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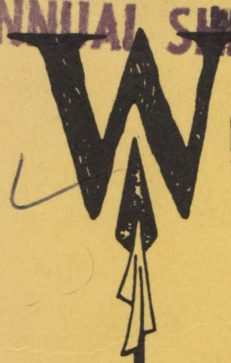
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SESSION 1

CHARACTERISTICS OF MICROCOMPUTER USAGE AND DETERMINANTS OF MICROCOMPUTER SUCCESS IN AGRIBUSINESSES

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ABSTRACT

Characteristics of microcomputer usage and determinants of successful computerization in agribusinesses were assessed. Results indicate that the agribusiness manager can influence system success by becoming personally involved in system development. Organizational and managerial characteristics did not influence microcomputer success, although they were related to the agribusiness' decision to adopt microcomputers.

INTRODUCTION

In recent years computerized information systems have become practical for almost all businesses. Agribusinesses have been no exception. The price of microcomputers has fallen to a level that system cost is no longer a major limitation for most businesses. Additionally, the increased "user friendliness" of software and the number of business applications available for agribusinesses have led many agribusiness managers to consider purchasing a microcomputer for the first time.

Businesses benefit in many ways from computerization. It may lead to increased accuracy and timeliness of reports (Markland, 1972) and more effective organizational communication (Newpeck and Hallbauer, 1981). Increased efficiency (Markland, 1974) and improved competitive advantages (Benbasat and Dexter, 1977) have also been observed.

Computerization also carries with it substantial risks. Managers may be inundated with irrelevant information, known as information overload (Ackoff, 1967). In some cases the computer system may be abandoned altogether (Soden, 1975). A difficulty for many small businesses is finding and acquiring the expertise to develop a system which meets their particular needs (Senn and Gibson, 1981). Another potential pitfall is that employees may resist the move to computerization (Greenwood, 1981).

The objectives of this study were to:

- (1) describe the characteristics of computer usage in agribusinesses;
- (2) identify the operational and organizational characteristics associated with the successful use of computers in agribusinesses; and
- (3) determine the differences between agribusinesses which have purchased microcomputers and those which have not.

HYPOTHESES

The first two sets of hypotheses relate to objective two and test the association between operational and organizational factors and the successful use of microcomputers. The third set of hypotheses relates to objective three and tests whether there are differences between those agribusinesses which have adopted microcomputers and those which have not.

The operational hypotheses test whether characteristics related to the development and operation of the computer system are associated with the success of the system. The management information systems (MIS) literature suggests that several factors are important for successfully implementing computer systems.

Many firms lack technical expertise in computerized information systems (Weber and Tiemeyer, 1981). Difficulty in obtaining adequate training in the use of computer systems is another common problem (LaPlante, 1987). Several studies have shown that the level of technical expertise of the system operator is

crucial to the success of the computer system (Cerullo, 1980; Fuerst and Cheney, 1982; Mykytyn, 1988; Bourke, 1979).

Related to the expertise available in the organization, is the amount of organizational experience with computers. Several studies have found the organization's experience with computers to be related to computer system success (Kasper and Cerveny, 1985; Sanders and Courtney, 1985).

The involvement of the management user in developing the computer system has been found to be important in ensuring that the information generated is useful to the decision maker (Benson, 1983; Alavi, 1982; Couger and Wergin, 1974; Carlson, 1967). In small businesses the involvement of the Chief Executive Officer (CEO) is frequently cited as being essential to the successful development of the computer system (Raymond, 1985; Raysman, 1981).

Carroll (1982) suggested that acceptance of the computer system by the organization's personnel is important to successful computerization. Personnel acceptance is particularly important in firms with only a small number of computer operators because the extent to which the system is used depends on only a few individuals (Heise, 1980).

Planning has also been recognized as being important to the successful implementation of computers (Casimir, 1988; Lucas, 1975; McFarlan, 1971), and the lack of planning has been cited as the major cause of failure of computerized information systems (Senn and Gibson, 1981). King (1978) suggests that planning the MIS should be an integral part of the firm's strategic planning process.

The characteristics discussed above form the basis for the following hypotheses:

- H₁: Microcomputers will be more successful in agribusinesses which have an employee trained in the use of microcomputers.
- H₂: Microcomputers will be more successful in agribusinesses which have used them for a longer period of time.
- H₃: Microcomputers will be more successful when the agribusiness manager actively participates in the purchase decision.
- H₄: Microcomputers will be more successful when there is greater acceptance of them by the agribusiness' employees.
- H₅: Microcomputers will be more successful in agribusinesses that spend more time planning the system development.

Several hypotheses were developed to test whether characteristics of the organization and its manager were related to the success of the computer system. The following hypotheses test whether the age and education of the manager and the organization's size are related to successful computerization:

- H₆: Microcomputers will be more successful in agribusinesses that have younger managers.
- H₇: Microcomputers will be more successful in agribusinesses that have managers with higher levels of education.
- H₈: Microcomputers will be more successful in larger agribusinesses.

It was also hypothesized that characteristics of the organization and its manager may be related to whether or not a firm chooses to computerize its operations. The hypotheses listed below tested whether the manager's age, education, and attitude toward innovation, the size of the agribusiness and the number of memberships it held in agricultural organizations were related to the firm's decision to adopt computers:

- H₉: Agribusinesses which have younger managers are more likely to adopt microcomputers.
- H₁₀: Agribusinesses which have managers with higher levels of education are more likely to adopt microcomputers.
- H₁₁: Agribusinesses which are more progressive are more likely to adopt microcomputers.
- H₁₂: Larger agribusinesses are more likely to adopt microcomputers.

H₁₃: Agribusinesses associated with a greater number of agricultural organizations are more likely to adopt microcomputers.

METHODOLOGY

A survey of New Mexico agribusinesses was conducted in late 1987 and early 1988. The sample used in this study was drawn from a list of agribusinesses in the state. The list was compiled from sources including the New Mexico Department of Agriculture, the New Mexico Cooperative Extension Service, New Mexico State University researchers, trade associations and industry directories. The sample included both firms in the farm supply sector, such as farm equipment dealers, farm supply dealers, veterinarians and feed dealers; and firms in the processing and distribution sector such as brokers, food processors, grain elevators and greenhouses. A total of 808 agribusinesses were identified. Three hundred of these firms were randomly selected to participate in this study.

Personal interviews were conducted by telephone using a questionnaire. A minimum of seven attempts were made to contact each agribusiness. When the manager could not be reached, the time, date and day of the week of the unsuccessful attempt were recorded. Subsequent calls were made at different times and on different days, including weekends, to ensure a high response rate. A total of 187 firms responded to the survey, for a response rate of 62%. The non-respondents were categorized into three groups. Thirteen (4%) of the sample firms were eliminated from the sample, in most cases because they were no longer in business. Fifty-eight (19%) agribusinesses could not be contacted. The most common reason for the failure to contact a firm was a disconnected number. In these cases an attempt was made to locate a new number for the business, although this was often not possible. Of the remaining 229 firms which were contacted, 42 (14%) firms chose not to participate in the survey.

In most cases the respondent was the manager of the agribusiness. It was thought that the manager would be in the best position to judge the success of the system and would have adequate knowledge about the organizational factors pertaining to the firm's computer system. When it was not possible to talk to the manager, someone who could respond from the manager's perspective was interviewed. The questionnaire included questions regarding the characteristics of the computer system, system usage, perceptions of system success, and descriptive information about the agribusiness and its manager.

The two dependent variables were: SUCCESS, which measured whether the agribusiness manager thought that the use of microcomputers had increased the profitability of the agribusiness; and ADOPTER, which indicated whether or not the agribusiness had adopted microcomputers.

In most cases the independent variable could be directly measured. However, in several instances a surrogate was used. The acceptance of microcomputers by the firm's personnel (ACCEPTANCE) was measured by the number of hours the computer system was used per day. The number of months spent planning the purchase of the computer was used to represent the amount of planning the agribusiness did in the development of the computer system (PLANNING). Finally, in order to determine how progressive the agribusiness was (CHANGE), the manager was asked how quickly the firm adopted new technology. The manager was asked to choose from four alternatives, loosely based on Rogers' (1958) five categories of adopters.

Because many of the variables involved ordinal scales, a non-parametric method of analysis was used. The relationship of the dependent variable to the independent variable for each hypothesis was examined by the use of two-way contingency tables. The chi-square statistic was calculated and the null hypothesis was rejected at the 10% level of significance.

SURVEY RESULTS

Characteristics of Computer Usage

Of the 187 respondents, 83 or 44% currently used a microcomputer in their business. There were an average of 2.01 microcomputers per agribusiness and they had been in use an average of 3.56 years. Only 4 of the 104 respondents who did not currently use or own a microcomputer had previously owned one. However, 28% were currently considering the purchase of a microcomputer.

Most of the firms owning microcomputers used them frequently. The respondents reported using their systems an average of 5.10 hours per day. System usage of greater than three hours per day was indicated by 63% of the respondents. Only 13% of the managers reported computer usage of one hour or less per day.

Microcomputers were most commonly used for record keeping and word processing functions. At least 50% of the managers reported utilizing their microcomputer for the following functions: accounting records, invoicing, inventory control and purchasing, word processing, and financial decisions. Microcomputers were not heavily utilized for production or marketing decisions. These results are fairly consistent with those obtained by Stegelin and Novak (1986) who found that accounting records were the highest ranked use of microcomputers by current users. Financial decision making, word processing and production decision making functions were also highly ranked in that study.

Satisfaction with Computer Hardware and Software

Most agribusiness managers were satisfied with their microcomputers. When asked whether they thought that their computer system helped increase the profitability of their business, 74% of the managers responded affirmatively. Likewise, the great majority of managers reported that they had more information, of a better quality and, on a more timely basis, as a result of their computer system. Only 21% of the computer users indicated that decision making was more difficult because of the increased amount of information available, indicating that information overload was not a major problem for most agribusinesses.

Eighty-four percent of the agribusiness managers surveyed were satisfied with their computer hardware. The most common reasons for dissatisfaction with computer hardware were insufficient memory or processing speed.

Most managers were also satisfied with their software. Most software problems were caused by software that was not designed to meet the firm's needs. In response to several questions concerning the performance of software, the great majority of agribusiness managers responded that software was available which met their needs, and that it worked properly and as advertised. However, only 54% of the respondents thought that instructions accompanying software were generally sufficient. Thirty-eight percent were dissatisfied with software instructions.

The managers were also asked what they would do differently if they could change their decision to purchase their computer system. Most of the responses concerned computer hardware. Many of the respondents indicated that they would purchase faster processors or printers, or machines with greater capabilities.

RESULTS OF HYPOTHESES TESTS

The first five hypotheses test whether operational factors are associated with the success of the computer system. The results of the tests, including the chi-square statistic and the level of significance are reported in Table 1.

The only hypothesis which was supported, tested the association between the manager's involvement in the purchase decision and successful implementation of microcomputers. The other four hypotheses, which tested the association between microcomputer success and the agribusiness' experience with computers, the computer expertise of its personnel, the level of personnel acceptance of microcomputers, and the amount of planning that went into the computer system development, were not supported.

Table 1. Results of Chi-Square Analysis of Operational Hypotheses Tests

Operational Success Factor	χ^2	Association
EXPERTISE	0.773 (0.379)	None
EXPERIENCE	0.315 (0.575)	None
MGRINVOLVED	6.542 (0.011)	Computer system tends to be more successful when the manager participates in the purchase decision
ACCEPTANCE	0.945 (0.331)	None
PLANNING	0.027 (0.869)	None
Note: Level of significance in parentheses		

The results of the second set of hypotheses tests, which examined whether characteristics of the manager or the organization were associated with the successful use of microcomputers, are presented in Table 2.

Table 2. Results of Chi-Square Analysis of Organizational Hypotheses Tests

Organizational Success Factor	χ^2	Association
AGE	2.239 (0.135)	None
EDUCATION	0.001 (0.972)	None
SIZE	0.287 (0.592)	None
Note: Level of significance in parentheses		

The results do not support the association of any of the organizational variables with the successful utilization of computers in agribusinesses. This indicates that situational variables, such as the size of the agribusiness or characteristics of its manager, which are largely outside of the control of the agribusiness, are not important in influencing the firm's experience with computerization.

The last set of hypotheses tested whether a relationship exists between the characteristics of the agribusiness and its manager, and the agribusiness'

decision to utilize microcomputers. The results of the hypotheses tests are presented in Table 3.

Table 3. Results of Chi-Square Analysis of Hypotheses Tests to Determine whether Differences Exist between Adopters and Non-adopters of Microcomputers

Characteristic	χ^2	Association
AGE	1.328 (0.249)	None
EDUCATION	7.072 (0.008)	Managers with a higher level of education are more likely to adopt microcomputers
CHANGE	23.350 (0.000)	Managers with a more favorable attitude toward innovation are more likely to adopt microcomputers
MEMBERSHIPS	7.250 (0.007)	Agribusinesses which are members of more agricultural organizations are more likely to adopt microcomputers
SIZE	19.114 (0.000)	Larger agribusinesses are more likely to adopt microcomputers
Note: Level of significance in parentheses		

All of the hypotheses were supported with the exception of the first one, which tested the relationship between a manager's age and the likelihood of the agribusiness adopting microcomputer technology. While there was an inverse relationship between the manager's age and the probability that the agribusiness utilized microcomputers, the association was not significant at the 10% level of probability. A very strong relationship existed between the other characteristics tested and the adoption variable, as indicated by the significance levels of the chi-square statistics.

DISCUSSION

One of the principal findings of this study is that the involvement of the agribusiness manager is a key to the successful implementation of microcomputers. This finding is consistent with the finding of another study which found that the involvement of the CEO was critical to successful computerization in small manufacturing firms (DeLone, 1988). In most agribusinesses the manager is responsible for a wide range of duties and is probably the only individual who has a broad enough perspective to know how computerization can make the greatest contribution to organization. It is essential that the manager, who is the prime user of management information generated by the computer, be involved in the development of the system from the start.

It is significant that no other operational variable was found to be important to the successful use of microcomputers. Of particular interest is the finding that neither an agribusiness' prior experience with computers nor the presence of a computer specialist in the firm is important to successful computerization. This is probably due to the wide availability of computer assistance to the

inexperienced user and the increasing availability of "user-friendly" software. This has important implications for agribusinesses which are considering purchasing a computer for the first time. Those agribusinesses which lack experience or personnel expertise with microcomputers should not consider this to be a major impediment to the successful development of a computer system.

Another important finding is that the characteristics of the agribusiness and its manager were not important in determining whether efforts to computerize were successful. While these variables had no effect on the success of the computer operations, several of these variables strongly influenced which firms made the decision to adopt microcomputers. Larger firms and those firms which held memberships in agricultural organizations were much more likely to utilize microcomputers than smaller agribusinesses and those which did not belong to any agricultural organizations. Likewise, agribusinesses, whose managers had higher levels of education and favorable attitudes toward change, were much more likely to adopt microcomputers than agribusinesses whose managers had less education and were resistant to change. The implication of these results is that while firm and managerial characteristics may be good predictors of whether an agribusiness will adopt microcomputers, they are not important in determining the success or failure of these efforts.

CONCLUSIONS

The results of the survey indicate that the majority of agribusiness managers are satisfied with their microcomputers. Seventy-four percent of the managers responded that they thought their computer system had contributed to increasing the firm's level of profitability. Likewise, when asked specifically if they were satisfied with their microcomputer hardware and software, the great majority of managers responded affirmatively. Most of the dissatisfaction with hardware was due to the acquisition of a machine that was too small or too slow for the firm's needs. This demonstrates the importance of matching the computer's capabilities with the intended uses of the equipment. The major problem with software was inadequate instructions.

Managerial involvement in the development of the computer system was found to be an important determinant of system success. It is important that those individuals who will use the information generated by the computer system for decision making purposes be involved in its development. The firm's previous experience with computers and the presence of a computer specialist were not found to be important determinants of success and therefore should not be considered to be barriers to successful computerization.

Characteristics of the agribusiness and its manager were not related to the success of the computer system. However, larger agribusinesses, agribusinesses which belonged to agricultural organizations, and whose managers were better educated and less resistant to change were most likely to be users of microcomputers.

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