, as well as differences in importance within the industry, although these mean scores were not tested statistically.

When attention is turned to industries segmented by size and computer literacy, a definite pattern emerges. Regarding size, the use/cost consideration and sales and service support demonstrate a significant relationship: As firms get larger, they tend to place greater importance on both use/cost and service and sales support. Perhaps frugality is a luxury possible in larger firms. Larger firms might also place greater service demands on a supplier.

Computer literacy produces a number of significant relationships with the importance factors. As firms become more knowledgeable and have greater microcomputer experience, they tend to place less importance on sales and service support, product quality, use/cost considerations. It might be that knowledge frees one from the overriding concern on quality, use/cost and service. It might also be that these functions are internalized. On the other hand, increasing computer literacy is related to increasing importance of product performance. It appears that with knowledge the focus is not on "Will it work?" but rather "How well will it work?"

Implications

These results clearly demonstrate that there are market segmentation concerns in the industrial microcomputer market. The successful organization will capitalize on these differences and use them to structure marketing efforts. Specifically, these findings suggest that market segmentation based on industry grouping, company size, and computer expertise yields distinct segments regarding product/supplier features. This information could be used to help structure promotional messages designed for each of the segments. As the match between product offerings and choice criteria becomes more evident, firms may be less sensitive to price, the results indicate that this sensitivity may vary based on industry, size, and computer literacy. The differences in importance criteria may also assist a sales rep in designing the sales approach; different approaches will be required depending on industry, size, and computer literacy.

While the results are significant and potentially useful to a company who is or will be competing in the microcomputer industry, there is a need to replicate this study using different sample frames. More importantly, however, might be the need to study an ongoing purchase process and determine how these importance criteria are being applied at the brand level by different market segments.

APPENDIX A Evaluative Criteria - Summary Statistics

Criteria	Mean	Standard Deviation
Manufacturer's Reputation	4.457	.740
Retailer's Reputation	3.713	1.119
Installation Services	4.186	1.116
Training Classes	3.868	1.168
Availability of Advice	4.256	.946
Ease of Use	4.465	.708
Equipment Reliability	4.775	.437
Initial Price	3.868	.804
Operating Capacity	4.295	.870

Equipment		
Servicing	4.366	.779
Engineering		
Quality	4.349	.767
Product Warranty	4.093	.744
Equipment Com-	3.449	1.308
patibility		
Brand Name	3.132	1.003
Operating Speed	3.806	.761
Peripheral	3.969	.887
Availability		
Software	4.250	1.019
Availability		

APPENDIX B
Rotated Factor Matrix

Criteria (See Appen. A)	FACTORS				
	1	2	3	4	5
	.089	.264	-.043	-.042	.493
	.500	.010	-.037	.122	.347
	.789	-.047	.070	.057	-.045
	.728	.237	-.042	.175	.031
	.559	.313	-.005	-.074	.011
	.053	.365	.084	.717	-.034
	.187	.430	.284	-.018	-.044
	.121	-.114	.078	.355	.035
	.142	-.022	.627	.097	-.011
	.651	.218	.252	.306	-.070
	.036	.698	.082	.067	.139
	.235	.569	.085	.108	.148
	-.073	.026	.282	.085	.000
	-.058	.002	.109	.041	.705
	.252	.217	.554	.026	.064
	-.080	.078	.571	.007	.040
	.106	.115	.345	.352	.025

REFERENCES

Acton, C. (1983), "Selecting a Microcomputer," Best's Review, (November), 40-44.

Archbold, P. (1984), "Fathoming the Industry," Datamation (June 1), 53-57.

Choffray, J. and G. Lilien (1980), Market Planning for New Industrial Products, New York: John Wiley.

Davis, G. B. and M. H. Olson (1985), Management Information Systems, New York: McGraw-Hill.

Dologite, D. G. (1981), "Small Business Computer Acquisition," Journal of Systems Management, (March), 34-40.

Green, P. and D. Tull (1978), Research for Marketing Decisions, 4th edition, New Jersey: Prentice-Hall.

Jackson, B. (1983), Multivariate Data Analysis: An Introduction, Homewood, IL: Richard D. Irwin, Inc.

Keen, P. G. W. and M.S. Scott Morton (1978), Decision Support Systems: An Organizational Perspective, Reading, MA: Addison-Wesley.

Lehmann, D. R. and O'Shaughnessy (1974), "Differences in Attribute Importance for Different Industrial Products," Journal of Marketing, 35 (April), 36-42.

Lilien, G. L. and P. Kotler (1983), Market Decision Making: A Model-Building Approach, New York: Harper & Row.

Raddon, G. H. (1982), "The Microcomputer Decision-When, Not If," Bank Marketing, (November), 8-10.

Robinson, F. and C. Faris (1967), Industrial Buying and Creative Marketing, Boston: Allyn & Bacon.

Senn, J. A. and V. R. Gibson (1981), "Risks of Investment in Microcomputers for Small Business Management," Journal of Small Business Management, (July), 24-32.

Sprague, R. H., Jr. and E. D. Carlson (1982), Building Effective Decision Support Systems, Englewood Cliffs, New Jersey: Prentice-Hall.

Stewart, D. (1981), "The Application and Misapplication of Factor Analysis in Marketing Research," Journal of Marketing Research, 18 (February), 51-62.

Webster, F. E., Jr. and Y. Wind (1972), Organizational Buying Behavior, Englewood Cliffs, New Jersey: Prentice-Hall.

Wilson, B. (1983), "Seven Reasons Not To Buy A Microcomputer," Industrial Marketing, (March), 75-80.

Wind, Y. (1970), "Industrial Source Loyalty," Journal of Marketing Research, 7 (November), 450-457.

(1978), "Organizational Buying Behavior," in Review of Marketing, G. Zaltman and T. Bonoma, eds., Chicago, American Marketing Association.